International Journal of Weather, Climate Change and Conservation Research
Vol.8, No.1, pp.20-35, 2022
Print ISSN: ISSN 2059-2396 (Print)
Online ISSN: ISSN 2059-240X (Online)

Government Agricultural Support Programs and Livelihood of Smallholder Vegetable Farmers in Kampala, District Uganda.

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Citation: Florence Nassiwa, Joshua Kwonyike and David Mwangi Kung (2022) Government Agricultural Support Programs and Livelihood of Smallholder Vegetable Farmers in Kampala, District Uganda, *International Journal of Weather, Climate Change and Conservation Research*, Vol.8, No.1, pp.20-35

ABSTRACT: *This article explores government agricultural support programs and livelihood of smallholder vegetable farmers in Kampala district Uganda. Climate variability is a reality and poses severe effects on societal economy. The agriculture sector in developing countries will be hard hit because it is mostly rain-fed. The poor in such countries will face the brunt of climate variability because they are poor and less able to cope with its effects. Government agricultural programs may help smallholder farmers cope with climate variability and thus protect livelihood. Primary data was collected using questionnaires and complimented by face- to- face interviews. In this paper, multiple linear regression was used to analyze the effect of government agricultural support programs and livelihood of smallholder vegetable farmers. The results showed that out of 201 farmers only 16 (8.0%) received government support and was received in form of subsidized credit, agricultural inputs, agriculture training, extension services and market support. Correlation analysis using Pearson Correlation Coefficient showed a significant positive and weak correlation ($r = 0.423$, $p = 0.000$) between government support programs and livelihood of farmers. Whereas multiple linear regression results revealed that government agricultural support programs ($\beta_2 = -0.037$ and $p > 0.05$) did not have a significant effect on livelihood of smallholder vegetable farmers. Consequently, the paper recommends increasing accessibility and affordability of government programs. Secondly, the Ministry of Agriculture, Animal Husbandry and Fisheries and NAADS should provide provide agricultural support as a full package to farmers.*

KEY WORDS: Climate variability, adaptation, government support programs, livelihood, smallholder's farmers.

INTRODUCTION

This paper investigates government agricultural support programs and livelihood of smallholder farmers in the context of climate variability. Globally, an estimated 570 million farms are

considered to be small or family –run and 85% of the world's farms are smaller than 2 hectares (Lowder et al., 2016). Small scale and family farmers produce 80% of the food supply in Sub-Saharan Africa and Asia (Food and Agriculture Organisation of the United Nations, 2017). In Latin America and Caribbean, smallholder farmers represent a population of about 66M people who are responsible for the production of the main staple foods consumed in the region lie maize, beans and potatoes. Smallholder farmers are characterized by less than 10 ha of land in size, family operated, family operated, limited or no hired labour, live with poverty food insecurity and limited access to markets and services (http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Factsheet_SMALLHOLDERS.pdf).

Smallholder farmers support food production systems, livelihoods of rural and urban households, support local and regional economies (Raúl , Nicholas , & Markku , 2018). The sustainable livelihoods idea which was first introduced by the Brundtland Commission on Environment and Development and the 1992 United Nations Conference on Environment and Development advocated for the achievement of sustainable livelihoods as a broad goal for poverty eradication. Achievement of sustainable development also influences attainment of other international and national development goals. These include; ending hunger, gender inequality,

Smallholder farmers are faced with climate change and variability challenges resulting mostly from global warming as well as non-climatic challenges. Numerous definitions of climate variability are used in climate change literature. According to IPCC (2007), climate variability refers to the seasonal variations in the weather conditions over a given period of time. Yet, Stone (2014) defines climate variability as variations in the mean state and other statistics such as standard deviations, the occurrence of extremes of the climate on all temporal and spatial scales beyond that of individual weather events. Climate variability and change studies indicate that smallholder farmers especially in Sub-Saharan will be among the most affected by climate variability due to lack of credit, poor infrastructure, already high temperatures, dependence on rain-fed agriculture and poverty (Jones & Thornton, 2003; Ringler, 2010). Garcia and Markandya (2015) noted that the urban poor living in informal settlements and account for about 60% of Kampala's population will suffer most from the impacts of climate change, especially from flooding because they are typically more exposed and they also have less capacity to recover.

