British Journal of Marketing Studies
Vol. 10, Issue 4, pp.,55-63 2022
Print ISSN: 2053-4043(Print),
Online ISSN: 2053-4051(Online)

Factors influencing banana growers to purchase water-soluble fertilizers in Trichy district, Tamil Nadu

Sathish Kumar M*
*Research Scholar, International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India.
H. Y. Maheta
Assistant professor, Post Graduate Institute of Agri-Business Management, Junagadh Agricultural University, Junagadh, 362001, Gujarat, India.
Y. A. Lad
Associate Professor & Head, Department of HRM & PM, International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India.
A. B. Mahera
Assistant Professor & Head, Department of Marketing Management, International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India.

Citation: Sathish K M., Maheta H. Y., Lad Y. A., Mahera A. B., (2022) Factors influencing banana growers to purchase water-soluble fertilizers in Trichy district, Tamil Nadu, British Journal of Marketing Studies, Vol. 10, Issue 4, pp.,55-63

ABSTRACT: *A solid form of fixed fertilizer composition is water-soluble fertilizer in the form of a water solution. Rather than granulated fertilizers, it contains free-flowing small particles that dissolve quickly in water. It is quickly absorbed by plants and has a noticeable effect within a few days. Water-soluble fertilizers have a better efficiency than granular fertilizers. The current study was done in Trichy districts since there were more banana growers available, and the farmers were chosen using a multi-stage purposive sampling technique. The information was gathered from 120 banana growers in the Lalgudi, Thottiyam, and Manaparai areas of the Trichy district. Water-soluble fertilizer adopters (60) and non-adopters (60) are represented among the 120 farmers. The factors that influence farmers' use of water-soluble fertilizer were studied using principal component analysis. To identify factors, the principal component analysis is used. Influence by social groups, marketing effectiveness and awareness, link with association and firm, and past experience and availability of the product were discovered to be the four main component variables in the study.*

KEYWORDS: influencing factors, water-soluble fertilizers, principal component analysis, and banana growers.

INTRODUCTION

In 2021, the global market for water-soluble fertilizers was valued at US$ 18.20 billion, with a forecast of US$ 21.12 billion by 2026. During the anticipated period, the annual compound growth rate was 5.69 percent. The major use of water-soluble fertilizer is to control the number of nutrients in the soil and to provide plants with the nutrients they require. Water-soluble fertilizers provided via fertigation and the rate of nutrient absorption by plants will grow faster in fertigation than in traditional irrigation systems.

Water will be saved, fertilizers will be used less, and labour costs will be reduced as a result of the application of water-soluble fertilizers through fertigation. Fertigation is the most appropriate way of irrigation for a growing number of farms nowadays. Factors influencing farmers' crop insurance decisions were discovered by Sherrick et al. (2004). Oni et al. (2005) looked at the factors that influence loan default among chicken producers in Nigeria's Ogun state. Masangano and Miles (2005) conducted research in Malawi to determine what factors influence farmers' adoption of the Kalima Bean (Phaseolus vulgaris L.) cultivar.

Farmers' engagement in forestry management initiatives in Haiti is influenced by a number of factors, according to Dolisca et al. (2006). Mohammed and Ortmann (2010) used a logit model to look at the characteristics that influence commercial dairy farmers in Eritrea to get livestock insurance. In the central Java province, Roessali et al. (2011) found factors impacting farmers' decisions to expand their beef cattle operations. Factors influencing the adoption of mobile phones among Bangladeshi farmers were discovered by Islam and Gronlund (2011). In North East India, Goswami et al. (2012) discovered factors impacting farmers' adoption of slash and burn agriculture. Mariano et al. (2012) conducted research in the Philippines to determine the factors that influence farmers' adoption of new technologies and excellent management practises. Lambros et al. (2013) conducted research in a Southern European country to determine consumer purchasing habits for organic wine. In Ntfonjeni rural, Sithole et al. (2014) discovered factors impacting farmers' participation in smallholder irrigation systems.

