ROLE OF SPECULATION SUPPLY CHAIN STRATEGY ON THE DISTRIBUTION OF SUBSIDIZED FERTILIZERS IN TANZANIA

[1*]Emanuel Manase Kimaro, & [2]Oden Mwaipopo

[1]University of Iringa Tanzania

emanuel.kimaro@uoi.ac.tz *

[2]University of Iringa Tanzania

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ABSTRACT

Background: Despite the government spending a huge amount of money on agricultural inputs such as fertilizers, there is still a problem in the distribution of agricultural subsidized fertilizers, and failure to address this problem will continue to be a waste of the government funds and obstacle to the growth of agricultural productivity. This study intended to establish the role of speculation supply chain strategy in the distribution of subsidized fertilizers in Tanzania.

Methodology: The study adopted a cross-sectional research design and target population was registered distributors of fertilizers in the country. Simple random sampling and purposeful sampling techniques were used in selecting 185 respondents who are the dealers in distribution of fertilizers.

Results: The study findings indicated that speculation supply chain strategy and distribution of subsidized fertilizers are positively and significantly correlated. Regression of coefficient results indicated that speculation supply chain strategy had a positive and significant effect on distribution of subsidized fertilizers.

Conclusions and Recommendations: The study concluded that the speculation supply chain strategy has a positive and significant contribution to the distribution of subsidized fertilizers in Tanzania. The government of Tanzania should ensure a review of policies on speculation supply chain strategy. In particular, the government should strengthen aspects relating to speculation supply chain strategy including time, demand, and risk speculation. This will enhance distribution of subsidized fertilizers in the country.

Keywords: *Speculation Supply Chain Strategy, Distribution of Subsidized Fertilizers, Tanzania*

INTRODUCTION

The distribution of subsidized fertilizer programs has been practiced all over the world for many decades. In Sri Lanka, the subsidy program was introduced in 1962 during what they called the green revolution where the government took charge in distrusting the agricultural inputs. The aim was to increase the production of rice, the policy has been evolving overtime to cover the production of other crops as well. However, the program has been expensive and most politically sensitive to implement (Weerahewa et al., 2010).

The distribution of subsidized fertilizers program has been practiced in Ghana since 2008, the program was difficult to implement in 2014. The government decided to launch a new program in Ghana in 2015 through the Ministry of Food and Agriculture. The new program aims at increasing food production and security in the country. It was introduced to meet the aspiration of many stakeholders in the agricultural sector after conducting research which discovered that there is a low usage rate of fertilizers in the country. The program target to increase the fertilizer use rate to at least 50kg per hectare by 2020 compared to the previous rate of 8kg per hectare (Akatey, 2015).

Marketing and distribution of fertilizers in Kenya have been facing challenges as well as in other African countries. The historical background shows that from 1974 to 1984, the responsibility of distributing agricultural inputs including fertilizers was given solely to Kenya Farmers Association and Agricultural Finance Corporation (AFC) who provided credit financing (Ochola & Fenguing, 2015). The government of Kenya took tight control of the fertilizer distribution, these included price subsidies, controlling prices, and licensing the activities of importers and distributors (Gutery & Cook, 2009; Yamano & Arai, 2010). The distribution of fertilizers problems emerged characterized by widespread corruption and bureaucratic costs. In the earlier 1980s, the government reduced restrictions and other traders were allowed to distribute the fertilizers under official regulated prices (Ariga et al., 2010). In 2006, the Kenyan government proposed to inject Ksh 36 billion for 3 years through the Ministry of Agriculture to subsidize the agricultural inputs. The aim was to increase food security and alleviate poverty among small-scale poor farmers. The farmers' intentions were identified and vetted in collaboration with the community stakeholders, they were given redeemable vouchers to help them to get the inputs at a subsidized price (Ochola & Fenguing, 2015).

The subsidized fertilizer distribution in Tanzania can be traced back to independence which was followed by the introduction of the Arusha declaration in 1967(Minot, 2009). The government-controlled the distribution process including all major means of production and economic activities, the aim was to ensure equitable distribution of income and self-reliance, the socialism ideology. The government took charge of managing the economy, thus private sector was prohibited to operate, and the distribution of fertilizers was entirely the responsibility of the government to all parts of the Country (Amani et al., 2004). However, in the 1970s and earlier 1980s, the country experienced steady economic decline, the situation was due to the failure of the government's socialist policy, the collapse of the East African Community in 1977, and the war with Ugandan Iddi Amin in 1979 (Muganda, 2004). The government decided to embrace the new economic reform in 1986 whereby the economy was liberalized which changes the fertilizer distribution process, with little involvement from the government.

