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RESEARCH ARTICLE

DETERMINING INSTITUTIONAL CAPACITY OF VOCATIONAL TRAINING CENTERS TO PROMOTE AGRICULTURAL MECHANIZATION AMONG SMALL HOLDER FARMERS IN KISUMU COUNTY, KENYA

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Abstract

Despite the benefits offered by Vocational Education including skills about agricultural mechanization, Small Holder Farmers are yet to benefit from vocational training with regard to agricultural mechanization. The purpose of this study, was to determine the Institutional Capacity of Vocational Training Centres to promote agricultural mechanization among Small Holder Farmers. However the study focused on determining the Outreach Services offered by Vocational Training Centres that promote agricultural mechanization. Descriptive survey research design was employed in this study. The sample size comprised of 110 Small Holder Farmers, 21 principals and 21 Heads of Departments. The reliability coefficient of instruments was 0.713. A coefficient of 0.70 was accepted as reliable. Interview guides for principals and Focus Group Discussion, facilities observation guides, questionnaires for Heads of Department were used to collect data. Descriptive statistics of mean, frequency and percentages were applied to analyse data. This study found out that Vocational Training Centres had Institutional Capacity to promote agricultural mechanisation but requires improvement and modernisation. The study noted that Vocational Training Centres offer Outreach Services but not scheduled. This study therefore recommend that Vocational Training Centres must intentionally build adequate institutional capacity intended for the promotion of agricultural mechanisation among small holder farmers. Findings can be used by Vocational Training Centres to promote adoption of agricultural mechanisation among Small Holder Farmers through.

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Introduction:-

Background Information

Globally, Agriculture plays a very important role in the economy of many countries. In 2022, **agriculture's contribution to the UK economy** was £13.9 billion (0.6% of GDP). This constituted an increase of £1.8 billion (15%) compared to 2021 (gov.uk, 2021). Germany is among the top four agricultural producers in the European Union, producing 50 billion Euros worth of agricultural products each year. The agricultural industry contributed to

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approximately 0.9% of Germany's GDP in 2021. It employs more than half of the population of India (Thar et al., 2021) and contributes about 23% of the Gross Domestic Product (GDP) of Nigeria (Food and Agriculture Organization [FAO], 2022). In Kenya, agriculture accounts for 20 percent of its Gross domestic Product (GDP) and employs over 40 percent of the country's population (Central Bank of Kenya, 2022). Farming in Kenya is practiced by large, medium and smallholder farmers (Republic of Kenya [RoK] 2010). Large scalefarms are commercial farms that range between 50 hectares to 3000 hectares according to Kisumu County Integrated Development Plan, 2018-2021 (KCIDP, 2018-2021). Large farms are mostly in the sugar belt of the county. They are responsive to technology. Medium scale farms range between 11 to 49 hectares and are also mostly, in the sugar cane growing areas. A smallholder farmer is a producer who rears livestock, raises fish or cultivates crops on up to 10 hectares, with most smallholder farmers cultivating less than 2 hectares of land.

Agriculture education

This is a systematic program of instruction for students desiring to learn about the science, business, technology of plant and animal production and/or about the environmental and natural resources systems. It is important to ensure that the agriculture sector is vibrant given the critical role it plays in the Kenyan economy. This can be done through agriculture education among other methods. Training in agriculture facilitates farmers acquisition of knowledge, skills and exposes farmers to current technologies in crop, livestock and fish production, processing and marketing of farm produce (Rajashree et al., 2013).

Vocational Training Centers and delivery of agricultural education

Vocational Training Centers (VTCs) is a subset of Technical Vocational Education and Training (TVET). The German development agency classifies the various types of TVET as formal, non-formal and informal Kirui et al (2018). Actors involved in the VTCs include state, students, trainers, farmers, sponsors and agri-sector companies. The crucial role of VTCs and agricultural education is based on the theory by Becker (1975) on human capital which presents human knowledge and skills as means of production and asset that can potentially generate income. TVET and VTCs have potentially great impact past the individual level. Consequently Vocational Training Centres as TVETS affects an individual by increasing their potential income (Kirui et al (2018)). To run their farms as productive enterprises, farmers need formal vocational training in order to sustainably enhance their level of productivity (Feng et al, 2022).