In Lima, Peru, Angie and Angel (2015) investigated organic purchase characteristics and customer classification based on their preferences. Anupama and Mamta (2015) discovered characteristics that influence mobile phone selection. In the Ghanaian mobile phone market, Solomon et al. (2015) used principal component analysis to determine customer satisfaction and repeat purchase behaviour. In Uttar Pradesh, India, Ashraf et al. (2015) discovered factors that influence farmers' decisions to plant trees on their farms. Ali et al. (2016) conducted research in Pakistan to determine the factors that influence farmers' adoption of energy-based water pumps and their effects on crop output and household income. In the Liangzihu Lake basin in Central China, Zhang et al (2016) explored factors influencing farmers' nitrogen fertilizer application decisions. Carrer et al. (2017) investigated the factors that influence citrus farmers' adoption of farm management information systems in Brazil. Promme et al. (2017) investigated the factors that influence smallholder farmers' rubber marketing in Thailand. In the Ngaka Modiri Molema district, Msimango and Oladele (2017) discovered characteristics that influence farmers' membership in agricultural cooperatives. Bosede et al. (2017) investigated the factors that influence casava farmers' adoption of enhanced planning materials in Nigeria's Ekiti state. In Bangkok, Walailak and Wariya (2017) studied consumer purchasing patterns for green items. In Tanzania, Mutanyagwa et al. (2018) looked at the factors that influence farmers' choice of enhanced maize seed varieties.

Hyland et al. (2018) used principal component analysis to determine the characteristics that influence dairy producers' adoption of best managed grazing methods. Based on subjective norm, perceived risk, and perceived value, Maverick and Prawira (2018) found sweetened packaged beverage purchasing intention and behaviour. Melusi et al. (2018) investigated small-scale farmers' perceptions and factors influencing the adoption of no-till conservation agriculture in Zeshuke, KwaZulu-Natal. In Pakistan, Fahad et al. (2018) discovered characteristics that influence farmers' crop insurance decisions. In the Keita Valley, a semi-arid region of Niger, Karidjo et al. (2018) conducted a study to determine factors impacting farmers' adoption of soil and water control technology. Farmers' participation preferences in Ethiopian agricultural cooperatives are influenced by a number of factors, according to Gashaw and Kibret (2018). In Indonesia, Gunawan et al. (2019) used binary logistic regression to identify characteristics that influence farmers' adoption of the warehouse receipt system. Pivoto et al. (2019) discovered characteristics impacting Brazilian grain producers' adoption of smart farming. In the hilly highlands of northern Vietnam. Bui and Nguyen (2020) found factors impacting farmers' decisions to shift to organic tea farming. Li et al. (2020) looked at the elements that influence Litchi farmers' technology adoption decisions in China. To investigate the factors influencing farmers' acceptance of organic farming. Sapbamrer and Thammachai (2021) used principal component analysis. Farmers' satisfaction with the quality of agricultural extension services was investigated by Kassem et al. (2021). Factors influencing farmers' adoption of environmentally friendly fertilising method in grain production in China were discovered by Qi et al. (2021). A study titled " Factors influencing banana growers to purchase water-soluble fertilizers in Trichy district, Tamil Nadu " was conducted to determine the importance of factors that drive banana growers to purchase water-soluble fertilizers.

METHODOLOGY

Selection of Samples

A multi-stage purposive sampling technique was used to choose districts, blocks, villages, and farmers, and 120 banana growers from three blocks in the Trichy district were chosen. Water-soluble fertilizer adopters and non-adopters were picked from each village based on the availability of banana growers, with 8 villages from the Lalgudi block, 10 villages from the Thottiyam block, and 10 villages from the Manapparai block being chosen. Adopters who have a micro-irrigation system and use water-soluble fertilizers in their banana fields, and non-adopters who do not have a micro-irrigation system and do not use water-soluble fertilizers in their banana fields. The data was analysed using the principal component analysis approach.