The United Republic of Tanzania (URT) reintroduced the subsidized distribution program in 2008, and in the year 2015/2016, the government distributed 99,993 tons of subsidized fertilizers to 999,926 households through the agents in possession of vouchers given to farmers. However, since

the introduction of the subsidized fertilizer program, there have been several problems such as loss of fertilizers vouchers, corruption, and delays in distribution making fertilizers not reach the farmers at the right time, place, quantity, and right cost (Nchemba, 2016). In 2017, the government changed the distribution strategy, bulky procurement, and the use of indicative prices to dealers to cut costs to the farmers, the practice which has made some fertilizers to reaching to interior regions and illegal export to neighboring countries such as Malawi (Chawe, 2018). It is against this background that, the study intends to establish the role of speculation supply chain strategy in the distribution of subsidized fertilizers in the country.

There is a need to appreciate the role of supply chain strategies, to get the product at the right time, right place, right quantity, and at the right cost (Lyson & Farrington, 2006). The study not only helps to add knowledge to the application of supply chain strategies in the agricultural sector in Tanzania but also provides useful information to the stakeholders in improving the distribution of subsidized fertilizers in the country. This may help to increase the use of fertilizers and boost agricultural production.

STATEMENT OF THE PROBLEM

Despite having good soil, favorable climate, and irrigation schemes, Sub-Saharan Countries like Tanzania are mentioned amongst the lowest in global consumption of fertilizers in agricultural activities, about 3% only of the total consumption of fertilizers in the world (Druilhe & Barreiro-Hurlé, 2012). Thus, there is a need of improving the use of fertilizers in African countries. Agricultural activities in Tanzania have been experiencing the low use of fertilizers and consequently low productivity (Hepelwa et al., 2013). Since the introduction of the subsidized programme, the United Republic of Tanzania (URT) has been facing several problems in distributing the fertilizers to the targeted farmers. From the 1960s to the 1970s, the programme was affected by the decline of the country's economy, thus the state monopoly failed to distribute and economic liberalization took place in 1986 when the private sector took charge of the distribution (Minot, 2009).

The National Agricultural Input Voucher System (NAIVAS) was introduced in 2008 to solve the problem of high agricultural inputs including fertilizers. The program again experienced several shortcomings, among them is the lack of accessibility, corruption, loss of fertilizers vouchers, and delivery delays (Nchemba, 2016). The programme took a new phase in the year 2014/2015 to distribute the subsidized inputs through registered groups and Agricultural Marketing Cooperative Societies (AMCOS). The government in collaboration with the local banks such as National Microfinance Bank (NMB) and CRDB. The group and cooperative members were given loans whereby they pay 20% of the price and the remaining 80% was paid at the point of selling their produce (Chizza, 2013). The program faced several challenges, apart from AMCOS being poorly managed, they are few and not all farmers are members of AMCOS or groups, for instance by march 2014 there were about 9604 AMCOS in the country characterized by lack of funds, lack of cooperative education and misuse of financial resources (Chizza, 2014).

The government is spending a huge amount of money on agricultural inputs such as fertilizers, for instant currently the distribution agents submitted a claim of Tsh 65.4 billion for the distribution services conducted in 25regions including Morogoro, Njombe, Rukwa, Kilimanjaro, and Arusha of which the total debts are approximately 70% of the distribution costs, yet the farmers were raising complain about not getting the fertilizers at the right time, quantity and right costs

(Mwananchi, 2017). In 2022 the fertilizer prices increase about 40 to 50 percent in Southern zones which is the hub for food supply in the country. For instance, in Njome and Ruvuma, the Urea 50kgs was sold up to 145,000-150,000 Tsh (HabariLeo, 2022). This revealed that there is a problem in the distribution of agricultural subsidized fertilizers, failure to address this problem will continue to be a waste of the government funds and an obstacle to the growth of agricultural productivity. That's why this study is important as it intends to establish the role of speculation supply chain strategy in the distribution of subsidized fertilizers in Tanzania.

RESEARCH HYPOTHESIS

H0: The speculation supply chain strategy has no significant influence on the distribution of subsidized fertilizers in Tanzania.

