ASJ: *International Journal of Agricultural Research, Sustainability, and Food Sufficiency (IJARSFS)*
Vol. 8 (02) 27 September, 2021, Pp. 522 – 533
www.academiascholarlyjournal.org/ijarsfs/index_ijarsfs.htm
ISSN: 2360-932X©Academia Scholarly Journals
Also Available@: Archive.org/Magabatela_and_Odunze
Open access

Full Length Research

Resilience Building Through Vertical Market Linkages. A Case Study of Small Holder Farmers in Zimbabwe

[1]Magabatela Fangel and *[2]Odunze Daisy Ifeoma

[1]Agricultural Partnership Trust, Zimbabwe.

[2]National University of Science and Technology, Zimbabwe.

*Corresponding Authors' Contact Detail: E-mail Address ✉: daisyifeoma@gmail.com

Accepted August 15, 2021

Empirical evidence shows that vertical market linkages impact positively on farmers' resilience capacities through increased income and productivity. This study had the primary aim of analyzing the impact of vertical market linkage outcomes on resilience capacities of smallholder farmers in Zimbabwe, and a secondary objective of comparing household characteristics portrayed by smallholders vertically linked to formal markets and those not vertically linked. Resilience capacities in this study are defined by the farmers' ownership of productive assets, diversity of crop production and access to community social safety nets. Using the survey strategy, the study employed a disproportionate stratified random sampling technique in gathering data from 37 vertically linked farmers and 93 non-vertically linked farmers from a target population of 170 farming households. Findings from the regression analysis used in testing the model specification for the study show that vertical market linkages have a significant impact on farmers' ownership of productive assets, and crop diversity but not community social safety nets. Findings also indicate that the household characteristics of vertically linked and non-vertically linked smallholder farmers are different. Extension access is identified in the study as a fundamental factor determining productivity gains and income improvement for vertically linked farmers.

keywords: Resilience; Vertical market linkage; Crop diversity; Productive asset; Community safety nets.

INTRODUCTION

Agricultural production in Zimbabwe is associated with different ecological and socio-economic risks resulting in farmers especially smallholders facing shocks and stresses from climatic, economic, and market changes. The shocks and stresses which include drought, pests, diseases, soil degradation, floods, and volatile price fluctuations have become frequent in recent years and it has become imperative that smallholder farmers develop resilience capacities in order to remain productive in the long term. Building resilience for smallholder farmers is a key proponent of agricultural development. Following the 2015 ElNino drought in Zimbabwe which resulted in farmers having a very poor harvest, the Zimbabwean government in partnership with Non-Governmental Organizations (NGOs) and international donor agencies rolled out the Zimbabwean Resilience Building Fund (ZRBF) with a focus on increasing the capacity of small holder farmers to cope with climatic and economic shocks.

Resilience entails building the capacity or ability of

a household to keep with a certain level of well-being by withstanding shocks and stresses. UNDP (2015) defined resilience for Zimbabwe as "the ability of at risk individuals, households, communities and systems to anticipate, cushion, adapt, bounce back better and move on from the effects of shocks and hazards in a manner that protects livelihoods and recovery gains, and supports sustainable transformation". A general definition by Marchese et al., (2018) states that resilience is the ability of a system to prepare for threats, absorb impacts, recover and adapt following persistent stress or a disruptive event. Although resilience most times tend to focus on responding to interruption, much of it is embedded in preparedness (Linkov and Palma-Oliveira, 2017). This is because resilience programs mostly focus on adjusting to new conditions, developing inventive uses of traditional knowledge, establishing new knowledge, and enhancing living conditions and employment (Lew et al., 2016). FAO (2016) views resilience as a measurable concept and suggests that household or community resilience can be achieved when farmers have adaptive, absorptive, and transformative capacities to bounce back to normal or better position after facing ecological or socio-economic shocks and stresses. In defining resilience building, it is important to take a gander at the relatedness of shocks/stresses facing farmers and poverty or vulnerability of the farmers. When hazards (droughts, floods, pests and diseases for crops and livestock and market fluctuations) meet vulnerable farmers it leads to shocks. These shocks have detrimental effects on agricultural production capacity, and these include interruption of food supply, drastic reduction of household income, the battering of savings, and erosion of livelihoods (FAO, 2014).

While resilience-building focuses to a large extent on the ability to observe, learn, and adapt to shocks, it is not achieved by working on farming systems only but through a multi-dimensional approach that involves increasing smallholder farmers' access to sustainable markets. This can be achieved through marketing linkages. According to Mercy Corps (2017), vertical market linkages enables farmers to bounce back to normal or better position after facing shocks and stresses, thereby contributing to their resilience capacities. Vertical market linkage is defined by Hobbs and Young (1999) as closer vertical coordination that exists between specific players in the supply chain as the agricultural sector moves from commodity spot markets towards a tighter, more specified linkage. Vertical market linkages link farmers to lucrative markets which implies that farmers are made better off with production and marketing risks addressed thus contributing to resilience building (Miyata et al., 2009).