Principal Component Analysis

The variables under the study are highly correlated, and as such, they are effectively "saying the same thing. "It may be helpful to transform the original set of variables into a new set of uncorrelated variables called principal components. These new variables are linear combinations of actual variables. They are derived in decreasing order of importance so that the first principal component accounts for as much as possible of the variation in the original data. Also, principal component analysis is a linear dimensionality reduction technique that identifies the original data's orthogonal directions of maximum Variance. It projects the data into the lower-dimensionality space formed of a subset of the highest variance components.
Let $x_1, x_{2,}, x_3, \ldots \ldots . x_p$ are variables under study, then first principal component may be defined as

$$z_1 = a_{11}x_1 + a_{12}x_2 + \ldots \ldots \ldots + a_{1p}x_p \ldots \ldots \ldots \ldots \ldots \ldots . (1)$$

Where,

x1= Price of product (High/ Medium/ Low)

x2= Quality/ Result of product (Good/ Average/ Poor)
x3= Availability of product (Regular/ Irregular)
x4= Experience of farmer (Good/ Average/ Poor)
x5= Dealer's opinion (Good/ Average/ Poor)
x6= Influence by retailers (Yes/ No)
x7= Influence by sales officer (Yes/ No)
x8= Influence by fellow farmers (Yes/ No)
x9= Availability of credit (Yes/ No)
x10= Awareness about water soluble fertilizers (Basic/ Moderate/ Deep)
x11= Membership of association (Yes/ No)
x12= Promotional activities (Yes/ No)

Such that Variance of z1 is as large as possible subject to the condition that

$$a_{11}^2 + a_{12}^2 + \dots\dots + a_{1p}^2 = 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

This constraint is introduced because if this is not done, then var (z1) can be increased simply by multiplying any a1js by a constant factor. The second principal component is defined as

$$z_2 = a_{21}x_1 + a_{22}x_2 + \dots\dots\dots + a_{2p}x_p \dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Such that var (z2) is large as possible next to var (z1) subject to the constraint that $a_{21}^2 + a_{22}^2 + \dots\dots + a_{2p}^2 = 1$ and $\text{cov}(z_1, z_2) = 0$ and so on.

It is quite likely that first few principals' components account for most of the variability in the original data. If so, these few principal components can then replace the initial p variables in subsequent analysis, thus, reducing the effective dimensionality of the problem. An analysis of principal components often reveals relationships that were not previously suspected and thereby allows the interpretation that would not ordinarily result. However, principal component analysis is more a means to an end than an end because it frequently serves as intermediate steps in much larger investigations by reducing the problem's dimensionality and providing easier interpretation. It is a mathematical technique that does not require the user to specify the statistical model or assumption about the distribution of original variants. It may also mention that principal components are artificial variables, and it is often impossible to assign physical meaning to them. Further, since principal component analysis transforms the original set of variables to a new set of uncorrelated variables, it is worth stressing that if original variables are uncorrelated, there is no point in carrying out principal component analysis (Angie and Angel, 2015).

RESULT AND DISCUSSION

Before moving forward with principal component analysis, some basic tests must be passed. Table 1 illustrates the KMO measures and Barlett's test findings, which are used to determine whether the sample size is adequate and whether the correlation matrix is sufficient for principal component analysis, respectively. The sample size is adequate, and at least some of the variables are intercorrelated, as indicated by the KMO value of 0.547 (which is greater than the minimum threshold of 0.50 (Gregory and Sewando (2013)) and Bartlett's test value of 0.000, indicating that the data is suitable for Principal Component Analysis.

Table 1 KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.547
Bartlett's Test of Sphericity	Approx. Chi-Square	246.174
	Df	66
	Sig.	.000

The purpose of the factor extraction was to estimate the number of factors impacting the farmer's purchase intention for water-soluble fertilizers, which can be categorised using 12 variables using Principal Component Analysis (PCA). Select a varimax orthogonal axis rotation. Without a factor loading coefficient value of less than 0.3, eigenvalues bigger than were found in the 25th cycle of factor extraction. Four components were identified in the scree plot diagram with 12 variables, as illustrated in Figure.1.

