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EFFECT OF FARMERS' PERCEPTIONS OF NGO INTERVENTIONS ON HOUSEHOLD FOOD SECURITY IN YATTA SUB COUNTY, MACHAKOS COUNTY, KENYA

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ABSTRACT

Purpose of the study: The purpose of the study was to determine whether farmers' perceptions of NGO interventions affect household food security in Yatta Sub County, Machakos County, Kenya.

Research methodology: The study applied a mixed method approach to collect both quantitative and qualitative data. This involved interviewing 357 farmers through a cross-sectional survey, undertaking focus group discussions and key informant interviews. The study employed a Likert scale to measure different perceptions held by farmers. A logic regression model was used to measure significance.

Findings: The findings demonstrated that there is a significant association between farmers' perception of NGO interventions and household food security outcomes. Farmers scaled-up and adopted interventions they positively perceive and consider effective.

Conclusion: The study revealed that there is a correlation between farmers' perception of NGOs interventions and household food security in Yatta Sub County (at 95% confidence level). The

more positive farmer's perceptions of NGO interventions are, the more likely household food security outcomes improve by a unit of approximately 1.389. Farmers constantly assess the effectiveness of various interventions promoted by NGOs and subsequently made decisions to either reject or scale them. Farmers consider interventions such as earth dams, terracing, zai pits, sand dams and water ponds, as well as crops such as cowpeas, pigeon peas, green grams, maize and beans as the most effective. Additionally, farmers prefer animals such as chicken and goats, as well as recommended training, post-harvest and marketing services as superior extension activities. Conversely, farmers perceive sorghum and millet to be ineffective and labour intensive and thus undesirable.

Recommendations: NGOs to incorporate customer satisfaction surveys in their food security programming in order to regularly evaluate farmers' perceptions regarding interventions. NGOs should invest their efforts in automating farming and upscaling modern technologies to lessen farmers' input in labour and enhance efficiency. NGOs should work concurrently with research institutes and knowledge centres to scale up innovations; test soils; undertake periodic customer satisfaction surveys; document evidence-based programming and stimulate improvement of communication with farmers.

Keywords: *Farmers perceptions, NGO interventions, household food security.*

INTRODUCTION

This study sought to determine whether or not farmers' perceptions of various NGO intervention ranging from rainwater harvesting, drought tolerant crops, soil enhancement, extension services, input provision, livestock production to off-farm activities affected their household food security. This is against the backdrop that food insecurity has continued to be a challenge globally as population growth is likely to reach 7 billion by the end of 2050 (Godfray et al., 2010). The Government of Kenya (GOK) estimates that an upward of 10 million people face seasonal food insecurity annually (GOK, 2011). This situation is likely to worsen with increasing effects of climate change in a Kenyan landmass that is largely either arid or semi-arid (GOK, 2010).

Non-governmental organizations (NGOs) work with farmers to prop up food production by utilizing various interventions. However, it is not known how farmers perceptions of these interventions impact on household food security. The overarching objective of this study was to investigate farmers perceptions of various NGO interventions and how they influence household

food security. Evidence from other studies (Meijer et al., 2015; Ybabe, 2014) point to the fact that perceptions, as well as knowledge and attitudes held by small-scale farmers largely underlie their decisions on whether or not to adopt various agricultural innovations. The above studies further revealed that underlying factors that include gender, marital status, incomes, age, asset ownership, markets, technologies promoted collectively influence farmers' decisions making on which innovations to adopt. Further, a study in Philippines by Pangilinan and Bagunu (2015) reported that farmers were more persuaded to accept genetically modified food on the premise that it improved their own food security, increased yields and was affordable as opposed to only contributing to their nutritional status. This implies that farmers have their own underlying perceptions that play a critical role in informing their decision making.

Voung (2012) asserted that it is important to pay attention to concerns of farmers, particularly regarding inclusion of the poor, duration of projects, choice of seeds and distribution process, as well as selection of beneficiaries to enable them consent to technologies that are promoted. It has been demonstrated that perceptions held by farmers occasionally delay implementation of interventions promoted by NGOs. For instance, a study in Ethiopian highlands (Tschopp et al., 2010) found that farmers believed that land degradation was not resulting from overstocking and overgrazing contrary to notions that were held by the NGOs. Instead, farmers wanted NGOs to increase access to water sources, distribute improved breeds and support communal farming in contrast to destocking activities that were promoted by NGOs.