Zimbabwean smallholder farmers have limited capacity (adaptive, absorptive, and transformative capacities) to cope with socio-economic and ecological shocks and stresses that prevail in the region given their low production and income levels of many. FAO (2007) defined smallholder farming as characterized by family-focused motives such as favoring the stability of the farm household system, using mainly family labor for production, using part of the produce for family consumption and the other part for generation of income. Von Braun and Mirzabaev (2015) agree with this definition but also added that smallholder farmers are small size land-holders with limited potential for economies of scale and they face many changes in producing family food, accessing markets and generating household income. Vertical market linkages in the form of market specification contracts, production management contracts, resource providing contracts, strategic alliances and out-grower schemes have been used by development agents in Zimbabwe prior and post 2015 ElNino drought to link smallholder farmers to markets. The Zimbabwean Resilience Building Fund (ZBRF) project with its component of market linkages for resilience building implemented by a consortium of firms under the Agricultural Partnerships Trust (APT) has been in operation since 2016 after the 2015 El Nino drought. Vertical market linkages (mainly production contracts) have been promoted in this region by different local and international organizations and for different horticultural and agronomic crops as well as for small and large livestock. But not all farmers are part of the vertically linked system given the limited funds and resources the organizations work with and the fact that some farmers due to past experiences opt to operate outside the linkage system. However, the question arises whether there are differences in the household characteristics portrayed by vertically linked and non-vertically linked small holder farmers in Zimbabwe and if vertical market linkages have an impact on the resilience capacity of small holder farmers in Zimbabwe. It is of paramount importance that the impact of these forms of vertical market linkages on resilience building for smallholder farmers in Zimbabwe is investigated. This study, therefore, aimed to assess the impact of vertical market

linkages on resilience building for smallholder farmers in the Umzingwane district of Matebeleland region of Zimbabwe.

More specifically, the study addresses the following objectives.

- To compare household characteristics portrayed by smallholder farmers who are vertically linked to formal markets and the household characteristics portrayed by smallholder farmers who are not vertically linked to formal markets.
- To analyze the impact of vertical market linkages on smallholder farmer's resilience capacity (ownership of productive assets, crop diversity, and access to community safety nets).

Based on the objectives and extant literature, the following hypotheses were proposed.

- There is a significant difference in household characteristics between households that are vertically linked and households that are non-vertically linked to markets.
- There is a significant relationship between outcomes of vertical market linkages (income and productivity gains) and resilience building capacity of smallholder farmers (ownership of productive assets, crop diversity and access to community safety nets).

EMPIRICAL LITERATURE

Empirical studies by different researchers on market linkages indicate a positive impact on farmer's productivity and income. Fafchamps and Vargas-Hill (2005) in their study conclude that lack of market linkages between farmers, processors or manufacturers, traders, and retailers contributes to lack of information on prices and technologies as well as distortions and inefficiencies in input and output markets which makes it difficult for smallholder farmers to grab market opportunities. A study by Miyata et al., (2007) in the Shandong province of China showed that contracted fruit farmers earn more than non-contracted fruit farmers. Their study concluded that contracted farmers produce products of higher quality that fetches higher producer prices on the market and the transaction costs for contracted farmers are lower because of the organization and logistics that give farmers economies of scale. Another study by Miyata et al., (2009) on vertical linkages for apples and green onions concluded using a treatments model that out of the increase in income, 38% was associated with contract farming. The study looked at different aspects of vertical market linkages including inputs access and extension and evaluated how it impacts income gains for smallholder farmers.