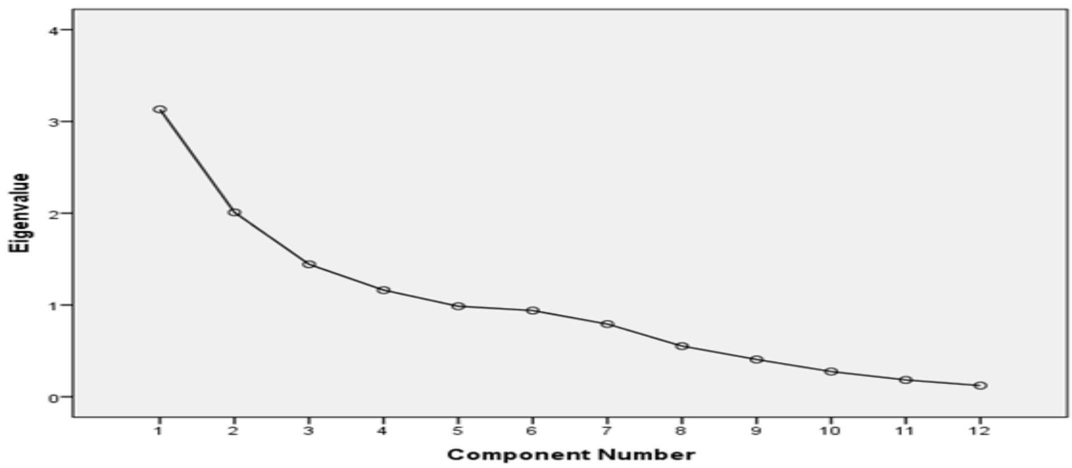

Fig.1. Scree plot diagram

The major components derived using the eigenvalue criterion are shown in Table 2. The main component based on the eigenvalue was retrieved from four (4) principal components. A principal component with an eigenvalue greater than one (1) was kept. The first component has the greatest eigenvalue (3.131), accounting for the majority of the variation in the data sets (farmers' purchase intentions of water-soluble fertilizer in Tamil Nadu's Trichy district). The second component also explains the greatest Variance, which the first component did not account for. In the Tamil Nadu district of Trichy, the four main components (factors) extracted account for 64.541 percent of the farmers' buy intention of water-soluble fertilizer. This shows that the four components retrieved in this study are sufficient to support the assertion of farmers' contentment with water-soluble fertilizers and their intention to purchase them again in the Trichy district of Tamil Nadu. The following are the four factors with eigenvalues greater than one that influence farmers' purchase behaviour on water-soluble fertilizers.

Influencing by social groups: - The relevance of this factor was quite high, with eigenvalues of 3.131. The percentages of this component that can explain all differences were 26. 095. This factor is made up of three variables: influence by retailers, influence by fellow farmers, and availability of credit.

Marketing effectiveness and awareness: - The relevance of this factor was quite high, with eigenvalues of 2.009. This component, which consists of five variables: price, quality, dealers' opinions, awareness of water-soluble fertilizer, and promotional activities, explained 16.742 percent of all variances.

Relationship with company and association: - The importance of this factor was quite high, with eigenvalues of 1.443. This component, which consists of two variables: influence by sales officer and association members, has a percentage of 12.023 that could explain all variances.

Previous experience and availability of product: - The relevance of this factor was quite high, with eigenvalues of 1.162. The percentages of this factor that can explain all differences were 9.681, and it consisted of two variables: experience of farmers and availability of the product .

Table 2 Extracted Principal Components Based on the Eigen value Criterion

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
X1	3.131	26.095	26.095	3.131	26.095	26.095	2.599	21.655	21.655
X2	2.009	16.742	42.837	2.009	16.742	42.837	2.054	17.114	38.769
X3	1.443	12.023	54.861	1.443	12.023	54.861	1.844	15.368	54.138
X4	1.162	9.681	64.541	1.162	9.681	64.541	1.248	10.404	64.541
X5	.986	8.218	72.759						
X6	.939	7.827	80.586						
X7	.792	6.601	87.187						
X8	.552	4.599	91.786						
X9	.406	3.383	95.170						
X10	.275	2.289	97.459						
X11	.183	1.526	98.985						
X12	.122	1.015	100.000						

Extraction Method: Principal Component Analysis.

Table 3 Rotated component matrix

Factors	Component			
	1	2	3	4
Influence by retailers	**.832**	-.108	-.312	.029
Availability of credit	**.826**	-.044	-.072	.100
Influence by fellow farmers	**.659**	-.116	.304	-.359
Price	-.153	**.789**	-.027	-.227
Dealers' opinion	-.278	**.753**	.343	-.051
Promotional activities	.192	**.463**	-.660	.147
Quality	-.150	**.320**	-.160	.204
Awareness about WSF	.014	**.087**	-.031	-.751
Membership of association	-.037	.264	**.858**	.191
Influence by sales officer	-.646	.075	**.572**	.222
Experience of farmer	-.022	-.031	.069	**.581**
Availability of product	-.458	-.661	-.043	**.055**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 6 iterations.