In this respect agricultural vocational education and training (AVET) are key enablers to help farmers develop competences to respond to their needs (Wolfgang, 2022). Hence the need for the provision of agricultural education as means to deliver skills to stake holders.

In Puerto Rico, Agricultural Education institutions employ theory and practical instruction and also link their curricula to workforce and community needs through outreach programmes (Roberts, 2016).

In Africa there is common practice of apprenticeship, whereby the trainees are taught for jobs in the 'jua-kali' (informal) sector. For the development of vocational agricultural education and training in Africa, it makes sense to link it with economic cooperation and integration approaches, for example for trade and services (Frommberger, 2022).

In Kenya agricultural education is offered at various levels in the education and training system. Public and private universities and middle level colleges offer degree and diplomas in agricultural education. It's also offered in Technical Vocational Education Training (TVET) institutes namely: National Polytechnics (NP), Technical Training Institutes (TTI) and Vocational Training Centers (VTC) at diploma, Craft, artisan and trade test levels. Kenya National Examination Council (KNEC) and the National Industrial Technical Authority (NITA) examine students in TVETS (Matete, Udoto, Konyango, Egerton University, Kenya, personal communication). The national set up of institutions offering agricultural education is also replicated in Kisumu County in Kenya.

Vocational Training Centers and promotion of Agricultural Mechanization

Introduction of new ideas in Agriculture inevitably require changes in the education of current workers as well as in the education of future workers. This creates pressure on vocational education and training (Marinič, Peter. 2023). In the Czech Republic adds Marinič et al (2023), it is important that educational institutions follow current trends in the field of Agriculture thus prepare not only future graduates but also their educators for an adequate form of education.

In Benin, Adegbola et al (2020) carried out research to analyse the extent to which existing formal and informal training programs provide the knowledge and skills needed for successful mechanization because according to them, this helps to guide future knowledge and skills development efforts. Farmers benefit from agricultural mechanization, by being able to increase their farm incomes (Adu-Baffour et al., 2019). Agricultural Mechanization is the application of mechanical and mechatronics technology in farming to increase the productivity beyond the capacity of human labour (Sims & Kienzle, 2015).

In Kenya the national and county government, non-governmental organizations, private sector and foreign development partners are involved in the promotion of agricultural mechanization among small holder farmers (SHF). According to Republic of Kenya (2017), the role of vocational training centres in promotion of agricultural mechanization, is training, outreach programmes and capacity building to farmers. Adoption of agricultural mechanization in Africa including Kenya and Kisumu County is still low (FAO, 2019). In total, only 10 percent of farm activities are done using tractors/machinery power. The rest rely on human and animal power. Uptake among small holder farmers is even lower low.

Statement of the problem

There are 23 equipped Vocational Training Centers (VTC) expected to provide skills for sustainable livelihoods and work in Kisumu County. They are meant to empower farmers to acquire and adopt systems like Agricultural Mechanization (AM) that can improve their production. However, the level of AM is still low in Kisumu County, perhaps due to lack of Institutional Capacity in VTCs to promote agricultural mechanization among Small Holder Farmers (SHF). Even though studies which examine VTCs and promotion of AM have been conducted elsewhere, a search could not find literature that links Institutional Capacity of VTCs to promotion of AM among SHF in Kisumu County, hence reason for this study.

Objective of the Study:-

The study sought to collect, document and analyze data to find out:

i. Whether Vocational Training Centres offer outreach services that promote agricultural mechanization to crop, livestock, and fish farmers in Kisumu County, Kenya.

Research Question:

The study sought to answer the following research question:

i. Does Vocational Training Centres offer outreach services that promote agricultural mechanization among crop, livestock, and fish Small Holder Farmers in Kisumu County, Kenya?

