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Assessment of the role of capacity building on agricultural productivity: A case of Mbozi District, Tanzania

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Abstract: Various studies have investigated on strategies in capacity building and its influence on agricultural productivity. However, such role of capacity building in fostering agricultural productivity in developing countries is relatively underexplored. This instance provided room for this article to investigate on capacity building and its influence on agricultural productivity in Tanzania. Specifically, it examines the role of capacity building in agricultural productivity, and identifies strategies for capacity building in Mbozi District. The study employed qualitative and quantitative techniques to collect and analyse data. Data were collected by interviews; observations and documentary review. Descriptive and inferential statistics were collected from 300 peasants and analysed by Statistical Package for Social Sciences version 20. Content analysis approach was used to analyse qualitative data which helped in reasoning and measuring quantitative data. A p-value of 0.000 reveals that capacity building influences agricultural productivity through the use modern farming, harvesting and storage skills. Stakeholders advocate the use of best seeds, skills on edaphic factors, equipment, farm field schools; and researches and workshops as strategies in capacity building. In addition, involvement of academia, researchers, and political leaders increased agricultural productivity. These results imply that raising productivity requires a combination of different individuals, private and public institutions. Therefore, capacity building is inevitable among peasants in order to raise productivity. It is recommended that impact assessment be incorporated because it helps in reviewing and amending land and agricultural policies. Online training is recommended as an alternative to shortage of trainers to build capacity in more peasants.

Keywords: Agricultural productivity, Capacity building, Food security, Mbozi district, Peasant

1. INTRODUCTION

Capacity building in agriculture entails provision of assistance and support in farming to produce adequate revenue for farmers and the country, as well as to guarantee there is enough food for both the current and future generations. Additionally, it entails coaching, mentoring, and training to improve the abilities and knowledge that allow the adjustment of policies to improve productivity (Adam, 2020; Mabaya et al., 2010). Generally, capacity building is also part of enhancing the ability to produce technical skills, research materials, knowledge, and to subject peasants into agricultural practicality to improve food and nutrition security thereby achieving the highest quality agricultural productivity (Hall, 2005).

With more than 28.4% of the GDP coming from it, agriculture is still one of the most significant industries. Although the industry employs about 65.5% of the workforce, its growth rates are quite sluggish. To guarantee that the nation maintains food security and produces enough raw materials for industry, strategic interventions are required (National Research Priorities, 2021/22 - 2025/26). There is a growing need for new production tactics that result in high productivity as the nation's population grows. To boost agricultural output, small-scale farmers must be given more tools to innovate and use new technologies. While having local knowledge is essential for survival, it is insufficient for impoverished people to take charge of their own development. It's also essential to do agricultural research and development since it creates a knowledge base for technology that farmers can utilise to innovate. Moreover, national agricultural growth that is sustainable can be fueled by agricultural research and development. High levels of investment in research and development have been shown to boost productivity, which in turn boosts economic performance. A significant portion of the 1990s economic boom in some Asian nations can be ascribed to the quick development of new technology, many of which were effectively embraced by farmers (Kwadwo, 2009). Thus, more researches in capacity building and agriculture are needed in different parts of the world particularly Africa which is the centre for raw material production.

2. LITERATURE SURVEY

Globally, agricultural stakeholders have been providing broad public awareness campaigns on sustainable development, as well as training, communication, and extension programmes agricultural development as part of capacity-building. Various trainings have been conducted to target agricultural stakeholders such as managers in public and private sectors who influence market, information and media related to agricultural implements. For example, from December 1992 to date, FAO has been conducting various consultations on agricultural technology (Seufert, 2013). Accordingly, these consultations respond to the agricultural technological challenges especially in the area of sustainable agriculture as identified by the United Nations Conference on Environment and Development through its conferences including the one held in Rio de Janeiro from 3 to 14 June, 1992. As a way to capacity building, consultations between agricultural societies and other stakeholders have been developing guidelines, concepts and indicators for agricultural technology that suits regular changes in weather and climate which, in turn, leads to improved agricultural productivity (Reddy et al., 1997). There should also be integration and advancement between sectors and infrastructures for the economy to grow. The advancement of public infrastructures such as roads and financial services, for example, increases agricultural productivity by facilitating the exchange of the goods and services related to the agricultural economy (Šūmane et al., 2018).

Strategies for creating capacity in Africa have focused on reducing poverty, especially in rural regions. In agricultural forums, a range of issues pertaining to smallholder production and its competitiveness are discussed. For instance, events such as the Africa Food Systems Forum (September 5–8, 2023) have revealed obstacles to smallholder productivity, including those related to education and skills for rural development, tenure security and access to land, access to farm inputs like agricultural credit, and opportunities for off-farm employment. These are all related to strategies for increasing capacity. In order to ensure efficient governance of rural development programmes and policies, it appears that the best way to address these issues is to effectively promote participatory approaches that improve the responsiveness of government institutions through transparency and accountability in the delivery of their services. Building capacity through group formation, communication channel development, and poverty reduction also strengthens capacity, which raises agricultural productivity (Ludemann et al., 2012).

In order to boost farmer performance and address low agricultural output, Africa has to employ a variety of capacity building initiatives. With predictions that the world's population will rise to about nine billion people by the year 2050, agricultural productivity has been Africa's top worry (Adam, 2020; UN, 2017). It is anticipated that

over the next 15 years, there will be a minimum 20% yearly rise in the global demand for food. However, there aren't enough methods to boost production, thus research into capacity-building techniques is crucial to improving the output of farmers and peasants. Innovation, technology adoption, extension services, tools, funding, coaching, mentoring, or training are a few examples of this.