According to Maharjan and Joshi, 2013; Republic of Uganda, 2013) variations in temperatures and precipitation, droughts and floods may affect productive capacity of the crop, increase crop pests and diseases, lead to low production, farm incomes and food security. In Uganda, a decline in agriculture growth from 1.5% in 2004-2005 to 0.4% in 2005-2006 was attributed to climatic variations (UN, 2015). Flooding in Kampala has resulted in deaths, mobility interruptions, disease out breaks and damage to crops (Garcia and Markandya, 2015). While plants weakened by the direct effects of weather stresses such as waterlogging are generally more vulnerable to viruses, and plants affected by drought are less able to outcompete weeds for soil moisture and nutrients (Simpson, 2017). Examples of major insect pests of cereals, pulses, vegetables, and fruit crops, which may move to temperate regions, include cereal stem borers, pod borers, aphids, and

whiteflies (Sharma, 2014). On the other hand, in high latitudes, productivity of crops is southern Europe projected to increase for cool season seed crops maize, sunflower and soya beans (Olesen et al. 2007).

Both direct and indirect impact of climate variability on agriculture is dire and disastrous in the tropical regions like Kampala (Ministry Agriculture Animal Industry and Fisheries, 2010). IPCC (2014) opined that, the impacts of climate change are expected to exacerbate poverty and inequality in most developing countries. Owing to variations in weather, farming communities will experience a food shortage, poverty and hunger. The advent of climate variability has and is likely to pose serious economic, social and environmental challenges especially to the poor who are less capable of coping with its consequences.

Thus, appropriate government support programs need to address widespread climate variability risks, pests and diseases as well as declining crop productivity. Numerous forms of support might boost productivity or mitigate climate change (Searchinger et al., 2020). Although literature indicates that support programs are effective in boosting productivity, the effects are so varied and unclear on livelihood of farmers. There is still a knowledge gap between how the government support programs employed by smallholder farmers affect farmers livelihood. The effectiveness of government agricultural support programs in urban areas will consequently determine whether or not Uganda will succeed in achieving global Sustainable Development Goals (SDGs) on reducing poverty, hunger, enhance good health, reduce inequalities, and maintain sustainable communities.

Yet necessary data that would show the effect of government support programs on livelihood of farmers in Kampala district is scanty. Most studies on effects of government support programs on farmers livelihood have been carried ought in rural communities (Ssonko & Nakayaga (2014); Mubiru et al. (2018), few studies have been carried out in urban areas which mask urban context. The fact that livelihoods vary along the continuum from rural to inner city areas as a result of variations in the availability and access of resources; distinctions in the context of vulnerability; and variances in the structures, guidelines and procedures that affect families, it is important to establish context specific results regarding government support strategies and livelihood of smallholder farmers. Scientific data are needed to determine clearly the most effective government support programs capable of guiding policy makers on how to efficiently support urban smallholder farmers to maintain their livelihood when climate variability hits. Also deteriorating livelihoods especially among smallholder farmers remains a major problem in the district, with agriculture largely being rain-fed.

Despite overwhelming evidence on the vulnerability of urban smallholder farmers many urban authorities have not comprehended the phenomena of adaptation strategies. Understanding government agricultural support programs as adaptation strategies is key to evaluate not only the level of vulnerability of smallholder farmers, but also to reveal which types of government support programs smallholder urban farmers generally access to maintain a livelihood and to determine the most effective government agricultural support programs for urban vegetable farmers. The

Ministry of Agriculture, Animal Industry and Fisheries, Kampala Capital City Authority, Non-governmental organisations may find such data useful for planning the advancement of urban agriculture within the district. It is hoped that the results of this study would help policy makers understand those factors which hinder or enhance farmers adaptive capacity. The objectives of the study were to assess the characteristics of vegetable farming, to establish farmers perceptions on climate variability, examine farmers access to government support programs and examine the effect of government support programs on livelihood of farmers. In this article the terms subsidy and support are used interchangeably keeping in mind that most of government support towards agriculture is not given in form of direct subsidy but rather mainly given indirectly.

RELEVANT LITERATURE

Relevant literature on government agriculture support programmes and their impact on livelihood is reviewed and presented below.

There is good evidence that spending on general services can often increase agricultural productivity. For example, spending on agricultural research, particularly when combined with good extension services, has a strong response in productivity (Alston et al. 2000). Various forms of infrastructure development including improved transportation routes and veterinary services may also contribute to productivity gains. These general services can also include more healthy livestock populations that are less likely to endanger herd health (Gale, 2013).