Findings from a resilience building study by Alinovi et al., (2008) show that the ability of a household to respond to shocks and stresses depends on available options like access to assets, social safety nets, income generating activities, and the institutional environment. A case study by Frankenberger et al., (2015) evaluated the impact of market linkages on achieving the broad objective of a PRIME project in Ethiopia aimed at increasing household incomes and enhancing resilience to climate change. The study was done post-ElNino drought that affected all smallholder farmers in Ethiopia but in a different way due to the difference in resilience capacities. The study concluded that private sector engagement in creating market linkages increased smallholder farmers' exposure to information, access to production inputs and reduced transaction costs which increased their income gains. It also concluded that the accumulation of productive assets resulted from investments from household income gains and this has a significant impact on the resilience capacity of smallholder households. Findings by Mercy Corps (2017) in their study on market development systems and resilience building indicate positive results with evidence that 20% of farmers realized a 25% increase in production capacity. However, the study also found that farmers are prone to economic and ecological shocks and stress like drought, pests and diseases and market price fluctuations that hinder resilience capacities. A research study by FAO (2017) in Burkina Faso, Malawi and Zambia shows that crop diversification tends to be highest for the poorest farmers. According to this study, there are various socio-economic and climate resilience benefits of crop diversity, but small-holder farmers are least likely to take it up due to limited input market development and limited extension support. The study concluded that contract farming help to overcome barriers to crop diversity because farmers gain access to inputs and extension support. Vertical linkages were found to be associated with crop diversity resulting in climate resilience for smallholder farmers. Another empirical study by Shamah and Singh (2013) assessed the impact of contract farming as vertical market linkages on promoting crop diversity using time series data and Simpson Index of diversity calculation. The study also concluded that contract farming is a tool meant to encourage crop

diversification but there are policy issues related to the contract framework.

MATERIAL and METHODS

Conceptual Framework

Empirical evidence shows that vertical market linkages impact positively on farmers' resilience capacities through increased income and productivity. The conceptual framework for the study proposed these two outcomes in time lead to resilient farming households with access to community safety nets, diversified crop production and livelihoods source, and access to productive assets.

Vertical Linkages: Most proponents of vertical market linkages in modern studies argue that vertical market linkages benefit farmers with productivity and income gains as well as secured formal market access (Miyata et al., 2009). An increase in the use of vertical linkages especially production and marketing contract play an important role in raising total factor productivity (Key and McBride 2007) and raising the total factor productivity of smallholders is a required condition for increasing incomes of farmers (McNamara 2009). Nguyen et al., (2015) in their review of theory and evidence on the impact of contract farming on productivity and income state that almost all studies argue that farmers on contract farming schemes experienced some increase in their productivity and income. Minot (2007); Olomola (2010); Ajao and Oyedele (2013); Kalimangasi et al., (2014); Odunze et al., (2015) all agree that one of the main benefits of farmers in contract farming is the increase in production output. Bolwig et al., (2009); Miyata et al., (2009); Saigenji and Zeller (2009), Barrett et al., (2011); Wainaina et al., (2012) and Wang et al., (2014) all agree in their studies that vertically linked (contract) farmers earned more income (higher margins) than their counterparts. Hu (2012) argue that households with better income levels have the capacity to invest in productive assets and community safety nets.

Resilience capacity: Resilience is viewed in the FAO (2017) resilience model as a function of different components ranging from household food and income access, access to basic services (health and education), access to social safety nets (Internal Savings and Lending (ISAL), land and livestock and adaptive capacity (income diversity, crop diversity and educational level). This agrees with Pingali et al., (2005) statement that a resilient household is depicted by certain resilience constructs which include the ability to have crop diversity, income diversity, productive assets, market access and social safety nets. Alinovi et al., (2010) also opines that household resilience is a function of productive assets, social safety nets, income and access to basic services and food. The resilience capacity of smallholder farmers is expected to improve with vertical market linkages which improve farmers' access to production and market information, reduces transaction costs, creates access to production inputs and productivity gains, all of which lead to household income improvement. It is from these arguments that this study analyzed the impact of the outcomes of vertical market linkages on resilience building.

Based on the framework, the model specification for farmers' resilience building capacity with vertical linkages variables is postulated as follows:

$$Rt=\alpha 0 + \alpha 1Extn + \alpha 2InputAcc + \alpha 3TransCost + \mu t$$

Where:

- Rt= Resilience measure (Crop diversity, Productive asset ownership, market access, and access to community safety nets) where:
- Extn = access to extension service as measured in number of meeting times with extension agent per month.
- InputAcc = Access to credit inputs.
- TransCost = Transaction cost measured as total production and marketing costs.
- μ= disturbance term of error term.
- α = coefficient of parameters.