THEORETICAL FRAMEWORK

The study is anchored on the transaction cost theory. The objective of supply chain and distribution management is to provide the goods and services at the lowest total cost without compromising the quality (Lyson & Farrignton, 2006). There is no doubt that, as products move from one process to another, one location to another, there are cost elements involved, the same applies to the distribution of subsidized fertilizers in SSA. The value has to be charged about the place where it is, internally and externally (Crocker et al., 2012). Supply chain strategies attempt to address costs optimization objectives as the governments are incurring high costs in the subsidy program (Baltzer &Hansen, 2011), that's why this theory is relevant to the study. Total acquisition costs as described by Baily et al. (2008), consist of all cost components which influence the distribution of goods from point of origin till they reach the final users. For the distribution of fertilizers, costs in distribution cannot be avoided even if the fertilizer is subsidized. Garg et al. (2011) argued that subsidized fertilizers can influence the costs of cultivation, this, in turn, will have an impact on the final harvest and agricultural market prices. Baily et al. (2008), suggest that there is a need to address the distribution costs; and supply chain strategies can play an important role in addressing the costs, for example, speculation strategy can assist in reducing inventory costs through inventory planning, determining the size or amount of requirement, the time at which it should be ordered, and the order quantity.

EMPIRICAL REVIEW

Speculation strategy is the one that reflects the traditional model of supply chains, make to stock process that follows the common supply chain process from the manufacturer, product assembly, finished goods packaging, and final delivery to the customers. The objective of speculation is to gain economies of scale and minimize the risks of demand changes (Kong &Allan, 2007). Speculation depends on accurate estimates of requirements, which in turn needs supply and demand information. Information is the hub in SC and distribution management, how much information should be available and how should be shared to permit effective speculation strategy, is the key question to the success of SC and distribution management of subsidized fertilizers.

As suggested by Chandra and Grabis (2007), there is a need to collect accurate information for better decision making particularly in the implementation of speculation strategy. Information coordinates the entire SC and distribution system, with good information, organizations can make effective decisions such as what to produce and how much, where to locate inventory, and how

best to transport them (Lyson & Farrington, 2006). In the formulation of various strategies such as the distribution of subsidized fertilizers, information is required from the initial stage. As suggested by Saunders (1997), purchasing and supply chain strategy formation should begin with collecting information about critical environmental issues to support the decision-making. The information enhances the connection between various stages of the supply chain and distribution system. The distribution of the fertilizer subsidy programme demands agricultural research and extension services, increased awareness of the programme, and ensuring sustainable implementation of the subsidy program. Reliable and rigorous information on the small farmers and rural households is critically important (Dorward et al., 2008), this would mark speculation decisions to be made with accuracy.

Provision of information and sensitization sessions to rural farmers is left in the hands of NGOs in developing economies which sometimes lack enough funds and capacities to accomplish the mission (Raut & Sitaula, 2012). The limited information on the subsidized inputs, such as fertilizers associated with the absence of reliable data with practicable methodology. This makes it difficult in realizing the distribution objectives (Chirwa & Dorward, 2013). With the increased availability of information, the online database can be applied to track the movement of fertilizers along with the supply chain from the manufacturers to the retailers (Sharma, 2012). Thus, there is a need to have an in-depth study of speculation strategy on the distribution of subsidized fertilizers to help address distribution challenges in Tanzania.

CONCEPTUAL FRAMEWORK

The conceptual framework is used to explain how the independent variables affect the dependent variable. Figure 1 shows the hypothesized relationship between speculation supply chain strategy and distribution of subsidized fertilizers.
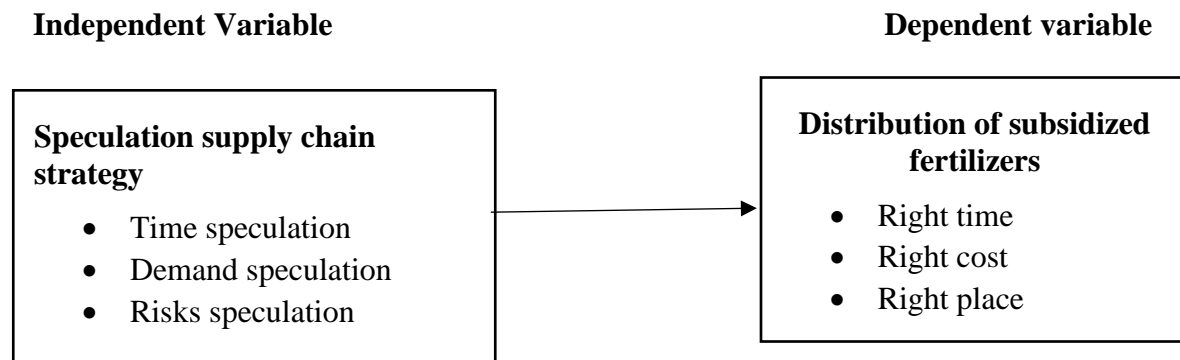
Independent Variable   **Dependent variable**