A study by Shoaib et al. (2018) in Germany on whether service sector firms that received government Research and Development subsidies (R&D) engaged more in marketing and organizational innovation activities than their counterparts revealed that service sector firms that received government Research and Development subsidies revealed that firms that received R&D subsidies participated more in marketing and organizational innovation activities than their counterparts especially in medium sized firms. I was also revealed that in small and medium firms R&D subsidies significantly increased the likelihood of a firm performing marketing and organizational innovation while in large firms R&D subsidies had an opposite but insignificant significance.

A study on socio-economic impacts of agricultural subsidy programs conducted in six blocks in Bhutan by Sonam, Jeong, Belay and Woo (2019) revealed that a bigger majority of households received at least one form of subsidy except for agricultural machineries. It was also revealed that the non-poor population has greater access to the government support subsidies compared to the poor and that seed subsidy had a significant impact on income even the non-poor who received a subsidy experienced seven and half times greater gains in income as compared to poor (US$307.69) who also received a subsidy. The study also revealed that, agriculture machinery subsidy was found to be counterproductive to the lower income groups (<US$153.85) and beneficial to the higher income groups.

In Malawi, Sibande, Bailey and Davidova (2015), studied the impact of farm input subsidies on household welfare. Using nationally representative two- wave Integrated Household Panel Survey (IHPS) data of 2010 and 2013 and fixed effect correlated and random effect quantile regression models, the study found no evidence of effects of subsidized fertilizers on annual per capita consumption expenditure.

A study on the effects of the NAIVS on crop production in some selected regions in Tanzania by Hepelwa et al., 2013 (as cited in Lameck, 2016) found a significant difference in welfare among households that received and those who did not receive subsidies. The study used expenditure as a proxy to measure welfare. It was revealed that households which accessed input vouchers had higher expenditures than those who had no access. Results showed that households without access to voucher spent on average smaller amount of money than those with access to voucher system and expenditures on hired labor were relatively high among those who accessed than those who did not.

A study by Nuamah et al. (2019) in AND district in Ghana examined the role of extension services on climate change adaptation in rural farming communities in Ghana. It employed a qualitative case study design using interview method, data was analyzed manually through thematic analysis following four stages of thematic analysis. The study found that the district had experienced rising temperature, destructive winds, floods and droughts, crop invasion by fall armyworms and grasshoppers. The study revealed that farmers have limited capacities to adapt to changes and hence rely on extension services to respond to climate change. In addition the findings reveal that extension services contribute to the realization of the district development agenda through the technical support and advice offered to smallholder farmers through the transfer of skills and knowledge, technology and innovations, supply of inputs, technical advice and liaison role with existing local institutions.

A study was done by DiFalco et al. (2011) in the Nile Basin of Ethiopia on whether adaptation to climate change provides food security. The study employed a survey on 1000 farm households in 2005. It used a simultaneous model with endogenous switching. The study revealed that access to credit, extension and information were found to be the main drivers behind adaptation. In addition, the study found that food productivity function of farm households that adapted to climate change is significantly different from the productivity function of farm households that did not adapt. That in puts such as seeds , fertilizers , manure and labour are significantly associated with an increase in the quantity produced per hectare by the farm household that adapted to climate change. The study recommended that research effort should be directed toward the distinction of the role of different adaptation strategies and the identification of the most successful ones.

METHODOLOGY

Kampala district is one of the 135 districts in Uganda. The district is comprised of five administrative boroughs / administrative divisions: Makindye, Rubaga, Kawempe, Kampala central and Nakawa. It is located on Northern shores of Lake Victoria, spreads over 839km2 (

Sabiiti et al., 2014). It is situated at an altitude of 1120m above sea level and is surrounded by a wetland valley (KCCA, 2016).According to the population census report of 2014, the population of Kampala district is estimated at 1.507,080 persons per square kilometer (UBOS, 2016).As far as weather is concern the district receives bimodal rainfall averaging 1290 mm, March –May is the main rainy season (KCCA, 2016). Rains reach peak levels around mid-October to early December. Yet the driest month is July (Uganda Meteorological Authority, 2018). Altitudinal and topographic variation, however produces considerable local variations in climatic conditions in Kampala district.