The above study was consistent with studies in Malawi, Zambia and Zimbabwe (Chitongo, 2013; Nyanga, et al., 2012; Ngwira et al., 2013). These studies noted that farmers perceived climate change to be caused by supernatural forces. This rendered efforts by NGOs to promote conservation agriculture (CA) to improve soil fertility meaningless to farmers. Farmers also viewed conservation agriculture as labour-intensive and hence a reserve of the rich farmers who had larger farms and better draught power. In the above studies, farmers maintained that CA did not increase food production as predicted. Conversely, farmers were interested with nutrition gardens that utilized drip kits and treadle pumps because they were seen to be less labour-intensive and generally efficient.

Other studies in Kenya (Mutunga, et al., 2018) looking at smallholder farmers' perception and adaptation to climate change and variability revealed that elements such as incomes from off-farm

activities, access to credit, education, climate change information, as well as weather information access played a significant role in influencing farmers to adapt to climate change. Conversely, poor access to credit, inadequate extension services, high labour costs among others prohibited farmers from undertaking climate change adaptation. The above study is consistent with other studies in Ethiopia (Asrat & Simone, 2018) that investigated 734 farmer households in Dabus watershed on perceptions and adaptation to climate change. This study reported that perceptions of farmers in wet lowland were largely shaped by factors such as frequency of crop failure, age of the household head and their experience on precipitation and temperatures variations. On the contrary, perceptions of farmers in drier areas were influenced by information on climate change, shortage of food, farming experience and crop failure durations. In general, farmers' decisions on adaptation were informed by land size, levels of education, gender of the head of household, availability of extension services, among others.

There is evidence to demonstrate that sometimes NGOs can exclude farmers if they are not listening and taking into consideration their perceptions. For instance, studies in Bangladesh (Farouque, 2007) investigating the perception of farmers on integrated soil fertility and nutrient management promoted to improve crop production sustainability revealed that marginalized and the landless farmers had a negative attitude towards this approach. They considered this approach to be time wasting, labour-intensive and of less significance. This made them to neglect applying this approach and instead left it to commercial farmers. Other studies in Nigeria (Adedayo & Oluronke, 2014) have found that farmers exhibit different perceptions towards agroforestry practices which determine whether they apply them or not. Some of the farmers in this study viewed agroforestry as being too scientific to apply. However, others lauded this as an approach that improves productivity. These perceptions were largely informed by farmers' education levels and ownership of land.

Globally, NGOs continue to play a critical role in enhancing household food security. Consequently, it is increasingly becoming important to understand whether farmers' perceptions of NGO interventions have any bearing on their household food security. Food insecurity poses a challenge in the world as an upward of 2 billion people continue to be affected (FAO, 2019). According to Food and Agriculture Organization (FAO) (1996), food security exists when people have sustainable physical or economic access to enough, safe, nutritious, and socially acceptable

food for a healthy and productive life. Food insecurity has been exacerbated by growth in population predicted to reach 9 billion people by 2050 (Godfray, et al., 2010). This growth alone will increase demand for food to exceed 70% and pile pressure on agricultural land, water, energy and environment. In Kenya alone, over 10 million people are affected by seasonal food insecurity and an upward of 2 to 4 million are in dire need of food assistance annually (GOK, 2011; FEWSNET, 2013, Kenya National Bureau of Statistics (KNBS), 2014; Kimiywe, 2015).). This situation is continuously worsening owing to effects of climate change. Goal number two of the UN 17 Sustainable Development Goals (SDGs) demonstrate the urgency of ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture. Achieving this goal is increasingly becoming elusive given the ensuing climate change.

Agricultural production in Kenya has recorded a marginal growth from 4.4% in 2016 to 7.2% in 2017 (KNBS, 2017). This is partly attributed to dependence on rain-fed agriculture in the wake of climate change and attendant disasters such as prolonged drought and floods, as well as low budgetary allocations. This is further exacerbated by poor markets, post- harvest losses and use of uncertified seeds thus relegating Kenya to be a net food importer (GOK, 2011; GOK, 2010). In order to increase household food security, NGOs undertake a variety of interventions that include rainwater harvesting, soil fertility enhancement, promotion of drought tolerant crops, improved extension services, among others (Cain,2014; Yosef, et.al., 2015). These interventions are sometimes combined with other off-farm initiatives such as enhancing market access, improving animal husbandry and cash transfers (Nyariki & Wiggins, 1997). This paper explores how farmers' perceptions on the effectiveness of NGO food security interventions affect their household food security in Yatta Sub County, Machakos County, Kenya.