Data Collection and Analysis

The study, guided by specific hypotheses employed quantitative methods in both data collection and analysis. The target population for the study was made up of smallholder horticultural farmers in the Umzingwane district of Matebeleland North province in Zimbabwe constituting both vertically linked and non-vertically linked farmers. The target population was divided into 2 strata based on whether vertically linked or not. The study used a disproportionate stratified random sampling technique to facilitate both within and between strata analyses. Disproportionate stratified sampling is used when there are strata in the population of interest that are quite small but very important and they may not be adequately represented in a survey if other sampling approaches are used (Levy and Lemeshow 2008). Data was collected in July 2019 through a survey of 37 vertically linked farmers and 93 non-vertically linked farmers bringing the total sample size for the study to one hundred and thirty farmers. Data was collected

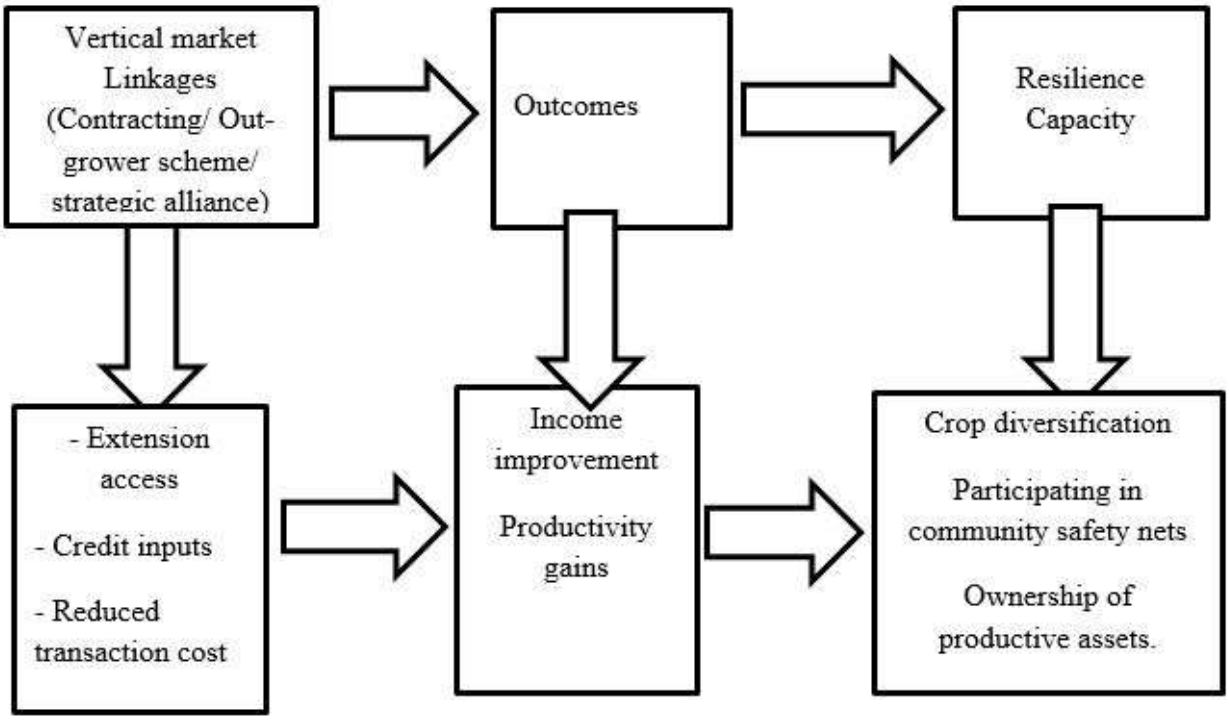

Figure 1: Conceptual framework. Source: Adapted from Alinovi, D'Errico, Mane and Romana (2010).

with a structured questionnaire with data scales and codes for easy analysis.

Pearson chi-square test and t-test were conducted to establish if there is any significant relationship between vertical market linkages and household characteristics (gender, marital status, education level, and income sources). A two-stage regression was also performed. Firstly, the study analyzed the impact of vertical linkage constructs (credit inputs access measured as the value of credit inputs, extension access measured as number of extension meetings or engagement with extension agent for the month and the transaction cost) on intervening variables (income measured as increase in income following vertical linkages and productivity gains measured as increase in output following vertical market linkages). The study used correlation matrix and Hosmer Lemshow goodness of fit test for diagnostic tests. Correlation matrix tested the presence of perfect linear relationship among regressors to avoid violation of the classical linear regression principles. There was no multicollinearity detected. The test statistic for the Hosmer-Lemeshow goodness of fit test was above 0.05 hence it was resolved that the model estimates sufficiently fits the data.

RESULTS and DISCUSSION

Household Characteristics of Sampled Farmers

Research findings presented in Table 1 indicate that vertically linked sampled households are dominated by female headed households whereas male-headed households dominate non-vertically linked households. The findings are also in line with survey results by FAO (2016) who found that female headed households participate more in contract farming and other vertical linkages than male headed households due to their vulnerability status. Findings show that no farmer with single marital status is vertically linked. This is attributed to the fact that single farmers are in most cases youthful and willing to relocate and diversify at any time and this reduces their commitment to contract farming or any other vertical market coordination. On the other hand, widow headed households due to vulnerability status are

Table 1: Categorical frequencies for farmers' household characterization.