Data source and sampling procedure

Both qualitative and quantitative methods were used to collect data on government agricultural support programs and livelihood of farmers. Data for the study was collected sequentially in phases starting with collection of quantitative data and then quantitative data. Thus, the study used both a mix of qualitative assessments and quantitative research methods of data collection and data analysis. Data from 292 smallholder farmers was collected using semi- structured questionnaires. In addition face to face interviews were conducted on KCCA and NAADS officials using interview schedules so as to elicit information on their role in farmers' climate variability adaptation journey. The target population of the study was majorly the smallholder vegetable farmers who have an estimated population of 1083 (KCCA, 2016). A sample of 292 smallholder farmers was selected to participate in the study using stratified sampling and simple random sampling. While in the second phase of sampling, purposive sampling was used to select key informants.

RESULTS

Characteristics of Vegetable farming

Kampala urban vegetable farming is mostly practiced in homesteads (on-plot) and a few farmers cultivate on land away from home (off-plot) as shown in table 1a. The gardens here are suitable for vegetable farming as opposed to livestock farming, although some farmers combine both. The data show that 92.5% practiced vegetable farming only while 26.9% engaged in both vegetable and livestock farming. Vegetables are preferred due to farmers' ability to cultivate them on a small area that can be taken care of. Vegetables also have high market value and take a shorter time to cultivate. The duration of crop types to mature showed that most crops took 1-3 months, others took between 4-7 months and the least vegetable crops took one month to mature. The various vegetable types were equally shown in table 1b. The table indicates that leafy vegetables are largely preferred indicated by aggregate response of 73.1%, this is followed by fruit vegetables (26.4%) and the least (0.5%) being root vegetables.

The farming experience of vegetable farmers was also established. Data showed that a large percentage of vegetable farmers (64.7%) had farming experience ranging between 1-5 years, (19.9%) had and (5.5%) had experience of 6 -10 and 11- 15 years of farming experience respectively, (5%) had 16 -20 years while (5.0%) had farming experience of above 20 years. Farming experience characteristic enables farmers to appreciate and give good account of urban vegetable farming in a fast changing environment.

Table 1a : Location of Vegetable Gardens

	Frequency	Percent	Cumulative Percent
On-Plot	169	84.1	84.1
Off-Plot	32	15.9	100
Total	**201**	**100.0**	

Table 1b: Showing Types of Vegetables Planted

	Frequency	Percent	Cumulative Percent
Leafy Vegetables	147	73.1	73.1
Fruit Vegetables	53	26.4	99.5
Root Vegetables	1	0.5	100.0
Total	201	100.0	

Farmers' Perception on Climate variability

In order to determine the climate variability adaptation strategies, the researcher established the perception of farmers on climate variability and the results are shown in the table. A majority of the respondents agreed that there were changes in rainfall patterns (M=4.24, SD=0.85), changes in temperatures (M=4.21, SE=0.78) and greater wind flow (M=3.78, SE=1.13) in 2020. In terms of changes in rainfall and temperature patterns, the overwhelming majority perceived an increase in temperature and a decrease in precipitation, rainfall frequency, and length of the rainfall seasons. The finding implies that vegetable farmers were aware of changes in climate and therefore could make adaptation decisions. Results also suggest that smallholder farmers in the district better understand climate change vulnerability and recognize that climate change is a serious threat affecting urban farming activities.

Table 1c: Climate Variability Indicators

	Min	Max	Mean	Std. Err	Std. Dev
There was change in rainfall in 2020	1.00	5.00	4.24	0.06	0.85
There was change in temperature in 2020	1.00	5.00	4.21	0.05	0.78
There was change in wind flow in 2020	1.00	5.00	3.78	0.08	1.13
Overall Mean			**3.92**	**0.05**	**0.71**

Source: Researcher, 2021

The study also sought to find out whether respondents received support from government towards vegetable farming. The study findings are shown in table 1d.

