RESOURCE CAPACITY PLANNING AND CLIMATE SMART AGRICULTURE IN LAIKIPIA COUNTY, KENYA

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ABSTRACT

Objective: The purpose of this study was to establish the extent to which capacity planning influences the performance of climate-smart agriculture projects in Laikipia County.

Theoretical Framework: The study was anchored on the theory of change whose pillars are planning, participation, and evaluation. These factors are critical in capacity planning of scarce resources and evaluating the effectiveness of the process.

Method: A concurrent mixed method approach that adopted the descriptive cross-sectional survey and correlational design was employed to study two World Bank-sponsored Kenya Climate Smart Agriculture projects. Stratified and Simple random sampling were employed to get a sample of 225 small-scale farmers and purposeful sampling identified four key informants. Data was collected using questionnaires and interview guide and analyzed using descriptive, inferential, and content data analysis techniques.

Results and Discussion: The respondent's opinion on capacity planning had a composite mean and standard deviation of 2.88 and 1.219 respectively. Capacity planning and the performance of climate-smart agriculture projects had a strong correlation coefficient of $r=0.644$ and p-value $p=0.000<0.05$. Therefore, resource capacity planning is fundamental in enhancing climate-smart projects, through proactive decisions, risk management, and cost reduction.

Research Implications: Consequently, it is imperative to have policies that prioritize and promote capacity planning of the scarce public and private goods to enhance their allocation.

Originality/Value: This study contributes to the literature by providing reliable and triangulated empirical data through authentic methodology enhancing suitability for data generalisability and replicability. The relevance and value of this research was evidenced by the need to promote food security in pursuance of the achievement of sustainable development goals.

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PLANEJAMENTO DA CAPACIDADE DE RECURSOS E AGRICULTURA INTELIGENTE EM RELAÇÃO AO CLIMA NO CONDADO DE LAIKIPIA, QUÊNIA

RESUMO

Objetivo: O objetivo deste estudo foi estabelecer até que ponto o planejamento de capacidades influencia o desempenho de projetos agrícolas inteligentes em relação ao clima no condado de Laikipia.

Estrutura Teórica: O estudo foi ancorado na teoria da mudança, cujos pilares são planejamento, participação e avaliação. Esses fatores são essenciais para o planejamento da capacidade de recursos escassos e para a avaliação da eficácia do processo.

Método: Uma abordagem de método misto simultâneo que adotou a pesquisa descritiva transversal e o projeto correlacional foi empregada para estudar dois projetos de agricultura inteligente climática do Quênia patrocinados pelo Banco Mundial. A amostragem aleatória estratificada e simples foi empregada para obter uma amostra de 225 pequenos agricultores e a amostragem intencional identificou quatro informantes-chave. Os dados foram coletados por meio de questionários e guias de entrevista e analisados por meio de técnicas descritivas, inferenciais e de análise de dados de conteúdo.

Resultados e Discussão: A opinião do entrevistado sobre o planejamento de capacidade teve uma média composta e um desvio padrão de 2,88 e 1,219, respectivamente. O planejamento da capacidade e o desempenho de projetos agrícolas inteligentes em relação ao clima tiveram um forte coeficiente de correlação de r=0,644 e um valor de p=0,000<0,05. Portanto, o planejamento da capacidade de recursos é fundamental para aprimorar os projetos climaticamente inteligentes, por meio de decisões proativas, gerenciamento de riscos e redução de custos.

Implicações da Pesquisa: Consequentemente, é imperativo ter políticas que priorizem e promovam o planejamento da capacidade dos escassos bens públicos e privados para melhorar sua alocação.

Originalidade/Valor: Este estudo contribui para a literatura ao fornecer dados empíricos confiáveis e triangulados por meio de uma metodologia autêntica que aumenta a adequação para a generalização e replicabilidade dos dados. A relevância e o valor desta pesquisa foram evidenciados pela necessidade de promover a segurança alimentar em busca da realização das metas de desenvolvimento sustentável.

Palavras-chave: Projetos de Agricultura Inteligente em Relação ao Clima, Planejamento de Capacidades, Projetos Agrícolas, Pequenos Agricultores, Ecologia Saudável.

PLANIFICACIÓN DE LA CAPACIDAD DE RECURSOS Y AGRICULTURA CLIMÁTICAMENTE INTELIGENTE EN EL CONDADO DE LAIKIPIA, KENIA

RESUMEN

Objetivo: El propósito de este estudio era establecer en qué medida la planificación de la capacidad influye en el rendimiento de los proyectos de agricultura climáticamente inteligente en el condado de Laikipia.