Print ISSN: 2053-4043(Print),
Online ISSN: 2053-4051(Online)

CONCLUSION

Farmers are increasingly using water-soluble fertilizers these days. Farmers' purchases of water-soluble fertilizers were influenced by four factors, according to the study. Influence from social groups, marketing effectiveness and awareness, relationship with association and company, and previous experience and product availability were the four main component elements extracted. Influencing by social groups includes influenced by retailers, availability of credit, and influenced by fellow farmers. Price, dealer opinion, promotional activities, quality, and awareness of water-soluble fertilizers are all factors in marketing effectiveness and awareness. Relationship with association and company includes association membership and influence by sales officers. Experience of farmer and availability of product was the fourth factor.

Application of research: Study the factors influencing farmers' purchase of water-soluble fertilizers.

Research Category: Agri-Business Management

Acknowledgment / Funding: The author thankful to the International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript

Conflict of interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by the authors.

References

Ali, A., Rahut, D. B. and Behera, B. 2016. Factors influencing farmers adoption of energy-based water pumps and impacts on crop productivity and household income in Pakistan. *Renewable and Sustainable Energy Reviews.* 54: 48-57.

Angie, H. and Angel, A. 2015. Organic purchasing factors and consumer classification through their preferences in the metropolitan area of Lima, Peru. *Journal of Sustainable Development in Africa*. 33(2): 27-35.

Anupama, C. D. and Mamta, B. 2015. Factors affecting the choice of mobile phones: A factor analysis based on pilot study. *International Journal of Advance Research in Computer Science and Management Studies.* 3(12): 43-49.

Ashraf, J., Pandey, R., Jong, W. D. and Nagar, B. 2015. Factors influencing farmers decision to plant trees on their farms in Uttar Pradesh, India. *Springer.* 14: 301-313.

Bosede, A.; Sekumade, R. S. and Adetule. 2017. Factors affecting the adoption of improved planning material by cassava farmers in Ekiti state, Nigeria. *International Journal of Sustainable Development Research.* 3(3): 27-31.

Bui, H. T. M. and Nguyen, H. T. T. 2021. Factors influencing farmers decision to convert to organic tea cultivation in the mountainous areas of northern Vietnam. *Organic Agriculture- Springer.* 11: 51-61.

Carrer, M. J., Filho, H. M. D. S. and Batalha, M. O. 2017. Factors influencing the adoption of farm management information systems by Brazilian citrus farmers. *Computers and Electronics in Agriculture- Elsevier.* 138: 11-19.

Dolisca, F., Carter, D. R., McDaniel, J. M., Shannon, D. A. and Jolly, C. M. 2006. Factors influencing farmers participation in forestry management programs: A case study from Haiti. *Forest Ecology and Management -Elsevier.* 236(2-3): 324-331.

Fahad, S., Wang, J., Hu. G., Wang, H., Yang, X., Shah, A. A., Huong, N. T. L. and Bilal, A. 2018. Empirical analysis of factors influencing farmers crop insurance decision in Pakistan: Evidence from Khyber Pakhtunkhwa province. *Land Use Policy- Elsevier.* 75(2): 459-467.

Gashaw, B. A. and Kibret, S. M. 2018. Factors influencing farmers membership preferences in agricultural cooperatives in Ethiopia. *American Journal of Rural Development.* 6(3): 94-103.

Goswami, K., Choudhury, H. K. and Saikia, J. 2012. Factors influencing farmers adoption of slash and burn agriculture in North East India. *Forest Policy and Economics- Elsevier.* 15: 146-151.

Gunawan, E., Kuwornu, J. K. M., Datta, A. and Nguyen, L. T. 2019. Factors influencing farmers use of the warehouse receipt system in Indonesia. *Agricultural Finance Review.* 79(4): 537-563.