There are several efforts in Africa and East Africa in particular which have been taken by different agricultural stakeholders. This is because transformation in agricultural sector will help to revitalize rural areas, turning them from zones of economic misery today, to zones of economic prosperity. This requires significant investments in raising agricultural productivity by developing rural infrastructures, provision of affordable and enough capital, as well as incentives for the private sector to establish food processing and agro-allied industries in rural and urban areas as well. The environments for transformation are beginning to materialize in a number of East African countries including Kenya and Rwanda especially in the area of horticulture and floriculture sectors. Through its Feed Africa Strategy, the African Development Bank and other stakeholders hope to invest USD 24 billion over the next 10 years to assist the transformation of African agriculture. Even in building the Africa we want, agriculture will help to end extreme poverty, to eliminate malnutrition, to end dependency on food imports and move Africa and East Africa in specific to the top of the value chains in areas of its comparative advantage (Salami, 2017; Samura et al., 2022).

In the course of agricultural development, the Africa Field Innovation Centre for Agricultural Technology (AFICAT) was proposed for promoting advanced technologies and agricultural mechanization through public and private partnership between Japan and African countries including Tanzania. The Ministry of Agriculture (MoA) and other concerned organizations have established the National Rice Development Strategy (NRDS) to raise the production of rice and other crops in Tanzania from the current 2.2 million metric tons to 4.4 million metric tons by 2030. In this effort, AFICAT will support Tanzania to be self-sufficient in rice, and to be the market for other African countries. This means without the inclusion of different efforts for capacity building, agricultural production will remain low in the country despite being endowed with large arable land.

More so, strategies for capacity building in the agriculture sector is crucial because the sector has been playing an important role as a key driver for economic growth of Tanzania since independence; and approximately 65% of the population depends on the sector both directly and indirectly. The sector also contributes about 28% of the country's GDP and about 24% of the total exports, and ensures food security in the country (Fredrick, & Ahmad, 2023; WB, 2020). However, these facts literally mean that two thirds of Tanzanians are working to produce only one third of the country's GDP. This implies that capacity building is inevitable because poverty rate in rural areas amounts to 31.3% while that of urban area is 16%. In this sense, agricultural development plays an integral part not only in economic growth but also in poverty reduction in this country. So far, capacity building is required since the growth rate of agriculture for the past several years (4-5%/year) has failed to achieve the national target (6-10%/year). Moreover, poverty reduction is also lagging behind because peasants are not connected to other stakeholders like banks and industrial stakeholders (Fredrick & Ahmad, 2023; Anner et al., 2019).

Different strategies for capacity building have been adopted by the country to raise agricultural productivity. In this regard, the country has been using different policies like Agricultural Policy of 2013, Land Act of 1997, Land Act No. 4 of 1999 and Village Land Act No. 5 of 1999 (Nnkya, 1999). However, these policies and acts have not practically praised capacity building in Tanzanian agriculture because there are still ups and downs in agricultural productivity and lacking consistency. One of the most significant challenges in policies and slogans implication is the failure to digest these efforts at the local level and context like village or rural level where many farmers and peasants are found. Other factors for the failure of agricultural productivity are insufficient training in climate change, poor seeds, old agricultural farming methods, poor technology, and shortage of capital, poor

infrastructures, and poor link between sectors. But also, policies and plans, such as 'agriculture is the mainstay of the economy' and *Kilimo Kwanza* (agriculture first), have remained slogans to the public as there is so little experience of reforms that have improved livelihoods; and millions in the agriculture sector remain in poverty. So, various studies about capacity building and agricultural productivity should be done in order to enable the government to get information that will facilitate the amendment and update of policies and acts to fit the current environmental and climatic conditions for agricultural productivity.

The Assessment (1998) sees capacity building in Tanzania as emphasis, power and ability on the overall system of occupying and using arable land for agricultural production. It emphasizes skills for arable land and the context within which individual peasants, climate policies, organisations and societies operate and interact with one another in order to ensure high productivity. Similarly, in Mbozi District, the strategies for capacity building are viewed in the context of facilitating peasants in farming activities in terms of providing education, researches, means to land acquisition, and farm demonstrations. Different agents are inducing capacity by providing ideological and material support to agro-organizations and individual peasants in order for them to own and use land more efficiently to raise agricultural productivity. The entire land, agricultural policy, national slogans, and the coherence of specific actions with micro and macro-level conditions that support the land tenure system and raise individual peasant agricultural productivity must all be combined in order to ensure capacity building among the peasants (Msokwe, 2024).

The trend of statistical data from different regional and district sources show the decline of employed inhabitants in the agricultural sector. Mulungu, (2021) shows that, agriculture is influenced by population increase through migration and it is the main economic activity in Mbozi District whereby 88% of its inhabitants depend on agriculture and livestock production that account for over 80% of the district earnings. Surprisingly, the United Nations Development Programme and Economic and The study by Biswalo et al. (2023) in the southern highland shows that the number of employed inhabitants has declined from 88% to 75%. Such decline is associated with insufficient capacity building, capital, and climatic conditions which have also reduced productivity of some crops like maize and coffee whose production hanged down from 42,109.99 tons in 2011 to 30,307.71 tons in 2015 (Assessment, 1998; ESRF, 2019). Thus, this study informs policymakers on the reasons as to why such a decline is happening by specifically investigating the strategies for capacity building and implications on agricultural productivity in the district.