Literature Review:-

Vocational Training Centres' Outreach services that promote agricultural mechanisation to Small Holder Farmers

A key driver of agriculture sector is a functional Agricultural Extension service that is responsive to socio-economic conditions. The aim is to consolidate efforts attending to farmers' needs, according to their scale of operation, production systems, technology level, and socioeconomic circumstances (Liedtka, Salzman, & Azer, 2017). In Philippines, Iloilo State University of Fisheries Science and Technology (2019) assert that one of the objectives of extension is to empower human resources by enhancing their capabilities through skills trainings, organizing, gender mainstreaming and sensitivity, and active participation in community development. Iloilo (2019) adds that extension provides technical assistance in education, fisheries, maritime industry, agriculture, food technology and hospitality services, entrepreneurship and industrial technology to clientele.

In Nigeria Training Institutions are advised that in designing a curriculum, it is important to incorporate extension courses from the first year, and to deemphasize theoretical teaching, which currently dominates the curriculum, and emphasize practical teaching (Agwu, A.E., 2023). Collaboration between training institutions and rural communities can either be formal or non-formal or both (Matete, Udoto, Konyango Egerton University, Kenya, personal communication).

In Kenya, one of the challenges identified by the Ministry of Livestock and Agriculture is weak institutional capacity to deliver quality extension services (Republic of Kenya [RoK], 2017). The delivery methods of extension services in the agricultural sector include Focus Group Discussion, Agricultural Shows, Farmer Field Schools, Farm

Visits, On-farm Demonstrations, Field Days, Electronic Media and Exchange Visits. Each of these approaches have components aimed at building human and institutional capacity to increase productivity (RoK, 2017). According to RoK (2017) the role of TVET is training, outreach programmes and capacity building to farmers so that they can adopt agricultural mechanization. The demand for agriculture mechanization emerges at the point when it becomes cost effective for farmers to use it over other available options. Thus, policy interventions aimed at promoting agriculture mechanization must first confirm whether sufficient demand is indeed present (Diao& Hiroyuki, 2016).

Awareness is also important and Information Education and Communication (IEC) plays a vital role in changing the attitudes small holder farmers. Memon et al (2012) defines IEC as an approach that attempts to change or reinforce a set of behaviors in target-audience regarding a specific problem in a predefined period. According to Vinay et al, (2023) various organizations and government agencies have conducted IEC activities to create awareness by using some of the entities namely: administration, vocational training centres, Non-Governmental Organizations (NGOs), schools and colleges and local media: local newspapers, radio stations, and television channels. Oywaya-Nkurumwa et al., (2023) posit that agriculture sector in Kenya is dominated by small scale producers consisting of subsistence farmers and fisherfolk and pastoralists. This sector is characterized by subsistence production, reliance on rain fed production and low mechanization. Low mechanisation hampers agricultural production because most agricultural activities demand a lot of power (Matete, Udoto, Konyango Egerton University, Kenya, personal communication). Therefore, Vocational Training Centers in their mandate to empower communities through outreach services should partner with the community to help them adopt agriculture mechanization skills. This study therefore sought to document the Institutional Capacity of Vocational Training Centers to promote Agricultural Mechanization among Small Holder Farmers in Kisumu County, Kenya with focus on Outreach services offered by VTCs that promote agricultural mechanisation.

Methodology:-

Introduction

This study employed descriptive survey design. This design was suitable for this study as it involves gathering respondents' ideas and views about issues through data collection methods such as interviews, questionnaires and observation.

Research Design

Descriptive survey was deemed suitable for this study because the research did not involve manipulation of variables (Kathuri, 2008). Through descriptive surveys, opinions, attitude, various suggestions for the improvement of education practice that leads to promotion of agricultural mechanisation has been obtained. The design provided a numerical description of some part of the population and also explains events as they are, as they were or as they will be (Onen&Oso, 2011). It's suitable for educational fact finding because it offers accurate information.