Table 1d: Support toward Vegetable Farming in 2020

	Frequency	Percent	Cumulative Percent
Yes	16	8.0	8.0
No	185	92.0	100.0
Total	**201**	**100.0**	

Source: Field Results, 2021)

From the findings, a minimal number of smallholder vegetable farmers received support from government while the majority did not thus limited government support programs to aid smallholder farmers adaptation efforts. This therefore implies that without the requisite support and commitment from the government, the chances of farmers preparing for and responding to the troublesome effects of climate variability would be low thus vulnerable to climate variability. In addition, minimal government support implies that farmers did not benefit from cost-effective alternatives and thus increased risk to climatic shocks. The finding of this study depicts a situation where farmers implemented adaptation strategies in 2020 mainly through individual initiatives. The finding of this study is supported by Hepelwa et al. 2013 study (as cited in Lameck, 2016) who stated that majority of poor households in Tanzania did not access government support and thus the intended objective of increasing productivity among poor smallholder farmers through the National Agricultural Input Voucher Scheme (NAIVS) was not reached. The findings attributed minimal access government agricultural support to the higher market prices of agricultural inputs. The finding is supported by National Planning Authority (2013) which stated that smallholder farmers in Uganda received a disproportionately small amount of developmental resources and institutional support which was inconsistent and largely inadequate despite the adoption of Plan for Modernization of Agriculture (PMA) in 2002 and the NAADS programme.

Government agricultural support is intended to increase the likelihood of adaptation to climate variability. Therefore, without adequate government support the ability of vulnerable households

to cope with and recover from adverse shocks such as flooding, drought, and heavy wind storms is limited. The study made a follow-up from respondents who received government support. The findings as presented in table 1e showed that government agricultural support was received in form of agricultural training (25.0%), extension services (31.3%), and subsidized credit (12.5%), agricultural inputs (18.8%) and government market support (12.5%).

Table 1e: Government Agricultural Support Strategy

Form of Government Support	Frequency	Percent	Valid Percent
Agricultural training	4	25.0	25.0
Agricultural extension services	5	31.3	31.3
subsidized credit	2	12.5	12.5
Agricultural inputs	3	18.8	18.8
Market support	2	12.5	12.5
Total	16	100.0	100.0

Source: Researcher, 2021

From the findings it was established that agricultural training was the second popular form of government support used by farmers to cope with the impact of climate variability (25%). Here, farmers were trained in practical skills, theoretical knowledge and agriculture technologies needed to run sustainable vegetable farming in a highly changing climate. This was aimed at making farmers understand the dynamics of current variability and future climate change and its impact on vegetable farming and farmers livelihood. Furthermore, agricultural training was aimed at enhancing capacity of farmers to respond to climatic variability in good time and thus improve livelihood. To support this a NAADS official in an interview opined;

"At NAADS we continuously train farmers from within and beyond the district in skills and knowledge necessary for adaptation to climate change. For instance, farmers are trained every Wednesday and Saturday from 9am-5pm at Kyanja agricultural resource centre. Secondly, every year the vision group in collaboration with KCCA organizes a 'harvest Money Expo' which brings together farmers and practitioners in the agriculture sector to share and build farmers capacities. Therefore, offering agricultural training is part and parcel of what we do in the spirit of improving the living standards of people." (NAADS officer, 2021).

From the findings it was established that the highest percentage (31.3%) of respondents relied on extension services as a form of government support to cope with climate variability. Here, district extension officers provided extension services to farmers in form of adaptation information, agriculture advise, technical support, advice and supply of inputs. This was aimed at building

farmers capacity so that their vegetable productivity and thus livelihood is not affected in the face of climate variability. In addition, extension services would help the farmers achieve efficiency in vegetable production which would in return lead to an increased income and livelihood. The finding on extension services is supported by the Budget, Monitoring and Accountability unit which noted that the Government of Uganda through the Ministry of Agriculture, Animal Industry and Fisheries reformed the extension services in FY2014/15 and introduced the Single Spine Agriculture Extension System to address challenges of extension among farmers, enhance agricultural productivity, food security and household incomes. The study finding is also supported by the finding of Nuamah et al. (2019) in Ghana who reported that farmers relied on extension services to respond to climate change since they had limited capacities to adapt to the changes on their own. Nuamah et al. added that extension services were provided to farmers in Ghana in form of technical support and advice, supply of inputs and liaising with existing local institutions. Furthermore, the finding of this study concurs with the finding of DiFalco et al. (2011) in the Nile Basin of Ethiopia which revealed that farmers accessed extension services and these formed a core driver in adaptation thus leading to an increase in the quantity of food produced per hectare by the adapting household. In addition, findings by Defang and Amungwa (2017) study in Muyuka, Konye and Tombel sub-divisions in Meme, Fako and Kupe-Manenguba in Cameroon reported that extension services were offered to farmers on when and how to plant by extension agents, through farmer to farmer extension and from personal experiences.