Marco Teórico: El estudio se ancló en la teoría del cambio, cuyos pilares son la planificación, la participación y la evaluación. Estos factores son fundamentales en la planificación de la capacidad de recursos escasos y la evaluación de la eficacia del proceso.

Método: Se empleó un enfoque de método mixto concurrente que adoptó la encuesta transversal descriptiva y el diseño correlacional para estudiar dos proyectos de agricultura climáticamente inteligente en Kenia patrocinados por el Banco Mundial. Se emplearon el muestreo aleatorio estratificado y el muestreo aleatorio simple para obtener una muestra de 225 pequeños agricultores, y el muestreo intencional permitió identificar a cuatro informantes clave. Los datos se recogieron mediante cuestionarios y una guía de entrevista, y se analizaron mediante técnicas de análisis de datos descriptivos, inferenciales y de contenido.

Resultados y Discusión: La opinión de los encuestados sobre la planificación de la capacidad tuvo una media compuesta y una desviación estándar de 2,88 y 1,219 respectivamente. La planificación de la capacidad y el rendimiento de los proyectos de agricultura climáticamente inteligente tuvieron un fuerte coeficiente de correlación de r=0,644 y un valor p=0,000<0,05. Por lo tanto, la planificación de la capacidad de recursos es fundamental para mejorar los proyectos climáticamente inteligentes, a través de decisiones proactivas, gestión de riesgos y reducción de costes.

Implicaciones de la Investigación: En consecuencia, es imperativo contar con políticas que prioricen y promuevan la planificación de la capacidad de los escasos bienes públicos y privados para mejorar su asignación.

Originalidad/Valor: Este estudio contribuye a la literatura proporcionando datos empíricos fiables y triangulados mediante una metodología auténtica que mejora la idoneidad para la generalizabilidad y replicabilidad de los datos. La pertinencia y el valor de esta investigación se ponen de manifiesto en la necesidad de promover la seguridad alimentaria en aras de la consecución de los objetivos de desarrollo sostenible.

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Palabras clave: Proyectos de Agricultura Climáticamente Inteligente, Planificación de Capacidades, Proyectos Agrícolas, Pequeños Agricultores, Ecología Saludable.

1 INTRODUCTION

Progressive population growth coupled with a downward spiral of climate crisis continues to threaten food security, despite, fixed or diminishing usable factors of production. Furthermore, by the year 2050, the global population projection is 9.74 billion (Kopittke et al., 2019). This situation means greater demand for food. However, current agricultural practices are resource intensive and ecology exploitive leading to soil degradation. In addition, water tower and carbon sink depletion leads to an unsustainable, impoverished, and unstable ecology, that fails to guarantee intergenerational equity to food security (Kopittke et al., 2019). Therefore, a proactive strategy is required to achieve the Pareto optimality level to moderate the climate crisis and concurrently promote food security projects. Government policies and training of farmers are some of the effective methods towards achieving sustainable food security.

The vicious cycle of population growth, demand for more food, and food production using conventional methods leads to degraded ecology resulting in food insecurity. The cycle will persist unless a purposeful strategic decision is made to break it. Over and above the predictable challenges that deter achieving food security, there are other unforeseen obstacles such as climate crisis, economic dips, the desert locust invasion in Eastern Africa, and poverty. Hence, developed countries are employing subsidies, labeling of farm products, and farmers training to promote transition from traditional farming methods to climate-conscious practices and principles.

A study by Jantke et al., (2020) in Germany found that subsidies and training farmers through magazines would promote the reduction of greenhouse gas discharge in agriculture. A similar study by Poeplau et al., (2019) in North America indicated there was need for a shift in farming methods to reduce the discharge of gasses that lead to global warming. A study by Akrofi-Atitianti et al. (2018) in Ghana found that farmers employing Climate-smart Agriculture had the advantage of acquiring a better income of 29% per hectare over farmers employing traditional agriculture methods. Moreover, government intervention is critical in Ghana and Kenya to promote sustainable food production (Asare-Nuamah et al., 2021; Wafula & Odula, 2018). Therefore, it is critical to consider resource scarcity, competition of resources by different users, resource fluctuations, and their use optimization through resource capacity planning.

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Moreover, resources are scarce but the needs are unlimited hence, demand for resources capacity planning. In Kenya, irrigation systems since the colonial era remain underdeveloped (Bjornlund et al., 2020). In addition, the market and the government control resource allocation disadvantaging social and ecological justice (Gupta & Lebel, 2020). Various empirical studies conducted globally and even in Laikipia County regarding food security differed from this study in methodology, context, and concept, justifying the need for this study.