Target Population

The target population was 150,029 subjects, comprising of 149,983 small holder farmers according to Kisumu Integrated County Development Plan (KICDP, 2013-2017), 23 principals who are managers of VTCs and selected 109 Heads of Departments (HoDs) in charge of sections that were offering skills related to agricultural mechanization. Determined by census, the maximum possible number of HoDs were to be 131, being the number of sections in 23 VTCs offering courses related to AM but some VTCs deployed one HoD to head two or more sections. The accessible population were 138, 23 and 109 SHF, principals and HoDs respectively (Table 1). The accessible SHF were 6 farmers (3 females and 3 males) in a radius of five kilometres from each of the 23 VTCs.

Table 1:- Accessible population of the study.

Category	Accessible population
Small Holder Farmers	138
Principals	23
Heads of Department	109
Total	270

Sampling Procedure and Sample size.

The sample size population was 152 respondents. The sample size comprised of 21 VTC principals, 21 heads of departments (a deputy principal who is also HoD and assisted by other HoDs represented each VTC during the data

collection), 110 farmers selected purposively from the accessible population of SHF (Table 2). According to Kathuri and Pals (1993) for survey research, each major sub-group requires a minimum of 100 cases and a minor sub-group should have 20-50 cases. The 110 SHF were organized into 5 clusters of 22 farmers per FGD comprising of 11 females and 11 males. Clustering bring about convenience, ease of management and variety of ideas for a wider audience Blasi (2020). The 21 VTCs were organized into 4 clusters, where 3 comprised of 5 VTCs per cluster while 4th the cluster comprised of 6 VTCs. At least one VTC in a cluster was used as venue for the 5 FGD meetings.

Table 2:- Sample size of the Study.

Category	Accessible population	Sample size
SHF	138	110
Principals	23	21
HODs	109	21
Total	270	152

Results and Discussion:-

Outreach Services provided by VTCs that promote Agricultural Mechanisation

Attendance of FGD sessions by participants presented some variations in terms of gender. There were more females at 50.9% compared to males who were 49.1 % in number (Table 3). This could mean females are more responsive to matters concerned with mechanisation than males because in Africa more females are engaged in manual labour so mechanisation is deemed as a relief (Matete, Udoto, Konyango Egerton University, Kenya, personal communication).

Table 3:- Distribution of clusters and Participants by Gender in numbers and percentage.

Cluster	Female (%)	Male (%)
Katito	12(10.9)	11(10.0)
Ahero	10(9.1)	10(9.1)
Sianda	14(12.7)	10(9.1)
Kitambo	12(10.9)	10(9.1)
Kigoche	8(7.3)	13(11.8)
Total	56(50.9)	54(49.1)

During focus group discussions (FGD), participants were asked to state whether they were aware of programs being offered by VTCs. The results is presented in Table 4. Findings show that exhibitions had the highest level awareness of 18.2 percent among the respondents while seminars had the lowest awareness of 3.6 percent. Field days and workshops level of awareness was 10.9 percent each .Farm/ home visits and demonstrations were 9.1 percent and 6.4 percent respectively. According to the Higher Education Ministry of India (2009) technologies developed by research institutions could not be adopted by SHF since the process of transfer of technologies was not undertaken in a planned manner. These results show low levels of awareness. Exhibition which at 18.2 percent is the highest was due to fashion design, hair dressing and beauty therapy services and shows in the VTCs. The level of non-awareness were above 80 percent for all methods.

Binde (2011) concluded that techniques of communication used to promote knowledge determines the level of awareness and rate of adoption of the innovation. This result is consistent with studies which had shown that communities are not informed of VTCs' activities and potential benefits. Provision of technical and consultancy

Table 4:- SHF awareness about extension methods for outreach services offered by VTCs.

Extension Methods	SHF Aware (%)	SHF not Aware (%)
Farm/home visits	10 (9.1)	100 (90.9)
Exhibitions	20 (18.2)	90 (81.8)
Seminars	4 (3.6)	105 (96.4)
Field days	12 (10.9)	98 (89.1)
Workshops	12 (10.9)	98 (89.1)
Demonstrations	7 (6.4)	103 (93.6)

services to farmers, businesses and industries is a function of VTCs as stated in the Kenya County Government of Lamu Youth Polytechnics (VTC) bill of 2014.