Speculation supply chain strategy
• Time speculation
• Demand speculation
• Risks speculation

→

Distribution of subsidized fertilizers
• Right time
• Right cost
• Right place

Figure 1: Conceptual framework

RESEARCH METHODOLOGY

The study adopted a cross-sectional research design as it is a useful design for studying the relationship between two or more variables. The study population was 2,045 registered distributors of fertilizers in the country because they are the implementors of supply chain strategies. Simple random sampling and purposeful sampling techniques were used to obtain 185 respondents. A questionnaire was used for data collection. Data were analyzed using descriptive analysis to

describe the nature of the study variables. Correlation and regression analysis were used to establish the relationship between the study variables.

RESULTS AND DISCUSSION

The study findings are presented based on response rate, descriptive analysis, correlation analysis, and regression analysis.

Response Rate

The researcher administered 185 questionnaires to distributors of fertilizers in Tanzania. Out of 185, 141 questionnaires were successfully filled and returned representing 76.2% response rate. The remaining questionnaires were either unreturned or incorrectly filled. According to Saunders et al. (2009), a response rate above 50% is considered adequate for analysis. Therefore, a return rate of 76.2% was considered a good representation of the views of the target population.

Descriptive Analysis

Descriptive analysis is necessary for a study as it helps to stipulate the findings as they are; thus, forming the basis for the researcher to deeply understand the phenomenon under which the research is based (Creswell, 2013). The main descriptive statistics used in the study are percentage, frequency, mean, and standard deviation. Table 1 illustrates descriptive statistics results relating to the distribution of subsidized fertilizers.

Table 1: Descriptive statistics on the distribution of subsidized fertilizers

Statements	Strongly disagree f (%)	Disagree f (%)	Agree f (%)	Strongly agree f (%)	Mean	Std. Dev
Subsidized fertilizer is distributed to farmers at the right time	14 (9.7)	27(18.8)	34(23.6)	69(47.9)	3.1	1.0
Subsidized fertilizer is distributed to farmers in the right quantity	55(38.2)	40(27.8)	15(10.4)	34(23.6)	2.2	1.2
Subsidized fertilizer is distributed to farmers at the right cost	5(3.5)	15(10.4)	63(43.8)	61(42.4)	3.3	0.8
Subsidized fertilizer is distributed to farmers in the right place	6(4.2)	14(9.7)	59(41)	65(45.1)	3.3	0.8
Aggregate score					3.0	1.0

The findings in Table 1 revealed that the majority of the respondents agreed with the statement that subsidized fertilizer is distributed to farmers at the right time (M=3.1, Std. dev=1.0); subsidized fertilizer is distributed to farmers at the right cost (M=3.3, Std. dev=0.8); and subsidized fertilizer is distributed to farmers in the right place (M=3.3, Std. dev=1.8). On the other hand, the majority of those who participated disagreed that subsidized fertilizer is distributed to farmers in the right quantity (M=2.2, Std. dev=1.2). The responses on the different aspects of the distribution of subsidized fertilizers are supported by an aggregate mean of 3.0 and a standard deviation of 1.0. It can therefore be noted that the respondents agreed with most aspects that had been identified to measure the distribution of subsidized fertilizers. Table 2 illustrates descriptive statistics results relating to speculation supply chain strategy.