Smallholder farmers and peasants in the district are primarily responsible for agricultural production; of these, 50% use hand hoes, 40% rely on animal draught power, and 10% utilise motorised equipment like tractors. Therefore, it should be noted that despite being in the main agricultural zones in the country, ways of production are still local in such a way that the produce cannot suffice the current population of 510,599 people in the district. Thus, strategies for capacity building are required in order to uplift agricultural productivity. In 2021, the production was more than 134,965 tones with a productivity of more than 1.47 tone/ha (ibd.). The production has remained low because peasants lack access to important strategies like training, and support of financial services mainly because they live in remote rural areas with no financial institutions, telecom infrastructures, or power supplies, which has also been remarked by the Demirgüç-Kunt, et al. (2022) and Motta et al. (2022) (Demirgüç-Kunt et al., 2022; Motta et al., 2022).

Lack of access to important information regarding capacity building in Mbozi district might be due to limited researches that provide scientific data. In the district, Mulungu et al. (2018) and Hall (1945) conducted their studies on population increase by migration and land use in Mbozi District. Their findings indicate that the increase of population in the district made shifting cultivation limited and increased land degradation which, in one way or another, reduced agricultural productivity. Capacity building is one of the important factors of productivity

increase that is left aside without being investigated. Thus, this study aims to investigate the strategies for capacity building and implications for agricultural productivity in Mbozi District, Tanzania in order to cover the gap. This work addresses the following two objectives:

i. Examines the association between capacity building and agricultural productivity in Mbozi District.
ii. Identifies the strategies for capacity building for agricultural productivity in Mbozi District.

This study was guided by the Sorrow model as propounded by researchers (Schumpeter, 2023; Thompson et al., 2009). The model provides a useful framework for understanding how technological progress and capital deepening interact to determine the growth rate of output. It assumes that full employment of capital and labour can result in high productivity. The model further proposes that doubling the capital and labour doubles the output. Based on these assumptions, the model simplified the investigation on the capacity building strategies and agricultural productivity in Mbozi District, Tanzania by enabling authors to choose appropriate variables that enabled to address the study objectives.

3. PROBLEM STATEMENT

In the context of agriculture for Mbozi district, research on capacity building especially building capacity in technology, skills, supporting peasants by giving them important inputs will result to high agricultural productivity. The growing population, which has increased from 446,339 to 510,599 (Agwanda, 2014; Population Census report, 2022) in Mbozi District, requires agricultural agencies to set long-run capacity building strategies to boost the growth rate of the economy to individuals and the nation at large. For them to get the best strategies, research on various factors for agricultural production needs to be conducted. Capacity building is among the most important factors for increased agricultural productivity. This should be well known to agricultural stakeholders in order to increase productivity thereby sufficing the growing population and eventually solving the problems of hunger and malnutrition among people in the district and other areas.

2.1. The article contributions

The paper expands on our understanding of how land policies that prioritise social and economic societal transformations might empower peasants to increase the productivity of their agriculture. The paper adds to our understanding of how specific peasants come to understand the relationship between agricultural productivity and measures for capacity building. Since the United Republic of Tanzania (2013) National Agriculture Policy and the National Research Priorities (2021/22 -2025/26) emphasise improving production methods and growing productivity in the agricultural sector; this article sets a precedent for the nation to guarantee high production skills and techniques to peasants.

4. RESEARCH METHODOLOGY

4.1. Study area

The study was conducted in Mbozi District as the best case study because it is one of the suitable agricultural zones in Tanzania with plenty of fertile land of almost 255,300 ha. The crops grown in the district include both cash and food crops. Among food crops are maize, paddy, beans, sorghum, sweet potatoes, banana and Irish potatoes. Maize has recorded the highest production in the district, followed by beans and paddy. There are also several cash crops, mainly coffee, pyrethrum, sunflower, sesame, tobacco and groundnuts. Despite being the suitable agricultural zone, its productivity does not suffice the requirements for the rapidly growing population due to statistical

evidence of decreased number of employed population in agricultural sector from 88 to 75%. Production in some crops like coffee has also been declining from 42,109.99 tons in 2011 to 30,307.71 tons in 2015 (UNDP & ESRF, 2019).

The area was selected due to the fact that Songwe Region particularly Mbozi District is one of the BIG SEVEN agricultural producers national wide in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT). Other regions in the list include Rukwa, Katavi, Mbeya, Njombe, Iringa and Ruvuma. The researcher opted for a case study design to gain and present contextual, in-depth, and concrete knowledge about the strategies for capacity building and their implications for agricultural productivity in Tanzania.

A mixed approach that involved quantitative and qualitative techniques were used for the sake of getting more factual, reliable, detailed and triangulated data. Secondary and primary data were used in order to enrich the article. Secondary data pertained to documentary review and primary data were collected from peasants through structured and unstructured interviews, and observation from three villages (Mponela, Ndolezi and Matula) and three urban centres (Mlowo, Vwawa and Ihanda). The primary data was collected by administering questionnaires to 300 (200 males and 100 females) peasants in November 2020. The villages were stratified based on potentiality of arable land and agricultural economy whereas the 300 respondents were sampled by Yamane (1967) and Cramer, et al. (2001) sample size determination methods.

4.2. Sample size determination

This study employed both purposive and random sampling methods. In purposive sampling, the study used snowballing for key informants (peasants) who responded to open ended interviews. The key peasants were recruited through referrals from initial peasants. In random sampling, 300 peasants were selected to answer the close ended interviews or questionnaires. The selection applied the Yamane (1967) and Cramer et al. (2001) sample size determination methods. The size of respondents to be included was obtained by the estimation of the sample proportions by means of the formula: $n = \frac{Z^2_{\frac{\alpha}{2}} Pq}{e^2}$.