The focus of this study is Laikipia County, a county that is majorly arid and semi-arid land. A study by Sala et al. (2020) in the county found that the use of climate-conscious practices is limited by lack of credit, limited information on the fodder market, and weather forecasts. In addition, actual and perceived communal land tenure leads to overgrazing. To solve these challenges, the Kariunga-Mutirithia-Naibor and the Ndathimi Dam water projects were sponsored by The World Bank at Ksh 29.5 million and 16 million shillings respectively as Kenya Climate-Smart Agriculture Projects. The projects are focused on ensuring sustainability.

2 THEORETICAL FRAMEWORK

The pillars of the theory of change are planning, participation, and evaluation. The proponent of the theory was Peter Ferdinand Drucker; an Austrian management consultant and author in 1954. The theory alludes to those activities undertaken by a project that contributes to intended impacts. Through Stufflebeam's Context, the theory has evolved to consider activities and resources, processes and outcomes, and logical frameworks. It is a hypothesis concerning achieving the expected change by employing strategies and activities. Hence, the blueprint indicates the route to the project's mission (Dhillon & Vaca, 2018).

The Theory of Change is applicable in this study as the performance of small-scale farmers' food projects requires planning. The log frame registers the activities as the fundamental aspect of measuring, monitoring, and evaluating a project. In this study, capacity planning promotes determining available resources for prioritizing, allocating and measuring, monitoring, and evaluating a project. In addition, deviation from the casual linkages between the previous and subsequent results (activities, outcome, and the intended goal) informs the risks that require immediate action (Dhillon & Vaca, 2018). In addition, an effective process of capacity planning of resources is critical to guarantee the performance of small-scale farmer's food security projects.

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The planning process involves interrogating the current capacity, desired capacity, existing buffer capacity, risk reduction, and opportunities optimization, which gives way to resource allocation.

Ascertaining what a project requires to achieve its goals is a primary process before engaging in any of its activities. Similarly, the strategic process of determining the available resources and how they could be harnessed to achieve the climate smart food security projects to progressively increase the supply of safe, secure, acceptable, and nutritious food is a principal process. In addition, the fundamental question in food production globally is the sustainability of resources involved in food production (Pawlak & Kołodziejczak, 2021). Therefore, capacity planning of resources in food production is critical. The process guarantees the expected outcome, despite, the existing constraints and ecological risks. This study will accentuate the current capacity, desired capacity, and existing buffer capacity of the food security projects.

In pursuance of achieving the desired performance in climate-smart food security projects, capacity planning is a vital element of assessing and estimating the available resources for the administration of sound decisions to achieve the desired goals. Though diverse capacity planning and management strategies may be applied, there is a relationship between the capacity planning of resources and excelling projects (Nangulu et al., 2022). Moreover, capacity planning lays a foundation for resource allocation. Excellence and sustainability of food security projects require capacity planning of the available resources. The earth's surface by the year 2000 was 2.06% urban and urbanization is projected to take 4.72% of the earth's surface by 2040. Unfortunately, most of the urban land is arable land. This would shrink food production capacity by 65 million tons. The worst hate areas are Europe, China, and the Middle East (Vliet et al., 2017). In addition, capacity planning is critical for effective and efficient utilization of resources and risk management.

Over and above geographic factors, capacity of resources is affected by unavoidable factors such as socio-economic and political factors. A study by Ragasa et al. (2016) in Congo focused on capacity planning of small-scale farming, and weak political context. The study found that capacity planning assisted farmers in responding to signals and heighten their risk management capacity. In addition, study by Yao et al. (2022) found that capacity forecasting and production programming allowed the determination of seasons and inventory management. Nonetheless, a study by Addison et al. (2022) found that capacity planning required technology and innovation. However, technology uptake in agriculture was still low (Yokamo, 2020). Hence, the need to enhance extension programs to help farmers have flexibility as they adopt new agricultural practices (Danso-Abbeam et al., 2018). Such practices include capacity planning for risks.

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Risks are a major hurdle in food security projects, hence, the need to plan for them beforehand. Delay et al. (2020) employing modeling methodology on the Kansas-farm Management Association, found that insured farms operated smoothly even after suffering unforeseen losses. In addition, Jabbar et al. (2020) found that capacity planning through risk management promoted food security projects. Appreciating the many factors that affect food production and the importance of agriculture, capacity planning could not be over-emphasized for guaranteed food security globally.