From the findings it was established that subsidized credit was the fourth preferred form of government support used by farmers to cope with the impact of climate variability (12.5%). Since the farmers accessed government subsidized credit, it meant that they would harness capabilities needed to be resilient against climate variability shocks.

An interview with a KCCA official revealed that some farmers accessed subsidized credit and he noted;
“Some farmers were able to access government credit through government aided schemes and microfinance institutions especially those who had collateral and also those who belonged to farmers’ groups. The advantage with farmers’ groups is that they provide credit with less stringent terms and conditions”. (KCCA official, 2021).

In support of the findings, Ssonko and Nakayaga (2014) study in Mukono district Uganda reported that some farmers applied and accessed government subsidized credit to improve returns on investment during times of limited cash flows. The study revealed that distance to credit facilities, easing application procedures, farm size, land tenure system, and being a member of farmer associations positively influenced the probability of a farmer demanding for credit.

The findings also indicate that respondents received agricultural inputs (18.8%) as an adaptation strategy which ensures that farmers apply agricultural inputs to vegetable gardens. Here, farmers accessed fertilizers, high quality seeds, crop protection chemicals and seedlings which were later applied to their vegetable gardens. This was aimed at maximizing crop production, productivity and profitability which boost household resilience and protect livelihood. A visit to Kyanja

agricultural resource centre revealed similar findings that agricultural inputs such as seedling of various vegetable varieties were availed to farmers who visited the resource center. The center managed by Kampala Capital City Authority is set on 31 acres of land with the following objectives; to demonstrate affordable urban farming technologies; offer hands-on training; produce high quality seed for farmers (vegetable seedling, piglets, chicks and fish fingerlings); provide pig breeding services; carry out research and development for city farmers; and provide a bulking centre to link farmers to lucrative markets (KCCA, 2016). Increased variation in rainfall, temperature and wind storms has serious consequences on especially the poorest members of society. Agricultural inputs are critical in increasing farmers likelihood of adapting to climate variability and protecting livelihoods. It can therefore be argued that agricultural inputs are applied to scale-up and unlock agriculture production among smallholder farmers.

From the findings it was established that (12.5%) of the farmers received market support as form of government support to reduce vulnerability of vegetable farming to risks related to climate variability. Here, farmers got market information and market linkages and used it to plan for their vegetable farming. Since farmers got market information which ensures that every farmer makes planting decisions (when to plant?, what to plant?) in line with urban consumer demands, this is likely to increase farmers income thus resilience to climate variability. Furthermore, market linkages ensure that farmers negotiate from a position of greater strength which enables them to improve household income and livelihood. The finding of this study is supported by Renko et al. (2002) who reported that in Croatia farmers accessed government market support and this helped to improve agrarian structures, competiveness of local producers and identification, introduction and application of modern technologies

Inferential statistics results (β_2= -0.037 and p=0.351) depicted that $p > 0.05$ thus the null hypothesis was accepted. This implies that for every unit increase in government agricultural support programs there was no corresponding improvement in livelihood of smallholder vegetable farmers. However, an interview with a NAADS representative revealed that vegetable farmers were supported to engage in value addition, credit access, extension services and training as a means to increase profitability.

DISCUSSION

The National Planning Authority (2013) pointed out that despite the adoption of Plan for Modernization of Agriculture (PMA) in 2002 and NAADS programme, the smallholder farmers still receive a disproportionately small amount of developmental resources and institutional support to agricultural development in Uganda has been inconsistent and largely inadequate. The characteristics of smallholder vegetable farmers that participated in the study, broadly agree with previous findings from studies conducted in other urban areas (Hooton et al., 2007, Yamba, et al. (2017). The results generally confirm the findings of earlier research analyzing the farm characteristics of smallholder farmers. In particular, the results confirm the hypothesis that farm characteristics influence adaptation measures.

As far as farmers' perception on climate change and variability is concerned, results suggest an awareness of perceived changes in climate patterns to include; increased rainfall, increased temperature and increased occurrence of floods. The results concur with that of Odewuni (2013) which indicated that farmers perceived climate variability in terms of increase in rainfall, temperatures. Yet Diran et al. (2021) findings indicate that farmers believed that climate change is occurring in terms of increase in temperature, decrease in rainfall patterns; that farmers used various agricultural practices to adapt to climate change. Further, Elum et al. (2017) found that farmers' perceptions of climate change formed their adaptation strategies. Thus, farmers' perception on climate change has a direct link with how they perceive the kind of adaptation they need. Our results point to availability of various forms of agriculture support accessed by a few smallholder farmers. The forms identified by farmers were agricultural training, extension services, subsidized credit, agriculture inputs and government market support. Agriculture training was rated the most popular form of government support. The idea behind government agricultural support is to increase likelihood of adaptation to climate variability.