Variable	Vertically linked		Non-Vertically linked	
	Count	Percent (%)	Count	Percent (%)
Gender – Female headed	26	70.3	34	36.6
Male headed	11	29.7	59	63.4
Total	**37**	**100**	**93**	**100**
Marital Status- Married	13	35	58	62.4
Widowed	13	35	9	9.7
Divorced	11	30	10	10.7
Single	0	0	16	17.2
Total	**37**	**100**	**93**	**100**
Education level – Primary	11	29.7	23	24.7
Secondary	20	54.1	41	44.1
Advanced	6	16.2	19	20.4
Tertiary	0	0	10	10.8
Total	**37**	**100**	**93**	**100**
Income Source Agriculture	35	94.6	49	52.7
Non-Agric	0	0	8	8.6
Both	2	5.4	36	38.7
Total	**37**	**100**	**93**	**100**
Safety nets – Engaged	26	70.3	31	33.3
Not engaged	11	29.7	62	66.7
Total	**37**	**100**	**93**	**100**

more likely to get engaged in vertical market linkages in order to reduce risks in agriculture and build resilience. This agrees with the findings by Mercy Corps (2017) and the expected results for this study. The percentage of vertically linked farmers without tertiary education is higher than that of vertically linked farmers with tertiary education. This implies that vertically linked household heads are less educated than non-vertically linked households. Less educated farmers tend to have low technical knowledge in agriculture hence they are engaged in vertical market linkages to access extension services from the contracting companies and improve resilience capacities. Findings presented in Table 1 also show that the sampled farmers who are vertically linked to markets predominantly relied on agriculture, specifically crop production for their income source with only 5.6% earning income from non-agricultural sources. while non-vertically linked farmers relied on. More than half of the non-vertically linked farmers depend solely on income from agriculture while and the remaining earn income from both agricultural and non-agricultural sources. The findings here imply contract farming and other forms of vertical market linkages are prioritized by households that are into full-time farming as they take it as a resilience strategy for their main source of livelihood. In the same vein, findings show that vertically linked farmers are more engaged in community safety nets (specifically savings and lending nets) than non-vertically linked farmers. The findings presented in Table 2 show that the mean age for the category of farmers linked to markets is 57.1 years and is 9.1 years bigger than the mean age for non-vertically linked farmers. Vertically linked farmers are older, tend to have input and knowledge challenges and are therefore more vulnerable to stresses and shocks. The average yield and income for vertically linked farmers are 0.6 tons and $181.1 higher than the average yield and income for non-vertically linked farmers, respectively. These findings coincide with research findings by Mercy Corps (2017) who concluded that vertically linked crop farmers get full extension knowledge on seed variety, bio-diversity, disease and pest management mechanisms, and soil management practices, all of which results in

Table 2: Descriptive statistics for the continuous variable for households' characterization.

	Statistic	Age (yrs)	Yield (ton)	Income ($)	Transaction cost ($)	Extension	Credit inputs	Crops	Assets
Vertically Linked	N	37	37	37	37	37	37	37	37
	Mean	57.1	1.5	408.1	49.5	4.2	41.24	2.54	10.43
	Std. Dev	1.3	0.8	207.6	23.6	1.4	11.37	0.73	4.8
	Var	176.2	0.6	43102	559.0	1.9	129.36	0.53	23.03
	Min	33.0	0.2	77.4	31.4	2.0	20.00	1.00	3.00
	Max	84.0	3.0	913.0	80.4	8.0	70.0	4.00	23.0
Non-Vertically Linked	N	93	93	93	93	93	93	93	93
	Mean	48	0.9	227	133.7	1.2	.000	1.5	6.7
	Std. Dev	1.7	1.1	109	46.1	1.2	.000	0.65	2.6
	Var	284	0.7	11975	2123.	1.4	.000	0.42	6.97
	Min	20.0	0.2	25.00	42.00	.00	.00	1.00	3.00
	Max	94.0	2.0	632.0	232.0	4.00	.00	3.00	15.0

increased yields and resilience capacity. Findings also agree with Mercy Corps (2017) who found that vertically linked farmers witnessed at least of 50% increase in income. Mudavanhu et al., (2016) also got similar results in Bindura Zimbabwe on a contract farming and income benefits study. The mean transaction cost for vertically linked farmers was found to be $49.50 whilst that of non-vertically linked farmers was $133.7. These findings imply that vertically linked farmers incur less transaction costs in their production and marketing. This is in line with Okello (2010) who concluded that vertically linked farmers have less transaction costs than non-vertically linked farmers because vertical linkages reduce the cost of searching buyers, screening, and transportation. Extension access was found to be four times higher for vertically linked farmers who meet with extension agents on average four times a month whilst non-vertically linked get extension support approximately and on average once a month. This is supported by research findings by FAO (2012); Mercy Corps (2017); Williamson, (1985); Miller, (2005); and Okello (2010) who all concluded that vertically linked smallholder farmers' access production and marketing information that results in better production performance than vertically non-linked farmers. Access to credit inputs measured in this study as inputs credit value accessed by sampled farmers also show that non-vertically linked farmers have no access to credit inputs whilst all sampled vertically linked farmers have access to inputs credit with credit values ranging from $20.