Food production sets the countries' wealth formation on the right footing. Moreover, food security projects are the backbone of industries, economic growth through taxation, and the source of foreign exchange. The development transformation of England, America, and Japan confirms that the Agricultural Revolution heralded the Industrial Revolution (Praburaj, 2018). Furthermore, food security project capacity planning is vital as food security is a contributory factor for people's health, economic growth, and ecological sustenance. However, as economies develop, the importance of food security projects diminishes as countries diversify their sources of income. The resultant effect is that in the industrialization age, the countries reduce their budget allocation quota in agricultural capacity planning, research, and development as they refocus on industrialization, this was evident in Sri Lanka, the Philippines, Egypt, and India (Payumo et al., 2018). Nonetheless, policies could be put in place to ensure industrialization does not trivialize food production. Capacity planning of Agricultural Development in Cape Verde led to the development of food security policies. As a result, the policies improved excellence in food production and protected the ecology from degradation (Payumo et al., 2018). Capacity planning of food production helps to minimize surpluses and deficiencies in supplies.

Due to the perishable nature of agricultural products, the market experiences a glut in the harvest season. This leads to the loss of surplus food and poor market prices. However, a few months later there is food deficiency (Morais et al., 2018). Capacity planning help to identify the surplus and deficits and smoothen production, for a stable supply. In addition, enhances the timely supply of inputs and reduces resource allocation anomalies. Capacity planning reduces resource constraints, ensures gender equality, and increases food supply (Makate et al., 2019). This demands availing farm inputs and finances. In addition, requires guaranteed gender inclusivity and a sufficient market for the farmer's products. A role that, cooperatives would achieve through synergizing farmer's capacity for bargaining power of small-scale farmers (Simelane et al., 2019). This is an indication that pooling the farmers

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enhances the possibility of capacity planning. Consequently, heightened allocation of the limited resources that are required by diverse competing factors.

Though capacity planning is costly in terms of time, labor, and resources, it is fundamental for any meaningful investment. However, for capacity planning to yield meaningful results, public participation is fundamental. Poku-Boansi (2021) studied capacity planning of Ghana and found there was no public participation involved in the capacity planning of the resources. Esfandi and Nourian (2021) found that poor capacity planning of resources in Tehran districts, in Iran led to poor resource allocation. Also, Akuja and Kandagor (2019) who measured policies and agricultural productivity in Turkana, found that poor capacity planning, overlapping policies, and failure to adhere to the 10% budgetary allocation as per the Maputo agreement of 2003, contribute to poor food production. This points out the efficacy introduced by policies, technology, and investing in skills to promote capacity planning of rural-urban resources to facilitate leveraging on the available resources.

Technology is critical in promoting capacity planning. Addison et al., (2022) measured capacity planning in terms of technology uptake and farmers' revenue. The study found that if farmers could use selected technologies, it could have greater potential to fight rural poverty. This was also in line with Wordofa et al. (2021) who measured advanced agriculture technology and small-scale farmer's revenue, and found that small-scale farmers who employed advanced technology had better income. Hence, the need for governments in Africa to invest in technology and extension programs in agriculture to promote resource capacity planning. Danso-Abbeam et al. (2018) measured the effectiveness of extension services in capacity planning in Ghana and found that extension programs were critical for periodic training of farmers. In addition, capacity planning helped to explore the available opportunities maximize them identify risks, and mitigate them.

Networks are a critical investment in every industry, Othieno et al. (2021) measured the capacity of irrigation farmers in Migori County. The concept distinguished the study from this study as it focused on institutional linkages only. Moreover, the study found that institutional linkages influenced smallholder irrigation projects. Hence, capacity planning is critical to guarantee the harmonization of the industry goals. The Government of Kenya's ministries concerned with agriculture and natural resources in the year 2017 initiated Climate Smart Agriculture strategy and food security projects' policies. The strategy focused on the climate crisis, development, ecology, and food security projects. However, the strategy and policy differed. In that, donors and state-led informal dialogues influenced policies and

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limited their effectiveness (Faling, 2020). Also, the available Climate Smart Agriculture toolkit in Kenya addressed technological factors but failed to address other factors such as social, economic, governance, and biophysical (Thornton et al., 2018). Hence the need for a multi-disciplinary stakeholder involvement to guarantee seamless coordination of all the industry players and the government.

With the devolved Government in Kenya, the capacity of the individual county to develop policies is fundamental. Laikipia County has emphasized capacity planning of resources. Study Muhua and Waweru (2017) found there was a lack of goodwill by the leaders in financing and realigning the policies. This has led to unprecedented resource utilization, a factor that has failed to transform the agricultural landscape of the county. This was supported by a similar study by Gitonga and Nderitu (2016) who found that Laikipia had a growing population with small parcels of arable land. In addition, a study by Lesrima et al. (2021) found that core water sources were rivers and boreholes, and irrigation infrastructure is negligible. Hence, complicating capacity planning of resources. Therefore, judicious capacity planning and top leadership support are pivotal for prudent resource allocation in the County.