Table 2: Descriptive statistics on speculation supply chain strategy

Statements	Strongly disagree f (%)	disagree f (%)	Agree f (%)	Strongly agree f (%)	Mean	Std. Dev
There is a detailed analysis and good estimates of the demand for subsidized fertilizers in the country (demand estimates)	53(36.8)	23(16)	33(22.9)	35(24.3)	2.4	1.2
The delivery time is well determined in advance (time speculation)	5(3.5)	15(10.4)	64(44.4)	60(41.7)	3.2	0.8
There are adequate risks management procedures that reduce the supply and demand uncertainties	10(6.9)	36(25)	42(29.2)	56(38.9)	3.0	1.0
Aggregate score					2.9	1.0

The findings in Table 2 revealed that the majority of the respondents disagreed with the statement that there is a detailed analysis and good estimates of the demand for subsidized fertilizers in the country (M=2.4, Std. dev=1.2). Further, the majority of those who participated agreed that the delivery time is well determined in advance (M=3.2, Std. dev=0.8); and there are adequate risk management procedures that reduce the supply and demand uncertainties (M=3.0, Std. dev=1.0). The aggregate mean of 2.9 indicated that the respondents agreed with most statements relating to speculation supply chain strategy. This implied that the respondents consider speculation supply chain strategy key in the distribution of subsidized fertilizers.

Correlation Analysis

Correlation analysis was carried out to establish the degree of the relationship between the independent variable (speculation supply chain strategy) and the dependent variable (distribution of subsidized fertilizers). The correlation results are shown in Table 3.

Table 3: Correlation Results

		Distribution of Subsidized Fertilizers	speculation supply chain strategy
Distribution of Subsidized Fertilizers	Pearson Correlation	1.000	
	Sig. (2-tailed)		
speculation supply chain strategy	Pearson Correlation	.607**	1.000
	Sig. (2-tailed)	.000	
	N	144	144

** Correlation is significant at the 0.01 level (2-tailed).

The findings in Table 3 indicated that speculation supply chain strategy and distribution of subsidized fertilizers had a correlation coefficient of 0.607. The significant value was obtained at (p=0.000) which was below 0.05. Therefore, there was a strong positive significant relationship between speculation supply chain strategy and distribution of subsidized fertilizers. This implies that an increase in speculation supply chain strategy is accompanied by an increase in the distribution of subsidized fertilizers.

Regression Analysis

Regression analysis was conducted using a linear regression analysis which involved running the least square regression method and interpreting the R2 values, F values, and coefficients. The independent variable (speculation supply chain strategy) was regressed on the dependent variable (distribution of subsidized fertilizers). The results are displayed in Tables 4, 5, and 6 respectively.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.607a	0.368	0.364	0.35939

a Predictors: (Constant), speculation supply chain strategy

The outputs of the model summary in Table 4 indicated an R square of 0.368. This implied that the speculation supply chain strategy explains 36.8% of changes in the distribution of subsidized fertilizers in Tanzania. Table 5 shows the ANOVA results.

Table 5: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.679	1	10.679	82.68	.000b
	Residual	18.341	142	0.129		
	Total	29.02	143			

a Dependent Variable: Distribution of Subsidized Fertilizers
b Predictors: (Constant), speculation supply chain strategy

The ANOVA results in Table 5 revealed that the established statistical model had a good fit for the observed set of data with a value of F-statistic as 82.68 at a level of significance of 0.000 which is lower than the 0.05 threshold adopted for concluding at 95% level of confidence. The results suggested that the proposed model is statistically significant (good fit) in predicting the dependent variable. Table 6 shows the coefficients results.

Table 6: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.345	0.206		6.533	0.000
	Speculation supply chain strategy	0.565	0.062	0.607	9.093	0.000

a Dependent Variable: Distribution of Subsidized Fertilizers

The statistical model was as follows:

Distribution of Subsidized Fertilizers=1.345+0.565 Speculation supply chain strategy

The regression of coefficient results in Table 6 indicates that the speculation supply chain strategy had a positive and significant effect on distribution of subsidized fertilizers. This was supported by a beta coefficient of 0.565 and a p-value of 0.000. The p-value was less than 0.05 at 95% confidence interval. This implies that a unit increase in speculation supply chain strategy would result in 0.565 unit increase in the distribution of subsidized fertilizers. The null hypothesis (H0) that speculation supply chain strategy has no significant influence on the distribution of subsidized fertilizers in Tanzania was, therefore, rejected.

CONCLUSION

The results of regression analysis determined that the speculation supply chain strategy has a positive and significant effect on distribution of subsidized fertilizers. Consequently, the study concludes that the speculation supply chain strategy has a positive and significant contribution to the distribution of subsidized fertilizers in Tanzania.

RECOMMENDATIONS

The study found that the speculation supply chain strategy has a positive and significant effect on distribution of subsidized fertilizers. The government of Tanzania should ensure a review of policies on speculation supply chain strategy. In particular, the government should strengthen aspects relating to speculation supply chain strategy including time, demand, and risk speculation. This will enhance distribution of subsidized fertilizers in the country.