Table 5 shows the results from FGD sessions when the participants were asked about trainings. A total 59.1 percent of the respondents confirmed having attended skill improvement training about poultry/hatchery in the VTCs. The other 37.7 percent attended innovation training on solar pump application, hiring, collaboration, funding and for mechanical and electric pump for irrigation and other farming requirements. Another 29.9 percent attended training about drip, overhead and surface irrigation. Most of these courses were conducted in Ahero, Katito and Arch Bishop Okoth VTCs. Vocational Training Centres in Kisumu County are at different levels of competence to promote agricultural mechanization. Ahero, Arch Bishop Okoth and Katito VTCs are fairly equipped. Katito has a fully-fledged school of agriculture with irrigation facilities including a borehole, solar pump and a training farm. They also offer poultry activities. Ahero has poultry undertakings, both mechanical and solar pump to irrigate crops in the green house and the farm. Arch Bishop Okoth has built a poultry house used for training farmers in poultry production. Farmers expressed the need to 'sensitize community about availability and benefits of trainings in VTCs'.

Table 5:- Training by VTCs about Agricultural Mechanization.

Training	Topic	Farmers in attendance	Percent
Skill improvement	Irrigation	32	29.1
Sensitization	Hatchery	65	59.1
Innovation	Solar pump	41	37.7

Table 6 shows that computer packages, hair dressing and fashion shows were the outreach services offered most at 14.3 percent of the VTCs. This is in line with Chauhan (2008) assertion that numerous digital educational tools have been innovated and used in promoting collaboration with community, and facilitating communication between students, tutors and the public. Building technology and electrical and electronics was each offered by 4.8 percent VTCs. Heads of department explained that building services included architectural plans and actual construction of structures as requested by individuals and county government. Electrical and electronics was required by the community for electrical installations and repair of appliances.

Table 6:- Outreach Services that Promote Agricultural Mechanization offered by VTCs.

Outreach Service	Component	VTCs	Percent
Computer packages/services	Cyber	3	14.3
Fashion show	Design	3	14.3
Hair dressing	Beauty	3	14.3
Electrical and Electronics	Wiring	14.8	14.8
Buildings Construction		14.8	14.8

Reports, data from interviews with principals and corroborated by SHF in the Focus Group Discussions, only 11 (52.4) VTCs offered outreach services. The services were on and off and not deliberate or formally scheduled. According to one principal, 'services were offered on request from the SHF and other clients'. He added that 'outreach works well when awareness is spread among the target groups about agricultural mechanization'. Information Education and Communication (IEC) plays a vital role in changing the attitudes of people (Ministry of Human Resource, India, 2009). The low number of VTCs offering outreach services shown on Table 7 is because IEC has not been applied by VTCs to create awareness about their potential. A Principal of one VTC noted they had been successful because of 'collaboration with experienced partners who offered valuable knowledge about outreach to poultry farmers'.

Table 7:- Vocational training Centres' offering Outreach services.

Service to SHF	Vocational training Centres
Computer packages/services	Ahero, Kitambo, Arch Bishop Okoth
Hair dressing	Kitambo, Kadongo, Nyabera
Electrical	Ahero
Buildings	Ahero
Hairdressing	Kitambo, Wachara, Arch Bishop Okoth
Fashion show	Mariwa, Kadongo, Bish Okoth

Conclusions:-

The following Conclusion was prepared based on the findings of the study as guided by the research question: Vocational Training Centres in Kisumu County had requisite Institutional capacity to provide outreach services that promote agricultural mechanization to crop, livestock, and fish farmers. Although the outreach services are informal and not scheduled, they are relevant and create awareness as regards need for mechanized agriculture to improve production and income.

Recommendations:-

The following are the recommendations emanating from findings of the study:

County and National governments should enhance Institutional capacity of VTCs in terms of facilities and finance and should be deliberate in offering outreach services to empower Small Holder Farmers to adopt up-to-date and adequate agricultural mechanization equipments to mitigate the low level of mechanization in Kisumu County.

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