The major Laikipia County's agricultural resources are land and water from sub-basin rivers (Lesrima et al., 2021). However, there is a need for the government to promote water harvesting and train farmers on water conservation and harvesting to be able to sustain modern agriculture. In addition, the County's land is mainly distributed into the agricultural, forest, bushland, and grassland. Over time, grasslands and riverbed vegetation have increased by 72%, while agricultural land has increased by 600% through encroaching on other land uses (M'mboroki et al., 2018). Capacity planning, working policies, and the willpower to enforce the policies guarantee equitable resource allocation, improved performance of food security projects, and flawless co-existence of the pastoralists, crop farmers, and wildlife in a stable ecology. Sadly, this scenario is lacking in the County.

3 MATERIALS AND METHOD

The main objective of this study was to examine whether resource capacity planning promotes climate-smart agriculture projects in Laikipia County, Kenya. The research question was stated: To what extent does resource capacity planning influence climate-smart agriculture projects in Laikipia County, Kenya? The concurrent multi-methodology approach was preferred to allow the collection of quantitative and qualitative data. Hence, a cross-sectional

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survey and correlational design were employed. This study unit of analysis was two World Bank-sponsored Climate Smart Agriculture dam projects namely, the Kariunga-Mutirithia-Naibor project (Segera Ward) with 300 small-scale farmers and the Ndathimi Dam project (Karaba ward), with 212 small-scale farmers respectively.

The study employed Yamane (1967) formula to calculate the required sample size and stratified and simple random sampling was used to determine 130 small-scale farmers from the Kariunga-Mutirithia-Naibor dam water project and 91 small-scale farmers from the Ndathimi Dam water project. Also, four key informants purposefully sampled included the county Government, the Ministry of Agriculture, the Livestock and Fisheries officer, and the two project managers. The questionnaires assisted in soliciting information from 203 small-scale farmers. The interview guide prompted the researcher while collecting information from the four key informants and the observation guide had questions that prompted the researcher in observing the projects.

4 RESULTS AND DISCUSSIONS

Capacity planning and Performance of Climate-Smart Agriculture Projects were assessed through various aspects, which included current capacity, desired capacity, existing buffer capacity, risk reduction, and opportunities optimization. Respondents were asked to indicate their opinion on a Likert scale of 1-5. Where: 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5 strongly agree. Results are shown in Table 1.

Table 1

Capacity Planning and Performance of Climate-Smart Agriculture Projects

Item	Statement	SD (1) F %	D(2) F %	N(3) F %	A(4) F %	SA(5) F %	TOTAL F %	M	SD
CP1	There is access to land for food production	36 (17.7%)	67 (33.0%)	55 (27.1%)	30 (14.8%)	15 (7.4%)	203 100%	2.61	1.157
CP2	There is access to water for food production	25 (12.3%)	56 (27.6%)	37 (18.2%)	69 (34.0%)	16 (7.9%)	203 100%	2.98	1.196
CP3	Food projects have constant supply of resources.	23 (11.3%)	46 (22.7%)	45 (22.2%)	66 (32.5%)	23 (11.3%)	203 100%	3.10	1.206
CP4	There are mitigation measures for risks	38 (18.7%)	67 (33.0%)	30 (14.8%)	50 (24.6%)	18 (8.9%)	203 100%	2.72	1.268

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Item	Statement	SD (1) F %	D(2) F %	N(3) F %	A(4) F %	SA(5) F %	TOTAL F %	M	SD
CP5	Uptake of technological innovation is embraced.	38 (18.7%)	55 (27.1%)	27 (13.3%)	68 (33.5%)	15 (7.4%)	203 100%	2.84	1.277
CP6	Farmers leverage on the existing extension services	21 (10.3%)	72 (35.5%)	34 (16.7%)	55 (27.2%)	21 (10.3%)	203 100%	2.92	1.206
CP7	Farmers have insured their agricultural activities.	30 (14.8%)	47 (23.2%)	41 (20.2%)	68 (33.5%)	17 (8.3%)	203 100%	2.98	1.224
Composite mean and composite standard deviation								2.88	1.219

Results in Table 1 furnish the line mean of each statement, lower item mean compared to the composite mean translated to a negative opinion on the tested item, while a lower standard deviation, as opposed to the composite standard deviation, translated to respondents' convergence in opinion. Statement CP1, there was access to land for food production, 36(17.7%) strongly disagreed, 67(33.0%) disagreed, 55(27.1%) were neutral, 30(14.8%) agreed, 15(7.4%) strongly agreed, averaged to 2.61 versus 2.88 as composite mean, implied that farmers had no access to sufficient land for food production. The item standard deviation and composite standard deviation of 1.157 and 1.219 respectively, indicated convergent respondents' opinions. This supported Gitonga and Nderitu (2016) who noted that Laikipia has a growing population with small parcels of arable land.