RESEARCH METHODOLOGY

The study was undertaken in Yatta Sub County within Machakos County (Kenya) among five wards namely Matuu, Kithimani, Katangi, Ndalani and Ikombe. This Sub County has a population of 147,579 people within an area of 1,057.30 Square kilometres. As demonstrated by Landon (as cited in Liavega et al., 2014) Yatta Sub County is a semi-arid falling under agro-climatic zone IV that is characterized by a bimodal rainfall of approximately 400mm. The study adopted a mixed method design that combined both quantitative and qualitative research methods. The sample size of the study was 357 farmers. It was sampled using Israel (1983) formulae for finite population

that enlisted 100 farmer groups constituting of a population of 3341 who had experience of working with NGOs for a period of more than three years. This was complimented with interviewing selected key informants and conducting six focus group discussions among farmers and NGOs working in the area. Data was broken down through Factor Analysis and a logistic regression model was utilized to test the hypothesis.

FINDINGS AND DISCUSSION

Effectiveness of rainwater harvesting interventions

This study assessed farmers' perceptions on different interventions implemented by NGOs to determine how they impacted household food security. These ranged from various rainwater harvesting, drought tolerant crops promotion, soil fertility enhancement measures to livestock production. Firstly, farmers were asked to assess whether various rainwater harvesting activities promoted by NGOs contributed to increasing water for crop production, utilized suitable technologies, were affordable, were less labour intensive and had capacity to harvest adequate water to last all seasons. As demonstrated in Table 1, earth dams, sand dams, boreholes, farm ponds and zai Pits were identified as effective.

Table 1: Effectiveness of different rainwater harvesting activities

	Earth dams Mean (sd)	Sand dams Mean (sd)	Water pans Mean (sd)	Farm ponds Mean (sd)	Boreholes Mean (sd)	Terracing Mean (sd)	Zai pits Mean (sd)
Provide sufficient water for food/crop production	1.47 (.810)	1.73 (.771)	1.96 (.845)	1.86 (.881)	2.15 (1.24)	1.60 (.601)	1.58 (.841)
Technology used is appropriate	1.63 (.682)	2.05 (.711)	2.51 (1.12)	2.22 (1.00)	2.21 (1.02)	1.89 (.61)	1.87 (.91)
It is not labour intensive	3.17 (1.52)	3.39 (1.15)	3.77 (1.11)	3.78 (1.06)	3.86 (1.21)	3.06 (1.13)	3.07 (1.23)
Yields sufficient water to last from one season to another.	1.46 (.861)	2.71 (1.33)	3.34 (1.34)	2.81 (1.24)	1.96 (1.25)	4.40 (.832)	4.39 (.77)
Overall mean	1.9325	2.4700	2.895	2.6725	2.545	2.7375	2.7275
overall sd	.612	.571	.762	.674	.751	.428	.631

The above findings in Table 1 were further confirmed by farmers in the focus group discussions. For instance, earth dams were deemed to be harvesting enough water to last all seasons. Similarly, farmers preferred sand dams, farm ponds, terracing, water pans and zai pits which were undertaken on individual farms as activities that harvested water for food production. These were desired because they were easier to manage. Nevertheless, farmers expressed concerns over costs involved in purchasing dam liners for farm ponds and water pans which were deemed necessary to reduce water sipping into the ground. Additionally, zai pits were generally acceptable and effective given their ability to retain water and increase food production despite their labour intensity. Nevertheless, farmers recommended for infusion of technologies to make activities such as zai pits, excavation of farm ponds, water pans and terracing less labour-intensive. Farmers in the focus groups discussions further noted that boreholes were effective in providing household water needs from one season to another despite costs involved.

Effectiveness of drought tolerant crops

Drought tolerant crops were assessed based on their capacity to increase food yields, meet household food preferences, suitability to local conditions and their likelihood to reduce farmers' input in labour. According to Table 2, cowpeas, green grams, pigeon peas, maize and beans emerged as effective as opposed to millet and sorghum.

Table 2: Effectiveness of drought tolerant crops.