Furthermore, analysis of correlation of government support programs with livelihood of vegetable farmers revealed a significant positive and weak correlation ($r = 0.423$, $p = 0.000$). This means that when government support increased farmers livelihood increased as well but in unreliable manner. This therefore implies that government support programs were not adequate to ensure that farmers gained resources, capabilities and implement activities required for a means of living. This could be associated to limited access to and affordability of government support programs. In addition, the weak positive correlation between government support programs and farmers livelihood could be associated to provision of support in peace meals. The finding of this study is supported by the finding of Sonam et al. (2019) in Bhutan which found a positive but weak correlation between government support programs and livelihood of farmers. The study indicated that seed subsidy had a significant impact on income however the non-poor population had greater access to government subsidies compared to the poor.

Multiple linear regression results ($\beta_2 = -0.037$ and $p = 0.351$) depicted that $p > 0.05$ thus failed to reject the null hypothesis. Thus the researcher concluded that, there was no significant effect of government agricultural support on livelihood of smallholder vegetable farmers in Kampala district, Uganda. This implies that for every unit increase in government agricultural support, there was no corresponding improvement in livelihood of smallholder vegetable farmers.

Agriculture is the backbone of Uganda's economy and her agricultural policy has always revolved around increasing productivity, farmers income growth, enhanced food security and nutrition. Therefore, agricultural adaptation support is necessary in the struggle to achieve sustainable livelihood as most poor smallholder farmers are vulnerable to climate variability and are less able to cope with its impacts. A support program that emphasizes provision of subsidies to the poor as a package that consists extension services, agricultural inputs, training, market and credit support and other forms of support is vital in the success of other adaptation efforts. Thus, absence of support as an adaptation measure is likely to block success in other measures. Government

agricultural support influences adoption and implementation of other adaptation strategies such as farm-level production and financial management strategies.

Agriculture is the backbone of Uganda's economy and agricultural policy has always revolved around increasing productivity, farmers income growth, enhanced food security and nutrition (FAO, 2017), thus agricultural adaptation support is key to poverty alleviation and livelihood sustainability.

The findings elaborate and confirm the importance of adopting climate variability adaptation strategies to enhance livelihood of respondents. Such information is important to any stakeholder in the study area. The findings also have implications on roles played by agriculture extension service providers. By integrating climate variability adaptation perspective, agriculture extension workers are able to re-examine and re-evaluate extension programs extended to farmers in the district.

The findings further suggest empirical evidence on climate adaptation challenges in Kampala district including technological, financial and resource related adaptation constraints. The motivation to adopt adaptation strategies surrounds effects of adaptation strategies on livelihood of vegetable farmers in Kampala district Uganda. This study suggests that livelihood of smallholder farmers could be improved when a combination of factors that constrain or enhance adaptation by the poor is considered by policy makers as no single factor is sufficient on its own to improve the poor people's livelihood.

Theoretically, the study findings and analysis confirm the Sustainable Livelihood Approach, since the findings clearly show that various factors constrain while others enhance livelihood opportunities of the poor .The sustainable livelihood approach provides an analytical structure that facilitates a broad and systematic understanding of various factors that constrain or enhance livelihood opportunities and shows how factors relate to each other.

The results highlight the relevance of action theory of adaptation, since it's clear that adaptation actions require actors, an intention and resources to address the goal. The intention of smallholder adaptation is to reduce negative impacts of extreme climatic events such as floods, droughts and wind storms on livelihood. Further, the findings also clearly confirm that climate adaptation efforts are provoked by a stimulus and that receptors have to take actions to avert risk.

Limitations of the study

This study focused government support programs indicator; however, farmers can also, adapt to climate variability through use of farm production, financial, and technological adaptation strategies. Furthermore, considering only one urban district and failure to stratify smallholder farmers based on their adaptive capacities was another limitation.

Future direction for research is to study smallholder adaptation in other urban areas in other districts, explore adaptations and livelihood of smallholder livestock farmers. This will enable a comparison between crop and livestock farming adaptation strategies and livelihood of farmers.

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