Since the method assumes that q is an estimate, we will set it to 0.5. It should be noted that, from a mathematical perspective, q = 0.5 and p = 0.5 result in the ideal sample size. The population percentage, P, should be set at 0.5. Let z be the constant coefficient / multiplier; let $Z_{\frac{\alpha}{2}}$ be 1.96; let e be the error; let it be 0.05658; and let n be the sample size. $\frac{1.96x1.96x0.5x0.5}{0.05658x0.05658}$ = 300.

The population from where the sample was drawn is presented in Table 1.

Table 1: The sample of peasants involved in the study

Sex	Population	Sample	Residence	Size
Female	30000	100	Urban/town	40
			Rural/countryside	60
Male	60000	200	Urban/town	60
			Rural/countryside	140
Total	**90000**	**300**	**Total**	**300**

Source: *Mbozi District Council, (2020)*

According to Busetto et al. (2020), Bengtsson (2016), and Creswell (2014), research utilising quantitative methods requires a big sample size to yield meaningful results. To prevent biases in the results, the three hundred peasants were chosen at random, and each one responded in a timely manner—between thirty and sixty minutes. The researchers presented the research permits and explained the importance of this study to the public and the country at large before being chosen. As a result, participants were aware of the purpose of the study and voluntarily agreed to supply the necessary information. Observation was also used to supplement the data from the questionnaires, and different approaches to capacity building and agricultural challenges were seen for the study.

Different approaches and motivations led to the usage of basic random sampling, snowballing, and purposeful techniques. Because the chosen towns had qualities that matched the type of data required for this study, purposeful sampling was chosen. In order to choose suitable villages for research on capacity-building tactics and their impact on agricultural productivity, the researcher used probability theory and the Sigma Algebra. High productivity villages were chosen as the study's focus among the dozens under consideration. The village selection process in probability theory was predicated on three factors. These are the countable unions of villages, the complement of another village in terms of agricultural productivity, and the sample space between villages to assure representativeness. The theory made it possible to choose rural and urban regions that were both representative and balanced, including Mponela, Ndolezi, and Matula in the rural areas and Mlowo, Vwawa, and Ihanda in the urban areas. Observation was used as one of the data collection strategies to draw evidence on the capacity building that was already in place.

In snow balling, Village and *Mtaa* leaders were used as a point of reference to recruit peasants in order to form part of the sample. Random sampling was applied in picking 300 peasants by Yamane (1967) and Cramer et al. (2001) sample size determination method. Subsets of peasants in Table 1 were selected from the population. The techniques were used at a time due to the fact that researchers focused on the quality of the available data, and used heterogeneous or mixed respondents so as to see if such differences brought homogeneous data for purpose of securing validity and reliability of the findings.

Furthermore, in-depth interviews were conducted with seven key informants who were selected by snowballing technique, each lasting for 60 to 90 minutes. Interviews involved experienced villages, street leaders and one extension officer from the District Council and TaCRI; and were conducted in Nyiha or Swahili languages and later translated into the English language. The collected data was analysed by descriptive and content analysis methods. Quantitative data from the close-ended questionnaires was analysed through descriptive statistics by showing the frequencies of capacity building strategies. Such frequencies were derived using the Statistical Package for Social Sciences Version 20. That far, quantitative data were analysed by inferential statistics whereby the SPSS-20 helped in data cross tabulation and generation of chi-square test and regression analysis which were used to test the way strategies for capacity building influences agricultural productivity through different demographic variables. These quantitative data were counted, measured and reasoned by content analysis approach.

Qualitative data from reviewed literature, non-participatory observation and interviews were collected in different ways. In reviews, the researcher read different valid documents in libraries, internet sources and from the Mbozi district council. Through observation, major five senses, sight, smell, touch, taste, and hearing are being use but for this study sight, touch, and hearing were widely used to collect data (Figure 1). On the other hand, interviews questions were asked to four key informants in order to validate and interpret quantitative information. These data were analysed by conceptual and relational content analysis, which allowed the researchers to identify various data recorded during field communication between the researchers and respondents by frequencies and

associations; this was adopted from Creswell (Creswell, 2014). In the course of analysis, the unit of analysis was an individual peasant.

4.3. Description of variables

In testing the association between capacity building and agricultural productivity, data were coded in the Statistical Package for Social Sciences version 20 in order to simplify the process of data analysis (Table 2). In this article, variables which were involved are residential status, sex, technology, strategies for capacity building, productivity and association between the capacity building and agricultural productivity. These variables were of different scales. Table 2 is illustrative.

Table 2: Description of variables

Variable	Responses	Coding	Type of scale
Residential status	Rural	1	Categorical or Nominal scale
	Urban	2	
Sex	Male	1	Nominal scale
	Female	2	
Technology dissemination	Yes	1	Nominal scale
	No	2	
Strategies for capacity building	Researches from academia	1	Nominal scale
	Field school skills	2	
	Guidelines from political leaders	3	
Association between Capacity Building and Agricultural Productivity	Not agree	1	Ordinal scale
	Strongly not agree	2	
	Neutral	3	
	Strongly agree	4	
	Agree	5	
Productivity	Low	1	Ordinal scale
	High	2	

Source: *Author's design (2020)*

4.4. Validity, reliability and ethical consideration

All these procedures of data collection and analysis in this study ensured ethical consideration by requesting a permit from the district administration for data collection. That far, triangulation was used to ensure validity and reliability of data by using multiple sources of data, mixed approaches of data analysis, secondary data and data from various researchers. More so, a pilot study was employed in order to ensure the validity and reliability of tools for data collection and analysis. In the pilot study, findings were similar to the actual study despite the respondents' variability. Lastly but not the least, linking the findings with the existing literature was another

triangulation technique to check the validity and reliability of data. For example, some variables like the strategies applied by agents resembled those used in other research (Šūmane et al., 2018).