	Maize	Beans	Green grams	Cow peas	Pigeon peas	Millet	Sorghum
	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)
Varieties promoted contribute to increased food/crop yields.	1.35 (.551)	1.41(.671)	1.22(.432)	1.21(.431)	1.20(.419)	2.21(1.60)	1.41(.618)
The technologies used required less labour	1.86(.941)	1.88(.957)	1.67(1.01)	1.62(.934)	2.01(1.25)	3.07(1.51)	2.25(1.27)
Foods promoted corresponded to household preferences	1.34(.512)	1.41(.589)	1.23(.511)	1.27(.499)	1.25(.501)	2.30(1.51)	1.65(.872)
The varieties promoted are suitable to the local context	1.41(.671)	1.63(.972)	1.19(.451)	1.18(.432)	1.23(.494)	2.60(1.54)	1.86(1.04)
Overall mean	1.4775	1.5825	1.3275	1.3200	1.4225	2.5450	1.7925
Overall sd	.481	.602	.422	.451	.442	1.27	.522

According to farmers in focus group discussions, cowpeas, green grams and pigeon peas considerably recorded favourable yields even when the rains were not as sufficient. Similarly, these crops matured faster hence providing farmers with much-needed food. Despite this, farmers were inclined to also grow maize (*Katumani and pioneer varieties*) and beans that had been developed by Kenya Agriculture Livestock and Research Organization (KALRO) to withstand drought irrespective of frequency of failure rate. This is because they preferred eating *'ugali'* made from maize flour and *'githeri'* that is a mixture of maize and beans. Conversely, farmers were not receptive to growing millet and sorghum although these were among the crops promoted by NGOs to address food insecurity in the Sub County. On the contrary, farmers considered sorghum and millet to be susceptible to invasion by birds and thus requiring high labour intensity to manage in terms of chasing birds away to reduce losses. Additionally, green grams were considered favourably both as a cash crop and a source of proteins by a large proportion of farmers.

Effectiveness of soil fertility improvement activities

Results of farmers' perceptions on the comparison between organic mature and inorganic fertilizers in enhancing soil fertility are presented in Table 3. Farmers revealed that they preferred organic manure instead of in-organic fertilizers mainly because it increased yields, had less negative effect on their soils fertility and was affordable.

Table 3: Effectiveness of use of organic compared to in-organic manure

	Organic manure Mean (sd)	Inorganic manure Mean (sd)
Increased household crop yields	1.25(.461)	1.64(.602)
Less labour intensive	1.99(1.03)	2.47(1.021)
Affordable by the farmers	1.84(1.14)	3.63(1.341)
Exhibited lessened long-term negative effect on the soil fertility	1.71(.891)	2.81(1.08)
Overall mean	1.6975	2.6375
Overall sd	.542	.611

On the contrary, farmers in the focus group discussions considered use of fertilizers to be expensive, inaccessible and likely to increase soil acidity - which was sometime cumbersome and costly to treat. Farmers asserted that over-use of fertilizers has caused soil to become acidic and thus less productive. Consequently, farmers noted the importance of NGOs to support them to undertake on-farm soil testing in order to determine the quality of their soils. Farmers felt that this process will inform them on various options for enhancing soil fertility and suitable crops to grow.

Effectiveness of extension services

Farmers assessed diverse range of extension services supported and provided by NGOs in line with their relevance, regularity, adequacy and comprehension by farmers. It was revealed that services such as training, marketing and post-harvest were effective in terms of being applicable to the local conditions, comprehensible by farmers and incorporating better follow-up mechanisms (Table 4). Farmers in the focus group discussions and key informant interviews confirmed that farmers appreciated trainings given by NGOs, as well as efforts to market their crops and to prevent post-harvest losses. However, they argued that trainings by NGOs should be undertaken on farmer's farms instead of hotels so that they are practical and tailored to respective farmers who need them.

Table 4: Effectiveness of different extension services

	Training Mean (sd)	Marketing Mean (sd)	AI Mean (sd)	Post harvesting Mean (sd)	Record keeping Mean (sd)
Relevant to the local conditions	1.34(.54)	1.69(.88)	2.71(1.52)	1.43(.71)	1.52(.71)
Frequent and regular	3.04 (1.12)	3.25(1.06)	3.84(1.12)	3.06(1.23)	2.52(2.14)
Incorporated sufficient follow-up through the model/lead farmer	2.96(1.31)	3.17(1.32)	3.91(1.23)	2.88(1.16)	4.53(.72)
Was easy and understandable by farmers	1.87(.98)	2.18(1.13)	3.12(1.55)	1.94(1.11)	2.11(1.43)
overall mean	2.3025	2.5725	3.395	2.3275	2.67
overall sd	.673	.753	1.105	.813	.182

Effectiveness of different farm inputs provided by NGOs

The farm inputs provided by NGOs which included seeds, fertilizers and varieties of farm tools were assessed in terms of increasing food production, their affordability, frequency and timeliness of their distribution. According to Table 5, seeds and tools/machineries were perceived as effective, particularly in improving production of food.