IMPACT OF VERTICAL LINKAGE ON HOUSEHOLD CHARACTERISTICS OF SAMPLED FARMERS

Table 3 show the Chi-square test results at 95% confidence interval. The Chi-square results show that there is a significant (significant at 10% level) association or linear relationship between vertical market linkages status of the farmer and gender, marital status and income source. Results also show that there is no linear relationship between farmers' vertical and market linkage status and educational

Table 3: Output table for Pearson Chi-Square test.

Variable	Pearson Chi-square test	
	Value	Prob-value
Sex	12.1	0.001***
Marital status	25.997	0.000***
Education level	5.036	0.169
Income source	20.421	0.000***
Community safety nets	0.157	0.692

*Significant at 1% level.

Table 4: Output table for T-test.

	statistics					
					95% Confidence Interval of the Difference	
Variables	T	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Age	35.278	129	.000	50.69231	47.8493	53.5353
Yield	11.749	36	.000	1.52162	1.2590	1.7843
Transaction cost	22.376	129	.000	109.71692	100.0154	119.4185
Total Income	19.202	129	.000	278.34885	249.6678	307.0299
Extension Cost	12.723	129	.000	2.04615	1.7280	2.3643
Area planted crops	22.037	129	.000	1.49673	1.3623	1.6311
Input credit value	6.820	129	.000	11.73846	8.3330	15.1439
Number of crops	25.215	129	.000	1.80769	1.6658	1.9495
Distance to formal market	18.550	129	.000	7.98231	7.1309	8.8337
Number of Assets	23.474	129	.000	7.76923	7.1144	8.4241

*Significant at 1% level.

level community safety nets. The t-test results shown in Table 4 indicate that all the continuous variables are associated with vertical market linkages where the variables' probability values are less than 10%. The computed test statistic lies in the critical region hence the null hypotheses is rejected and the study concludes that there is a significant difference in household characteristics between households that are vertically linked and households that are non-vertically linked to markets.

Table 5: Linear regression results for the impact of vertical linkages on income.

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	254.831	40.006		6.370	0.000
	Input credit value	1.888	1.055	0.224	1.790	0.076***
	Extension access	27.025	9.771	0.300	2.766	0.070***
	Transaction cost	-0.492	0.275	-0.166	-1.788	0.076***
	Dependent Variable: Income					

Table 6: Linear regression results for the impact of vertical linkages on Productivity.

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.035	.475		-.074	.941
	Input credit value	-.002	.011	-.030	-.194	.848
	Extension meetings	.381	.089	.661	4.266	0.000***
	Transaction cost	.001	.004	.033	.248	.806

a. Dependent variable: productivity

IMPACT OF VERTICAL MARKET LINKAGES ON FARMERS' RESILIENCE CAPACITIES

Impact on Income

Results presented in Table 5 show that an increase in extension access and credit inputs has a positive impact on smallholder farmers' income. On the other hand, there is an adverse relationship between transaction costs and income gains. Lower transaction costs lead to an increase in income. Vertical market linkages bridge the information gap between farmers and buyers and reduce the cost of searching for buyers, screening and transportation for the farmers. Vertical market linkages are expected to bridge the information gap between farmers and buyers, reducing the asymmetry of information and reducing the cost of searching buyers, screening, and transportation.

Impact on Farmers' Productivity

Research findings presented in Table 6 indicate that there is a significant linear relationship between extension access and productivity or yield. A unit increase in extension access results in a positive increase in productivity by 66.1%. However, there is no significant linear relationship between productivity and transaction costs as well as access to credit inputs at 10% significance level since the probability values are greater than 10%. The researcher safely concludes that the increase in yield for vertically linked farmers results from increased access to extension services.

Impact on Farmers' Productive Assets

Findings presented in Table 7 indicate that increases in income and productivity subsequently increases in

Table 7: Impact of vertical linkage outcomes on productive assets owned.

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.919	1.849		6.447	.000
	Total Income	.000	.007	.018	.063	0.05***
	Yield	-1.088	1.731	-.179	-.629	0.534
Dependent variable: Number of productive				assets owned		

Table 8: Impact of vertical linkages on crop diversity.