5. DATA ANALYSIS AND DISCUSSIONS

5.1. Demographic profiles of respondents

Various demographic traits such as sex and residence were considered in this study. These are important variables in the aspect of strategies for land tenure and its implications for agricultural productivity because they help to determine the distribution of social and economic activities. Such variables also enable the reflection of biological differences and the way those differences affect land occupancy; and indicate the variation of preferences on land tenure systems and agricultural production based on regions and cultures. From the sample size, 200 (66.7%) were male and 100 (33.3%) were female. Out of that total, 60 (20.0%) male and 40 (13.3%) female respondents were residing in urban areas whereas 140 (46.7%) male and 60 (20.0%) female were in rural areas.

5.2. The association between capacity building and agricultural productivity

Prior to the strategies for land tenure, the study explored the influence of capacity building on agricultural productivity. It was found that 90% of the respondents strongly agreed and 10% simply agreed that capacity building influences agricultural productivity; with variation of responses between rural and urban. These results are statistically justified by the p-value of 0.041, which is less than 0.05. This means that there is a direct relationship between capacity building and agricultural productivity (Table 3).

Table 3: Association between Capacity Building and Agricultural Productivity

Residence	**Agree**	**Strongly agree**
Urban	15(5.0%)	85(28.3%)
Rural	15(5.0%)	185(61.7%)
Total	**30(10.0%)**	**270(90.0%)**
$\chi^2 = 41.67$, degree of freedom = 1 and p-value = 0.041		

Source: *Field Survey, (2020)*

5.3. Strategies for capacity building and their influence on farming output

5.4.1. Understanding of farming practices, yield processing, and land usage

In examining the strategies for capacity building towards farming output in Mbozi District Tanzania, the study examined one of the strategies, which is knowledge in land access among peasants. Peasants reported that land access and application of better farming systems have a significant influence on agricultural productivity. This implies that changing some technicalities in land use and farming systems as one of the strategies in capacitating peasants is primarily intervened by land ownership. Various stakeholders like TaCRI were providing skills, and knowledge for land acquisition and use. The data in Table 4 shows that 60.7% of males and 27.7% of females agreed that knowledge for land access, use, farming systems and yield processing influences productivity. On the other hand, 6% of males and 5.6% of females disagreed on the same. Thus, knowledge of land use and farming systems contributes to agricultural productivity in the district since majority of the respondents agreed on the matter. In these results, there is a strong statistical significance (p-value = 0.042) between knowledge of land use or farming systems and agricultural productivity.

Table 4: Influence of Knowledge of Land Use and Farming Systems on Agricultural Productivity

Sex	**Does knowledge for land use and farming systems influence agricultural productivity?**	
	Yes	**No**
Males	182(60.7%)	18(6.0%)
Females	83(27.7%)	17(5.6%)
Total	**265(88.4%)**	**35(11.6%)**
$\chi^2 = 41.40$, degree of freedom = 1 & probability value = 0.042		

Source: Field Survey (2020)

5.4.2. The role of agricultural agents

The study found different agents who applied different strategies in capacity building for peasants (Table 5). The agents include TaCRI, political leaders, academia and researchers. Some strategies included educational programmes, educational-material support programmes, conducting projects like farm field schools (*shamba darasa*), and exhibitions like *Nanenane*, which are usually held in Mbeya Region for the southern highlands in August every year. The trainings, advice and guidance from the mentioned agents influenced agricultural productivity among peasants. Such strategies enable dissemination of knowledge on agricultural implements, and land use against the type of crops in the district.

Table 5: Strategies in Capacity Building by Agents in the District

Variables	Researches from academia	Field school skills from TaCRI on land use, seeds & climate	Guidelines from political leaders	**Total**
Sex				
Male	37(75.5%)	139(90.8%)	24 (24.5%)	200 (66.7%)
Female	12(24.5%)	14(9.2%)	74(75.5%)	100 (33.3%)
$\chi^2 = 120.438$, degree of freedom = 2 and p-value = 0.000				
Residence				
Urban	28 (57.1%)	20 (13.1%)	52 (53.1%)	100 (33.3%)
Rural	21(42.9%)	133(86.9%)	46(46.9%)	200(66.7%)
$\chi^2 = 57.928$, degree of freedom = 2 and p-value = 0.000				
Total	**49(100%)**	**153(100%)**	**98(100%)**	**300(100%)**

Model		**Sum of squares**	**df**	**Mean square**	**F**	Sig.
1	Regression	15.004	2	15.004	86.543	0.000
	Residual	51.663	298	0.173		
	Total	**66.667**	**300**			

Source: Field Survey, (2020)

The cross-tabulation of the strategies employed by agents in capacity building was done based on sex, and residence in order to establish levels of statistical significance of variables in the study findings. Table 5 shows that 37 (75.5%) males said researches from academia influenced high agricultural productivity, 139 (90.8%) males viewed the field schools to have influence on agricultural productivity and the other 24 (24.5%) males said guidelines from political leaders influenced agricultural productivity. In the same veins, 12 (24.5%) females said researches from academia influence agricultural productivity in Mbozi, 14 (9.2%) females viewed the field schools from TaCRI to have positive contribution in land use and seeds in relation to soils and climates, eventually leading to high agricultural productivity. Moreover, 74 (75.5%) female respondents said guidelines from political leaders influenced agricultural productivity. In general, this indicates that the majority of males and females had the view that the strategies employed by agents had influence on agricultural productivity. The statistical data also support this influence based on the statistical significance that shows the relationship between strategies for capacity building and agricultural productivity; with the distribution free test of 120.438 and a probability value of 0.000. Further implication based on regression analysis (0.000) is that the effect of agents in the district is influential and fruitful in increasing agricultural productivity since it has multiple roles. The roles include dissemination of farming information, skills and ability that support innovation and adoption of new farming technologies among peasants.