Table 5: Effectiveness of farm inputs provided by NGOs

	Tools/ machinery	Seeds	Fertilizer
	Mean(sd)	Mean(sd)	Mean(sd)
Improved food production	2.01(1.4)	1.46(.80)	2.16(1.31)
Were affordable/accessible	2.52(1.3)	1.82(.89)	3.01(1.5)
Given in a timely manner	3.05(1.4)	2.41(1.2)	3.13(1.4)
Were frequently given	4.3(.820)	4.23(.94)	4.27(0.99)
Average mean	2.97	2.48	3.14
Overall sd	.962	.641	.981

Further, farmers in focus group discussions revealed that they did not wish to depend on NGOs for their farm inputs. Instead, they preferred that expensive farm inputs such as seeds and fertilizers be given on loan basis in sufficient amounts through their groups. Farmers noted that NGOs gave insufficient seeds and fertilizers that did not match the size of the land they owned. Similarly, farmers urged NGOs to support them with improved technologies (automated machinery) to reduce efforts they put in interventions that were labour-intensive instead of giving them rudimentary tools

Effectiveness of various livestock supported by NGOs

Similarly, farmers evaluated suitability of livestock promoted by NGOs in relation to their suitability to the local conditions, production of milk, provision of meat and eggs and their contribution to enhancing household incomes. As demonstrated in Table 6, farmers preferred chicken and goats as animals that increased household incomes and contributed to provision of eggs and meat. Farmers in focus group discussions and key informant interviews consistently perceived goats and chicken as a fall-back resource, especially during depressed seasons. Goats were deemed to be resilient to effects of climate change such as prolonged drought. Farmers were resolute that livestock production promoted by NGOs should lay emphasis on improvement of breeds, value addition, increasing market access and enhancing capacities of farmers to prevent diseases in order to enable them to optimize their profits.

Table 6: Perceptions of farmers on preferred livestock

	Cows Mean(sd)	Goats Mean(sd)	Chicken Mean(sd)
Breeds are suitable in the local context	1.61(.91)	1.43(.701)	1.31(.639)
Increase production (milk, meat, eggs)	1.71(.972)	1.36(.671)	1.32(0.6)
Contributes to enhancing household incomes	1.53(.841)	1.34(.692)	1.25(.541)
Overall mean	1.616	1.377	1.293
Overall sd	.834	.627	.549

Lastly, this study tested null hypothesis (H_0) which stated that farmer's perceptions of NGOs interventions are not positively associated with household food security outcomes. Firstly, the Principal Component Analysis to establish a common factor that account for farmers' perceptions of NGOs interventions was extracted. This factor represented 51.840% of deviation in the scores, while the Kaiser-Meyer-Olkin that is a measure of sampling adequacy recorded 0.735. Additionally, the Bartlett's test of sphericity was significant (χ^2=527.810 (21df); p=0.000). Finally, this score was tested using logistic regression as demonstrated below.

Table 7: Omnibus Tests of Model Coefficients

		Chi-square	**Df**	**Sig.**
Step 1	Step	78.214	1	0.000
	Block	78.214	1	0.000
	Model	78.214	1	0.000

The omnibus test above reveal that the model is significant at the 0.95 confidence level as shown in Table 7

Table 8: Model Summary

Step	**-2 Log likelihood Initial model**	**-2 Log likelihood**	**Cox & Snell R Square**	**Nagelkerke R Square**
1	427.621[a]	416.693[a]	0.297	0.362
	a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.			

Additionally, the results of the Cox and Snell R Square and Nagelkerke R Square scores that determine the level of variance explained by the logistic model is presented in Table 8 above. In

this Table, the Nagelkerke R Square records 0.362 suggesting that 36.2% of the model is as a result of independent variables. Furthermore, the -2 log likelihood value was applied to determine the involvement of independent variables to the model and analysing the significance of the regression coefficients (Ata, et al., 2015). This demonstrated that the -2 log likelihood is 416.693 at 95% confidence level. In the original model which contains only the constant term, the -2 log likelihood value is found to be 427.621. However, after the fourth step, the value records 416.693 which reveals that there is improvement in model-data fit once independent variables are included.