Model		**Unstandardized coefficients**		**Standardized coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	2.047	.263		7.790	.000
	Total Income	.000	.001	-.139	-.522	.605
	Yield	.455	.246	.491	1.851	0.073***
a. Dependent Variable: Number of crops						

productive assets owned by a smallholder farmer thereby increasing the resilience capacity of a farmer. This was found to be significant at 10% with a probability value less than 0.1. These findings concur with research findings by Mercy Corps (2017) and Mudavanhu et al., (2012) who both concluded that vertical market linkages specifically contract farming result in increased income levels and acquisition of productive assets thereby increasing the resilience of smallholder farmers. From the finding, the researcher can safely reject the null hypotheses and conclude that vertical market linkages are significantly associated with productive asset ownership.

Impact on Crop Diversity

Findings from Table 8 show that the vertical market linkages outcomes consequently increase the number of crops grown by a smallholder farmer thereby increasing crop diversity. Yield coefficient of 0.491 which is significant at 10% (p value of 0.073 is less than 10%) implies that a unit increase in yields results in 49.1% increase in crop diversity by smallholder farmers. These results show that the researcher can safely reject the null hypothesis and conclude that there is a significant linear relationship between vertical market linkages and crop diversity.

Impact on Social Safety Nets

Regression results shown in Table 9 indicates income and yield resulting from vertical market linkages are insignificantly related to community safety nets since the probability values for yield and income (0.55 and 0.881, respectively are greater than 10%).The findings are insignificant at 10% significance level hence the researcher fails to reject the null hypothesis and concludes that there is no significant association between vertical market linkages and social safety nets.

Table 9: Impact of vertical linkages on community safety nets.

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	Yield	.441	.747	.348	1	.555	1.554
	Income	.000	.003	.023	1	.881	1.000
	Constant	-1.372	.861	2.538	1	.111	.254
a. Dependent variable: Social safety nets							

CONCLUSION

Based on the findings of the study, the researchers conclude that vertical market linkages can increase the resilience capacities of smallholder farmers. Vertically linked farmers have less transaction costs, more access to inputs, and regular extension services resulting in an increase in income and productivity which positively impacts their resilience capacity in terms of diversity of production and productive assets ownership. The study held horizontal market linkages constant hence it is a recommended area of further study to evaluate the contribution of horizontal market linkages in resilience building.

DISCLOSURE STATEMENT

This research received no grant from any funding agency, commercial or not-for-profit sectors.

DECLARATION OF INTEREST

The authors declare no conflict of interest whatsoever with this work. The study was carried out for academic purposes.

REFERENCES

Ajao AO and Oyedele GA (2013). Economic efficiency of contract farming in Oyo state: Experience from British American Tobacco Company. International Journal of Agricultural Science, 3(9): 699-707.

Alinovi L, D'Errico M, Mane E and Romana D (2010). Livelihoods strategies and household resilience to food insecurity:an empirical analysis of Kenya. European Report on Development, Kenya: erd.eui.eu/publications/erd.

Alinovi L, Mane E and Romana D (2008). Measuring household resilience to food insecurity:application to palestinian households.. Agricultural Survey Methods.

Barrett CB, Bachke ME, Bellemare MF, Michelson HC, Narayanam S and Walker TF (2011). Smallholder participation in contract farming: comparative evidence from five countries. World Development.

Bolwig S, Gibbon P and Jones S (2009). The economics of smallholder organic contract farming in tropical Africa. World Development, 37(6): 1094-1104.

Fafchamps M and Vargas-Hill R (2005). Selling at the farm gate or travelling to the market. American Journal of Agricultural Economics. 87 (3): 717–734

FAO (2007). Approaches to linking producers to markets, Agricultural Management, Marketing and Finance Service.Volume 13.

FAO (2012). Resilience Index Measurement and Analysis (RIMA). [Online] Available at: www.fao.org/3/ai4102e [Accessed 21 April 2019].

FAO (2014). Food security statistics Economic and social development department. United Nations Food and Agriculture Organization Report, 2014.

FAO (2016). Food security and resilience building. Rome, FAO.

FAO (2017). Climate-Smart Agriculture. Rome, Italy, FAO .

Frankenberger T, Smith L, Langworthy B, Martin S, Spangler T, Nelson S and Jeanne P (2015). Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation, Ethiopia: Feed The Future

Hobbs JA and Young L (1999). Increasing Vertical linkages in agrifood supply chains:. Conceptual Model and some preliminary evidence, Issue 35.