On the aspect of political leaders, one of the key informants detailed this: -

> *……at local the level, Politicians insisted on the benefits of owning land, farming during proper seasons and insisting the pre-harvests (manage and better preparation of crops for harvest) and post-harvests (better ways for preserving, storing, and processing crops). At the national level, politicians helped in capacity building by setting slogans, laws and policies in the agricultural sector…….*(Key informant /Mlowo/January, 2020).

Further analysis was done based on residence; and findings showed that 20 (13.1%) peasants in town and 133 (86.9%) in countryside areas said the field schools undertaken by TaCRI have much influence on agricultural productivity. Similarly, 52 (13.1%) respondents in town and 46 (46.9%) in countryside areas indicated guidelines from political leaders to have influence on agricultural productivity; and the remaining 28 (57.1%) in the urban and 21 (42.9%) in the rural reported that researches from academia provide useful knowledge on land tenure, which eventually triggers high agricultural productivity. Statistically, there is a significant relationship between residence and strategies for capacity building towards agricultural productivity ($\chi^2 = 57.928$ and p-value = 0.000).

Based on regression analysis model, these results indicate that the regression model is statistically significant in this study. Thus, there is a strong statistical relationship between the strategies for capacity building and other variables like sex, and residence as they contribute much to agricultural productivity in the district. For example, one of the key informants had this to say: -

> *…..there is a link between the strategies for capacity building and agricultural productivity. In this view, training through farm fields for both males and females, guidelines for providing loans, the supply of implements have contributed to land occupancy at large which in turn has led to high agricultural productivity in Mbozi district……* (Key informant /Vwawa/January, 2020).

5.4.3. The role of traditional skills

5.4.3.1. Curing technologies

Moreover, the utilisation of traditional knowledge enhanced productivity. There was a need to look at methods that secure productivity loss in the context of post-harvest loss, which takes into account direct physical losses and

quality losses that lower the crop's economic worth or might render it unfit for human consumption. Peasants in Mbozi district who were unable to choose cutting-edge and contemporary crop processing technology were given access to a number of traditional skills. Moreover, the utilisation of traditional knowledge enhanced productivity. There was a need to look at methods that secure productivity loss in the context of post-harvest loss, which takes into account direct physical losses and quality losses that lower the crop's economic worth or might render it unfit for human consumption. Peasants in Mbozi district who were unable to choose cutting-edge and contemporary crop processing technology were given access to a number of traditional skills. Locals, particularly those with very little money, found these locally developed technology to be of great assistance. A few of the tools that the peasants were able to use thanks to capacity building from stakeholders and professional advice are shown in Figure 1. These devices made it easier to peel bananas and their trees and cure groundnuts.

Figure 1: Photo showing local machine for curing ground nuts and banana peeling
Source: Field survey, (2020)

5.4.3.2. Demographic profiles of respondents

Through capacity building, peasants got knowledge about the occupancy and use of arable land and boundary definitions and verifications in order to avoid land conflicts which might lower productivity. The Village Government Land Council and Committee ensured legal land transactions and legal boundary verifications were done simultaneously in order to maintain peace and harmony among peasants. Management and adjudication of doubts and disputes regarding peasants' rights and parcel or plot boundaries were insisted not to use informal and temporary boundary verification, which involved channels or planting trees and banana alongside (Figure 2 B). Rather, peasants should opt for authorised bench marks which are permanent and can stay longer along the plot (Figure 2 A).

Figure 2: Formal (A) and Informal (B) Boundary Verifications between Farms
Source: *Field Survey, (2020)*

5.4.4. Training from agricultural experts to peasants

Through training, awareness increased among peasants regarding the value of arable land access, crop spacing, season detections and crop selections, the use of agricultural implements, climates, market of crops and the shift from traditional to modern farming practices. Training was important because some peasants especially in the rural areas did not consider land as one of valuable resources which can be transferred into financial resource. Following the training, however, peasants recognised that land is among the key resources which can multiply agricultural productivity if other factors like capital and technology are also considered. In Mbozi District, training was conducted by some agents like TaCRI in order to make peasants aware so that their productivity increased and for them to produce surplus. The Institute does not only train peasants in Mbozi District in Songwe Region but also peasants in other regions such as Katavi, Rukwa, and Mbeya (Figure 3). Moreover, TaCRI Officials have been working smoothly due to their link with other nations where farmers have been attending various forms of training in order to gain better skills related to land tenure, land use and agricultural productivity. This implies that such training has also increased and changed the use and ownership of arable land, farming skills, identifying market networks etc. which, in turn, has raised agricultural productivity among peasants in Mbozi District. Based on observation, Figure 3 is a group photo that shows training at TaCRI offices (left) and TaCRI coffee farm (right).