Statement CP2, there was access to water for food production, 25(12.3%) strongly disagreed, 56(27.6%) disagreed, 37(18.2%) were neutral, 69(34.0%) agreed and 16(7.9%) strongly agreed, averaged to 2.98 versus 2.88 as composite mean, implying that the projects had access to water for food production. The item standard deviation and composite standard deviation of 1.196 and 1.219 respectively, showed convergent respondents' opinions. This supported Lesrima et al. (2021) who found that the main water sources of Laikipia County sub-basin were rivers and boreholes. Therefore, the government should heighten the irrigation infrastructure.

Statement CP3, food security projects had a constant supply of resources to support productivity, 23(11.3%) strongly disagreed, 46(22.7%) disagreed, 45(22.2%) were neutral, 66(32.5%) agreed and 23(11.3%) strongly agreed, averaged to 3.10 versus 2.88 as composite mean, demonstrating that food security projects constantly supported the farmers with resources for productivity. Item standard deviation of 1.206 and 1.219 as composite standard deviation, pointed out convergent responses. This contradicted Akuja and Kandagor's (2019) study that found that

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poor capacity planning, overlapping policies, and failure to adhere to the 10% budgetary allocation as per the Maputo agreement of 2003, has led to dismal food production in related projects.

Statement CP4, there were mitigation measures for all the risks identified, 38(18.7%) strongly disagreed, 67(33.0%) disagreed, 30(14.8%) were neutral, 50(24.6%) agreed and 18(8.9%) strongly agreed, averaged to 2.72 versus 2.88 as the composite mean. This pointed out that some identified risks had no prescribed mitigation measures. The item standard deviation of 1.268 and 1.219 as the composite standard deviation implied divergent responses. This resonated with Jabbar et al. (2020) who found that risk management instruments in food production promoted food security.

Statement CP5, uptake of technological innovation was embraced by farmers, 38(18.7%) strongly disagreed, 55(27.1%) disagreed, 27(13.3%) were neutral, 68(33.5%) agreed and 15(7.4%) strongly agreed, averaged to 2.84 versus 2.88 as composite mean showed that technological innovation in food security projects' uptake of was not embraced by all farmers. Item standard deviation of 1.277 and 1.279 as the composite standard deviation, revealed convergence of responses. This supported Addison et al. (2022) who found that agricultural technology was still low due to lack of knowledge and skills, but if farmers embraced selected technologies, this could have greater potential to fight rural poverty. Also, supported Wordofa et al. (2021) who found that small-scale farmers who employed advanced technology had better income.

Statement CP6, farmers leveraged the existing extension services offered by the available agricultural research institutes, 21(10.3%) strongly disagreed, 72(35.5%) disagreed, 34(16.7%) were neutral, 55(27.2%) agreed and 21(10.3%) strongly agreed, averaged to 2.92 versus 2.88 as composite mean, implied that farmers attached to food security projects had been utilizing extension services by the agricultural research institutes. Line standard deviation of 1.206 versus 1.279 as composite standard deviation, translated to convergence in respondents' opinion. This supported Danso-Abbeam et al. (2018) who found that extension programs had a positive influence on farm output and farmers' income.

Statement CP7, farmers had secured insurance policies insurance covers to support their agricultural activities, 30(14.8%) strongly disagreed, 47(23.2%) disagreed, 41(20.2%) were neutral, 68(33.5%) agreed and 17(8.3%) strongly agreed, averaged to 2.98 versus 2.88 as composite mean, which implied that farmers had insured their agricultural activities. The item standard deviation of 1.224 versus 1.219 as the composite standard deviation implied, divergent

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respondents' opinions. This supported Delay et al. (2020) who found that loss compensation for insured farms, supported farmers from going under financially.