Hu W (2012). Effect of contract farming on the farmer's average return: the case of the grainindustry in USA . Paper presented in the Agricultural and Applied Economics Association. Washington DC, Seattle.

Kalimangasi NN, Agrey K and Natalia K (2014). Contribution of contract cocoa production on improving livelihood of smallholder farmers. International Journal of Scientific and Research Publications, 4(10): 1-10.

Key N and McBride WD (2007). Production contracts and farm productivity: Examining the link using instrumental variable. Paper prepared for presentation at the Annual Meeting of the AAEA, Portland, Oregon, July 29-August 1.

Levy PS and Lemeshow S (2008). Sampling of populations: Methods and applications. Wiley and Sons 4th Edition, John Wiley and Sons, Hoboken.

Lew AA, Pin T. Ng, Chin Cheng (Nickel) Ni, Wu T (2016). Community sustainability and resilience: similarities, differences and indicators. Tour. Geogr., 18:18–27. https://doi.org/ 10.1080/14616688.2015.1122664.

Linkov I and Palma-Oliveira JM (2017) Risk and Resilience. Springer, Amsterdam.

Marchese D, Reynolds E, Bates ME, Morgan H, Clark SS and Linkov I (2018). Resilience and sustainability: Similarities and differences in environmental management applications. Science of The Total Environment, 613-614, 1275–1283. doi:10.1016/j.scitotenv.2017.09.086

McNamara K (2009). Improving Agricultural Productivity and Markets: The Role of Information and Communication Technologies. Agricultural and Rural Development Notes; No. 47. World Bank.

Mercy Corps (2017). Can Market Systems Development Build Resilience in Fragile. Myanmar: Mercy Corps.

Miller (2005). Market information systems for smallholder farmers. S.l., Sage publications.

Minot N (2007). Contract farming in developing countries: Patterns, impacts, and policy implications. Case study #6-3 of the program: "Food Policy for Developing Countries: The Role of Government in the Global Food System".

Miyata S, Minot N and Hu D (2007). Impact of Contract Farming on Income. Working paper. No 742, IFPRI discussion papers from International Food Policy Research Institute (IFPRI).

Miyata S, Minot N and Hu D (2009), Impact of contract farming on income: Linking small farmers, packers, and supermarkets in China. World Development, 37(11): 1781-1790.

Mudavanhu V, Musindo B, Chigusiwa L, Muchabaiwa L and Bindu (2016). The Impact of Alternative Vertical Coordination Mechanisms for the Development of Small Scale Farmers; A Case Study of Bindura District. International Journal of Management Sciences and Business Research, 5(10).

Nguyen AT, Dzator J and Nadolny A (2015). Does Contract Farming Improve Productivity and Income of Farmers? A Review of Theory and Evidence. The Journal of Developing Areas. Special Issue on Sydney Conference Held in April 2015, 49(6).

Odunze D, Van Niekerk JA and Ndlovu S (2015). Assessment of Factors that Impact on the Viability of Contract Farming: A Case Study of Maize and Soya Beans in Mashonaland West and Central Provinces in Zimbabwe. South African Journal of Agricultural Extension, 43(2): 78 – 90.

Okello J (2010). Does use of ICT-based market information services (MIS) improve welfare of smallholder farmers? Evidence from Kenya. Brasilia, ACORN-REDECOM Conference Brasilia.

Olomola AS (2010). Models of contract farming for pro-poor growth in Nigeria. IPPG Briefing Note, August.

Pingali P, Alinovi L and Sutton J (2005). Food Security in Complex Emergencies: enhancing food system resilience. Disasters 29, Supp. 1: S5-S24.

Saigenji Y and Zeller M (2009). Effect of contract farming on productivity and income of small holders: The case of tea production in North-western Vietnam. Contributed Paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China. August 16-22.

Shamah NS and Singh P (2013). Agricultural Diversification And Contract Farming In Punjab. Economic and Social Development, IX(1).

UNDP (2015). Building Resilience in Zimbabwe: Towards a Resilience Strategic Framework.

Von Braun J and Mirzabaev A (2015). Small farms: Changing structures and roles in economic development, ZEF Discussion Papers on Development Policy, No. 204, University of Bonn, Center for Development Research (ZEF), Bonn.

Wainaina PW, Okello JJ and Nzuma, J (2012). Impact of contract farming on smallholder poultry farmers' income in Kenya. Selected paper prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguacu, Brazil, 18.

Wang H, Moustier P and Loc NTT (2014). Economic impact of direct marketing and contracts: The case of safe vegetable chains in Northern Vietnam. Food Policy, 47: 13-23.

Williamson O (1985). Information access for agricultural development. USA, Sage.