REFERENCES

Akatey, N. (2015). *The Launch of the Agri- fertilizer subsidy programme and the way forward.* www.ghana.gov.gh.

Amani, H., Wangwe, S., Rweyemamu, D., Aiko, R. and Wanga, G. (2004). Understanding economic and political reforms in Tanzania. *Economic and Social Research Foundation (ESRF).* A report was submitted to GDN Under the Understanding Reform Project.

Baily, P., Farmer, D., Crocker, B., Jessop, D., & Jones, D. (2008). *Procurement principles and management.* Pearson Education.

Baltzer K&Hansen H. (2011). *Evaluation study on agricultural input subsidies in Sub-Saharan Africa.* Institute of Food and Resource Economics, University of Copenhagen

Chandra & Grabis (2007*). Supply chain management: Concepts, solutions, and applications.* New York. The United States of America.

Chirwa E&Dorward A. (2013), *Agricultural input subsidies* (1st edition). United Kingdom: Oxford University Press, https://doi.org/10.1093/acprof:oso/9780199683529.003.0001

Creswell, J. W. (2013). Steps in conducting a scholarly mixed methods study.

Crocker B, Jessop D& Morrison A (2012). *Inbound Logistics Management: Storage and Supply of Materials for the Modern Supply Chain.* (7th edition). England. Pearson Education Ltd.

Dorward A. et al (2008). *Towards 'smart' subsidies in agriculture? Lesson from recent experience in Malawi.* Natural resource perspectives. ODI

Druilhe, Z., & Barreiro-Hurlé, J. (2012). Fertilizer subsidies in sub-Saharan Africa.

Garg B et al (2011); Distribution of fertilizer subsidies and its impact on the cost of cultivation of major crops in Punjab state. *International Research Journal of Agricultural Economics and Statistics.* 2(2).

Gugerty K, Cook J (2009). Political Economy of Fertilizer Policy in Kenya. Brief. Seattle: *Evans School Policy Analysis and Research. The* University of Washington.

Hepelwa A (2013). The Voucher System and the Agricultural Production in Tanzania: *Is the model adopted effective?* Evidence from the Panel Data analysis.

Kong & Allan. (2007). *More on postponement adapting postponement to the supply chain.* http://www.kongandallan.com

Lyson, K., & Farrington, B. (2006). *Purchasing and supply chain management* (7th edition). Britain. Pearson Education Ltd.

Minot N (2009). Fertilizer policy and use in Tanzania. *Fertilizer Policy Symposium of the COMESA African Agricultural Markets Programme (AAMP).* Livingston, Zambia

Muganda A (2004). *Tanzania's economic reforms and lessons learned.* World Bank.psu.edu- visited 26th Oct 2016.

Mwananchi (2017). *Waziri Mkuu amsimamisha Mkurugenzi, Ni baada ya madeni ya pembejeo kuonekana makubwa kuliko pembejeo zilizosambazwa*. No 6101. Pg 25.

Nchemba (2016*), Hotuba ya waziri wa kilimo mifugo na uvuvi kuhusu makadirio ya matumizi ya fedha ya wizara ya kilimo mifugo na uvuvi kwa mwaka* 2016/17. URP

Ochola, R. O., & Fengying, N. I. E. (2015). Evaluating the effects of fertilizer subsidy programmes on vulnerable farmers in Kenya. *Journal of Agricultural Extension and Rural Development*, *7*(6), 192-201. https://doi.org/10.5897/JAERD15.0673

Raut N&Sitaula B (2012). Assessment of fertilizer Policy: Farmers' perceptions and implications for future agricultural development in Nepal. *Sustainable Agriculture Research*.1(2). https://doi.org/10.5539/sar.v1n2p188

Saunders M (1997). *Strategic purchasing& supply chain management*. (2nd edition). Great Britain. Prentice-Hall.

Saunders M, Lewis P&Thornhill A (2009). *Research methods for business students*. (6th edition) London. Pearson Education Ltd.

Weerahewa J, Kodithuwakku S& Ariyawarddana (2010). *The fertilizer subsidy programme in Sri Lanka*.New York.NY: Cornell University, Ithaca.

Yamano K, Arai A (2010). Fertilizer policies, price, and application in East Africa. *GRIPS Discussion Paper 10-24*. Japan. GRIPS National Graduate Institute for Policy Studies.