Results gathered from the interview showed that respondents had the same opinions about capacity planning of the food security projects. This is what they had to say: Results gathered from the interview showed that respondents had the same opinions about capacity planning of the food security projects. This is what they had to say:

> Albeit, the effective capacity planning of the resources at Kariunga-Mutirithia-Naibor Dam Project and Ndathimi Dam project, due to emphasis on stakeholder involvement, leading to the projects' sustainability, the projects' capacity was constrained by the fact that Laikipia is majorly Arid and Semi-Arid Land, characterized by socio-cultural conflicts and insecurity. (Respondent A)

> Kariunga-Mutirithia-Naibor Dam Project and Ndathimi Dam project are great models of the agricultural infrastructure regarding irrigation systems. The projects could feed and provide income to the targeted members, but, overstretch with the entry of new members without further investment. Also, members sometimes lack anything to show for it due to insecurity. (Respondent B)

> Capacity planning of the resources was critical to maintain the projects. However, the project seems to have used up all the buffer resources, hence, limited capacity to expand. In addition, the environment impacted the project, as water resources were in excess in the rainy period, but scarce in the dry period. In addition, during drought, farmers feared for their lives from cattle rustlers and wildlife, hence, security was primary. (Respondent C)

> Capacity planning of the resources would be practical with more government, private investors, and development partners' intervention. This could be achieved through erecting sufficient security, agricultural infrastructure, provision of loans to farmers, and encouraging farmers leverage benefits of cooperatives in the purchase of inputs and sale of their products, eliminate middlemen, and avail ready market for their products. (Respondent D)

The researcher was able to observe that: the technology employed by the Kariunga-Mutirithia-Naibor Dam Project and Ndathimi Dam project, enhanced the capacity planning of the resources. Water was well utilized and reserved for the dry season, to avoid unreliable climate-reliant food production. However, extended drought experienced from 2019 to 2022 had overstretched the project capacity.

The results from observation showed that there was stakeholder involvement in the capacity planning of the projects' resources. In turn, it assisted the project to serve the target community efficiently. Nonetheless, appreciating that the projects had a hostile environment, in terms of

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drought and conflicts, this affected the projects' growth capacity. The County had idle resources that could not be planned to cope with climatic conditions, insecurity, and agro-pastoral conflicts.

4.1 CORRELATION ANALYSIS BETWEEN CAPACITY PLANNING AND PERFORMANCE OF CLIMATE-SMART AGRICULTURE PROJECTS

To examine capacity planning's relationship with the performance of climate-smart agriculture projects at a 0.05 level of significance, Pearson's Correlation Coefficient were adopted. The vector and extent of association were established through correlation analysis. The values of correlational analysis range from negative one to positive one. Where positive one and negative one infer perfect-positive and perfect-negative correlation respectively, while zero implies no correlation. The modular values 0.001 to 0.250, 0.251 to 0.500, and 0.501 to 0.750 imply weak, moderately-strong and very strong correlations respectively. Table 2 details the correlation results.

Table 2

Correlation Analysis between Capacity Planning and Performance of Climate Smart Agriculture Projects Correlations

Variables		Capacity Planning	Performance of climate smart agriculture projects
Capacity Planning	Pearson Correlation	1	0.644[**]
	Sig. (2-tailed)		0.000
	N	203	203
Performance of climate smart agriculture projects	Pearson Correlation	0.644[**]	1
	Sig. (2-tailed)	0.000	
	N	203	203

[**]Correlation was significant at 0.05 level of significant (2-tailed)

Table 2 details the correlation coefficient of (r=0.644) with a P-value of (p=0.000<0.05) for capacity planning and performance of climate-smart agriculture projects. Hence, the null hypothesis H_0: Capacity planning has no significant relationship with the performance of climate-smart agriculture projects was rejected. Therefore, concluded that there was an association between capacity planning and the performance of climate-smart agriculture projects. The results supported the findings of Othieno et al. (2021) who found that farmer capacity building promoted subsistent irrigation projects.

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4.2 REGRESSION ANALYSIS OF CAPACITY PLANNING AND PERFORMANCE OF CLIMATE-SMART AGRICULTURE PROJECTS

Demonstrating how capacity planning significantly predicted the performance of climate-smart agriculture projects was the justification for employing the simple regression model.

4.2.1 Regression Model

The following statistical model served in assessing the null hypothesis.

Performance of climate smart agriculture projects = capacity planning

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon \qquad (1)$$

where:

Y = Performance of climate-smart agriculture projects

X_1 = capacity planning

β_0 = Constant term

β_1 = Beta coefficient

ε = Error term

Table 3 presented the regression results.

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Table 3

Regression Analysis on Capacity Planning and Performance of climate-smart agriculture projects

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.644[a]	0.415	0.412	0.40068

ANOVA						
	Model	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig**
	Regression	22.867	1	22.867	142.439	0.000[b]
1	**Residual**	32.269	201	0.161		
	Total	55.136	202			

Regression Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	**(Constant)**	1.403	0.122		11.488	0.000
	Capacity Planning	0.493	0.041	0.644	11.935	0.000

Predictors: (constant), Capacity Planning
Dependent Variable: Performance of climate smart agriculture projects

Table 3 presents the model summary, it highlights the presence of a positive correlation coefficient (R=0.644), linking capacity planning and the performance of climate-smart agriculture projects. The coefficient of determination $R^2 = 0.415$, translating to 41.5% of total variations in the performance of climate-smart agriculture projects was explained by capacity planning.