Figure 3: Group Photo (left) after Lesson at TaCRI Coffee Farm (right)
Source: Field Survey, (2020)

5.5. Discussion of results

5.5.1. Descriptive statistics

The study involved sex and residence during data collection and analysis. The involvement of sex is important when studying issues related to productivity; it is a vital organizing issue in societies which can significantly affect the processes of production, consumption and distribution of agricultural productivity. In this study, 66.7% were male and 33.3% were female respondents. The difference between male and female did not negatively affect the study findings rather it balanced the quality and validity of information because there were many male peasants than female in Mbozi district.

On the other hand, residential status was crucial in determining the spatial distribution of peasants, connectivity between rural and urban areas on agricultural productivity, the nature of land use and productivity. The distribution of results was in two patterns, the rural and urban areas. There were 33.3% (13.3% males & 20%

females) of the respondents from the urban whereas 66.7% (46.7% males & 20% females) of the respondents were sampled from the rural areas. Thus, by involving different sex and residences to get similar responses in various interviews, it signifies the collected information were reliable and valid.

5.5.2. The association between capacity building and agricultural productivity

The study investigated the relationship between capacity building and agricultural productivity. The findings revealed the statistical association between capacity building and agricultural productivity at p-value of 0.041 (Table 2). This implies that when there is low or poor or no strategies for capacity building in farming systems, agricultural productivity will be low. Likewise, if there are proper strategies for capacity building, agricultural productivity will increase. Demirgüç-Kunt et al. (2022) discovered the same thing in Chad: increasing agricultural output is significantly influenced by capacity building, particularly in the area of land tenure. Because the goal of capacity building is to increase farmers' methods of production, farmers were willing and able to adopt various technologies, such as contemporary farming, harvesting, and storage techniques. Encouraging smallholder farmers to increase their output is likely to result from providing them with the necessary tools. This implies that agricultural productivity can increase not only by having capital, good climate, and availability of labour force but also by building capacity to peasants regularly. Such association was studied based on some roles of capacity building which were transferring Knowledge, Skills and Ability (KSA) through extension services and ensuring peasants are able to innovate and adopt new farming technologies.

5.5.3. Strategies for capacity building and their influence on farming yield

a. Awareness on the use of plot of arable land, farming systems and yield processing

The study investigated the influence of capacity building on agricultural productivity by using the variable of knowledge on land use, farming systems and yield processing among farmers by asking the respondents on whether the knowledge for land use and farming systems influences agricultural productivity through YES and NO responses. The opinions from the majority (88.4%) of the respondents indicated that knowledge for land access, land use, systems of farming and yield processing influenced productivity at the probability value of 0.042 (Table 5). Similar findings were found by Solow model in Thompson, et al., (2009), who has revealed that modern skills for economic growth blends the performance of the knowledge advancement with the ability of individuals to absorb and expand it in improving the land use and farming systems. Additional evidence can be found in the studies by Demirgüç-Kunt et al. (2022) and Motta et al. (2022), which noted that productivity was low relative to the current population. The findings of this study indicate a statistically significant relationship between agricultural productivity and knowledge of production variables. This implies that there is no enough knowledge for agricultural production among peasants, and that is why productivity remains low despite enough fertile soil in the district. So far, stakeholders like policymakers have partially played their roles to facilitate peasants in the agricultural economy. Thus, advocating and financing trainings to stakeholders like TaCRI among farmers towards land tenure, use, modern farming systems and crops processing after harvest will yield high productivity in agricultural Tanzania.

b. The Role of Agricultural Agents

In this article, the variables of researches from academia, field school skills from TaCRI on land use, seeds and climate as well as guidelines from political leaders were used to study the role played by agents such as TaCRI as a part of capacity building and its influence on agricultural productivity based on sex, and residence. Majority of the respondents said capacity building influences agricultural productivity. This was also justified by the statistical

significance that shows a relation at a probability value of 0.000 for demographic variables of sex and residence which is less than the critical value 0.05. Analogous results were obtained in the study conducted by Mabaya and colleagues (2010), which indicated a noteworthy role for agents in capacity building and its impact on agricultural productivity. According to the essay, ensuring a proper land tenure system and increasing agricultural output in Africa and other regions require capacity training in agriculture. Through seminars, trainings, and workshops from various organisations, including the National Food Reserve Agency (NFRA), the Food and Agricultural Organisation, the World Bank, the European Union, political leaders, as well as local and global land policies, are enhancing Tanzania's capabilities. It increases agricultural productivity and uses land efficiently. Traditionally, agricultural education and training have concentrated on raising agricultural production in the African environment in order to support rural development and food security.

These findings are consistent with those of Šūmane et al. (2018), who contended that agricultural productivity is enhanced through public infrastructure development, including roads, skills, and guidelines for financial services like loans, through capacity building. This is based on the exchange of goods and services, which transforms the economy. This suggests that methods for increasing agricultural output, including those aimed at boosting capacity, are essential not only in Mbozi but also in other parts of Tanzania and the global community. This means that techniques like agricultural fields, which were typically concentrated in urban areas, will increase production more if they are transferred to rural areas with a high concentration of peasants and ample arable land.