Table 9: Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	21.212	8	0.007

Similarly, the Hosmer–Lemeshow test was applied in order to measure the goodness of fit for logistic regression models. This tests the following hypotheses:

H_0: There is no significant difference between observed and predicted value in the model.

H_1: There is significant difference between observed and predicted value in the model.

As shown in Table 9, the calculated p-value of the Chi-square was found to be 0.007 which was below the critical value of 0.05. As a result, the study rejected H_0 and maintained that there was significant difference between observed and predicted values in the model.

Table 10: Classification Table

	Observed		Predicted		
			Household Food Security		Percentage Correct
			NO	YES	
Step 1	Household Food Security	NO	19	86	18.1
		YES	8	244	96.8
	Overall Percentage				73.7
a. The cut value is 0.500					

In the classification scores achieved from logistic regression model shown in Table 10 above, the ratio of the total correct classification of the model at 5% significance level was established to be 73.7%. This meant that the model correctly approximated 244 of 330 food secure households in the study.

Table 11: Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Farmers' perception of NGO interventions	1.389	0.307	20.491	1	0.000	4.010	2.198	7.317
	Constant	-1.182	0.469	6.343	1	0.012	0.307		
a. Variable(s) entered on step 1: Farmers perception of NGO interventions.									

The standard error of coefficients of independent variables (SE), Wald statistics (Wald), significance levels (Sig) and Exp (B) statistics are illustrated in Table 11. The Wald statistic, which has a specific distribution known as chi-square, is a measure of the significance of β (Cokluk, 2010). The results show that variables including farmers' perception of NGO interventions were significant at 95% confidence level. Ultimately, the model is presented below.

$$ln\left[\frac{p}{1-p}\right] = -1.182 + 1.389\ \text{Farmers}'\text{perception on NGO interventions}$$

As shown in the model, it was deduced that as farmers' perception of NGO interventions positively improved, household food security grew concurrently. Therefore, this study rejected the null hypothesis which indicated that farmers' perceptions of NGO interventions are not significantly associated with household food security, hence accepting the alternative hypothesis.

CONCLUSION

It is concluded that there is a correlation between farmers' perception of NGOs interventions and household food security in Yatta Sub County. The more positive farmer's perceptions of NGO interventions are, the more likely household food security outcomes improve by a unit of approximately 1.389. Farmers constantly assess the effectiveness of various interventions promoted by NGOs and subsequently make decisions to either reject or scale them. As a result, farmers consider interventions such as earth dams, terracing, zai pits, sand dams and water ponds, as well as crop such as cowpeas, pigeon peas, green grams, maize and beans as the most effective. Additionally, farmers prefer animals such as chicken and goats, as well as recommended training,

post-harvest and marketing services as superior extension activities. Conversely, farmers perceive sorghum and millet to be ineffective and labour intensive and thus undesirable. Similarly, farmers have a positive perception of farm manure as compared to fertilizer in enhancing their soil fertility.

Although farmers are receptive to inputs and tools provided by NGO, they did not want to depend on them. Instead, they prefer NGOs to provide automated tools with up-to-date technologies that will go a long way to reduce time and effort put on interventions that require intensive labour such as excavations of zai pits, farm ponds and water pans. Additionally, farmers prefer inputs such as seeds and fertilizers to be given through loans and in sufficient quantities. In general, farmers appreciate the interventions that are more individualized at their farm level which they have control over as opposed to those that are communal. Farmers noted that communal interventions lacked sufficient ownership once NGOs left. The findings concur with studies in Malaysia (Rulia et al., 2018) which found there is a significant positive relationship between perceptions of farmers regarding climate change, their attitudes, as well as awareness and adaptation measures, they take. The study is consistent with the theory of planned behaviour (Ajzen, 1991) in which intentions held by people and embedded in attitudes, subjective norms and behaviour determines whether or not they apply certain actions.

RECOMMENDATIONS

NGOs to incorporate customer satisfaction surveys in their food security programming in order to regularly evaluate farmers' perceptions regarding interventions. NGOs should invest their efforts in automating farming and upscaling modern technologies to lessen farmers' input in labour and enhance efficiency. NGOs should work concurrently with research institutes and knowledge centres to scale up innovations; test soils; undertake periodic customer satisfaction surveys; document evidence-based programming and stimulate improvement of communication with farmers.

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