Table 3 presents the ANOVA results, indicating that F statistics (1,201) =142.439 was consequential at P-value 0.000<0.05. This implied that the predictor coefficient was at minimum not equal to zero and the regression model could allow prediction of the performance of climate-smart agriculture projects by capacity planning. Table 3 results of simple linear regression suggest that capacity planning had consequential influence on the performance of climate-smart agriculture projects.

The constant term's coefficient of ($\beta_o = 1.403$; P < 0.05) and capacity planning ($\beta_o = 0.493$; P < 0.05) were statistically consequential. The capacity planning's regression model was $Y = 1.043 + 0.493X_1$ indicating that one unit of the performance of climate-smart agriculture projects was marginally converted by 0.493 units of capacity planning. Hence, the conclusion that capacity planning and performance of climate-smart agriculture projects were positively and linearly related. This supported Ragasa, et al. (2016) who found that increasing the farmers' capacity helped them to be proactive, increased their risk management ability and created an incentive to invest in agriculture productivity using high-yield technologies. In turn, higher agricultural productivity directly increased income and food security. In addition, supported Yao et al. (2022) who found that capacity planning and production scheduling models allowed

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joint determination of seasons, inventory management, and logistics plans to minimize costs suitable for multiproducts with significant capacity and labor costs.

Figure 1

Map of Kenya and Laikipia County where the study was conducted
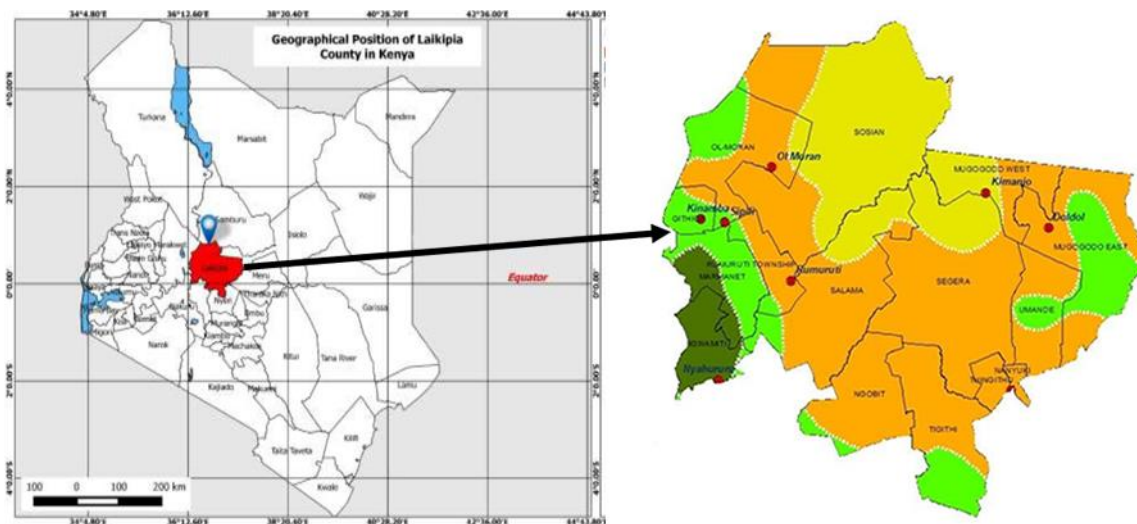
Source: (GOK., 2017).

5 CONCLUSIONS

Capacity planning of food security projects was critical to promote effectual resource allocation. Moreover, capacity planning helped farmers to be proactive, increased their risk management ability, and created an incentive to invest in agriculture productivity using high-yield technologies. Hence, this promoted effectual use of resources and led to access to the resources even beyond the dictates of weather patterns. In turn, higher agricultural productivity directly increased income and food security. In addition, capacity planning heightened the determination of seasons, inventory management, and logistics plans to minimize costs suitable for multiproducts with significant capacity and labor costs. The study supported Maslow's theory on the hierarchy of needs. Security and basic public needs are critical before profitable production can be guaranteed and escalated to a commercial level where value addition can generate dividends. In addition, subsistence food production requires external support to be sustainable. Hence, the need for policies that promote the provision of public goods in rural areas.

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