These results are the evidences that institutions that deal with dissemination of strategies for capacity building cannot accommodate the large number of peasants in the district. This leads to poor agricultural skills among peasants. Thus, if these results are used by policymakers, it is obvious that policies will favour and facilitate such institutions to widen the chance for capacity building in the district by increasing the number of staff in the institutions like TaCRI and others. The results also provide visions into the different strategies that enable co-operation and communication among stakeholders like policy-makers, and researchers. However, it remains necessary to increase understanding of the interests and motivations of different actors like peasants, who are involved in the process of agricultural industry, influencing policy, finding out clear policy-influencing productivity and institutional support.

c. Traditional skills and technologies on boundary verification, local curing and peeling machines

In ensuring high productivity through land security, stakeholders provided trainings on boundary verifications (Figure 2), trainings on the patterns of climate, and seedlings of coffee (Figure 3) and the trainings on traditional machines that helped curing groundnuts and peeling banana (Figure 1) to peasants. It was found that boundaries verification as a results from agrarian stakeholders helped production processes to be in harmony because they reduce and resolve conflicts among peasants which allowed the use of much time in production rather than in solving conflicts hence high productivity. So far, trainings on the patterns of climate, and seedlings of coffee and other crops enabled peasants to coup with the current changing climate by choosing proper seeds in relation to climate. For example, in terms of maize seeds regarding the climate, peasants were then able to not that Tembo Seed.co was only appropriate for cold climate areas like Tukuyu and Makambako, Pundamilia and Tumbili was only appropriate for hot climate areas like Chunya, Mbarali in the Usangu Basin, and Momba District along the Msangano Basin, whereas Simba Seed.co was appropriate for both cold and hot climates, including Mbozi District. Unfortunately, peasants were just purchasing any kind of those seeds before trainings, which meant that some of them were producing low productivity despite fertile, and large sized arable land due to lack of know how and why.

The triangulation of results with other previous studies indicated the difference in the aspect of traditional skills in Mbozi district (Figure 1). For example, these findings were contrary to Kumar et al. (2017) who investigated on Reducing Postharvest Losses during Storage of Grain Crops to Strengthen Food Security in Developing Countries who said that storage losses significantly impact farmers' livelihoods and make up the largest portion of all postharvest losses for cereals in poor nations. The majority of harvested grains are processed and kept in traditional storage buildings, which are insufficient to prevent mould growth and insect infestation during these stages and result in significant losses and low production. Enhancing storage structures and using technology interventions can significantly lower postharvest losses and boost production, resulting in higher profits for farmers.

On the other hand, the results on capacity building in the aspect of trainings were similar to Mabaya *et al*. (2010) and Thompson, et al., (2009) who investigate the theme in different areas including Asia, they observed that training from different experts such as the National Food Reserve Agency (NFRA), Food and Agricultural Organization (FAO), World Bank (WB), and European Union (EU) increased agricultural productivity among peasants. This was achieved by scrutinizing the global and local land and agricultural policies, conducting seminars, training and workshops between experts and peasants. Such strategies increased agricultural productivity in one way or another.

Since different techniques in capacity building were found to influence agricultural productivity, a combination of both is required among peasants in order to raise agricultural productivity in Tanzania especially rural areas. The similar option can be adopted in the rest of Africa in order to achieve the fulfilment of SDGs especially the goal number two that insists on "*Zero Hunger*" in targets 2.3 that aim to double the productivity and incomes of small-scale food producers and target 2.4 that advocate the increasing of sustainability in food production and resilient agricultural practices.

6. RESEARCH IMPLICATIONS

The article provides evidences that since the association between capacity building and agricultural productivity exists, then the application of strategies for capacity building may catalyze the implementation of Research Priorities for Tanzania 2015 -2020 especially in improving production of indigenous crops and crops of cultural significance. So far, practical use of results may allow stakeholders to adhere on Standard Development Goals (SGDs). More specifically goal number 2 on "*Zero Hunger*" targets 2.3 that aim to double the productivity and incomes of small-scale food producers and 2.4 that intend to make food production more sustainable and resilient agricultural practices. More recently especially after 2010 the development practitioners and policy makers have broadened their attention to include agro-business or agro-industries.

7. RECOMMENDATIONS AND FUTURE RESEARCH

a) Strategies like farm fields should be demonstrated in both urban and rural areas. This can help individual peasants to raise their production skills, and hence productivity, which finally improves their livelihood.

b) Other stakeholders should conduct further studies on the impact of the strategies employed in capacity building so as to assess its outcome on agricultural productivity. Such assessment can bring new observations that are helpful to amendment of policies.

c) Following the large number of peasants especially in rural areas, TaCRI offices should be expanded by increasing capacity and extending to other regions like Rukwa and Katavi regions which were being served by TaCRI-Mbozi district. To that effect, online delivery of the strategies for capacity building should be emphasized rather than depending on only geophysical mode of skills dissemination. Such approach

will enable transfer of skills and technology to many peasants within a short period of time as compared to geophysical approach.

d) Crop-based agricultural productivity as a result as strategies in capacity building was the main focus of this article. Therefore, since all production processes are done on arable land then further researches can look into the agricultural productivity and land tenure structures in relation to livestock rising in Tanzania.

e) As with this article, real data on household agricultural productivity should be gathered in addition to data on opinions or perceptions for future research methodology. Thus far, if it's feasible, carrying out a natural science study will increase stakeholders' understanding of this social science investigation which can improve ways to build capacity among peasants.

8. CONCLUSION

The use of mixed approach was sufficient in this study which assessed the role of capacity building on agricultural productivity. So far, based on the influence of capacity building in agricultural productivity, strategies like training, political guidelines, researches, skills on land use, seedling, farm field schools, and boundary verifications were potential for peasants in the district. Such strategies significantly influenced land tenure, which is the basis for agricultural production, and eventual increased productivity. In the course of implementing the strategies, statistics and observations showed that strategies like training and farm field schools were insufficient due to large number of peasants. This was mostly remarked in the rural areas in the sense that many strategies were more centred in the urban areas compared to rural areas with large number of peasants and endowed with many potentials for production. Such differences limited productivity in rural areas, which is the centre for agriculture activities.

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