Hyland, J. J., Heanue, K., McKillop, J. and Micha, E. 2018. Factors influencing dairy farmers adoption of best management grazing practices. *Land Use Policy- Elsevier.* 78: 562-571.

Islam, S. M. and Gronlund, A. 2011. Factors influencing the adoption of mobile phones among farmers in Bangladesh. *International Journal on Advances in ICT for Emerging Regions.* 4(1): 4-14.

Karidjo, B. Y., Wang, Z., Boubacar, Y. and Wei, C. 2018. Factors influencing farmers adoption of soil and water control technology in Keita Valley, a semi-arid area of Niger. *Sustainability.* 10(2): 288.

Kassem, H. S., Alotaibi, B. A., Muddassir, M. and Herab, A. Factors influencing farmers satisfaction with the quality of agricultural extension services. *Evaluation and Program Planning- Elsevier.* 85(2): 24-29.

Lambros, T.; Efstrations, L. and Anstasios, K. 2013. Consumers purchasing behaviour patterns regarding organic wine in a Southern European Country. *British Food Journal*. 111(2): 120-137.

Li, H., Huang, D., Ma, Q., Qi, W. and Li, H. 2020. Factors influencing the technology adoption behaviors of Litchi farmers in China. *Sustainability.* 12(1): 271.

Mariano, M. J., Vilano, R. and Fleming, E. 2012. Factors influencing farmers adoption of modern rice technologies and good management practices in the Philippines. *Agricultural Systems.* 110(2): 41-53.

Masangano, C. M. and Miles, C. A. 2004. Factors influencing farmers adoption of Kalima Bean (*Phaseolus vulgaris L.*) variety in Malawi. *Journal of Sustainable Agriculture.* 24(2): 117-129.

Maverick, K. and Prawira, P. F. 2018. Sweetened packaged beverage purchase intention and behaviour based on subjective norm, perceived risk and perceived value. *International Journal of Business and Economics.* 4(3): 12-15.

Melusi, M.; Brian, M. and Njabulo, L. N. 2018. Farmer's perception and factors influencing the adoption of No-Till conservation agriculture by small scale farmers in Zashuke, KwaZulu- Natal provinence. *International Journal of Sustainable Development Research*. 5(3): 38-41.

Mohammed, M. A. and Ortmann, G. F. 2010. Factors influencing adoption of livestock insurance by commercial dairy farmers in three Zobatat of Eritrea. *Agricultural Economics Research, Policy and Practice in Southern Africa.* 44(2): 172-186.

Msimango, B. and Oladele, O, I. 2017.Factors influencing farmers participation in agricultural cooperatives in Ngaka Modiri Molema district. *Journal of Human Ecology.* 44(2): 113-119.

@ECRTD-UK: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

Mutanyagwa, A. P., Isinika, A. and Kaliba, A. R. 2018. The factors influencing farmers choice of improved maize seed varieties in Tanzania. *International Journal of Scientific Research and Management*. 6(4): 55-63.

Oni, O. A., Oladele, O. I. and Oyewole, I. K. 2005. Factors influencing loan default among poultry farmers in Ogun state Nigeria. *Journal of Central European Agriculture*. 6(4): 619-624.

Pivoto, D., Barham, B., Waquil, P. D., Foguesatto, C. R., Corte, V. F. D., Zhang, D., Talamini, E. 2019. Factors influencing the adoption of smart farming by Brazilian grain farmers. *International Food and Agribusiness Management Review*. 22(4): 571-588.

Promme, P., Kuwornu, J. K. M., Jourdain, D., Shivakoti, G. P. and Soni, P. 2017. Factors influencing rubber marketing by smallholder farmers in Thailand. *Development in Practice*. 27(6): 865-879.

Qi, X., Liang, F., Yuan, W., Zhang, T. and Li, J. Factors influencing farmers adoption of eco-friendly fertilization technology in grain production: An integrated spatial-econometric analysis in China. *Journal of Cleaner Production- Elsevier*. 310: 127-135.

Roessali, W., Masyhuri, Nurtini, S. and Darwanto. 2011. Factors influencing famers decision to increase beef cattle business scale in central Java province. *Journal of the Indonesian Tropical Animal Agriculture*. 36(1): 27-35.

Sapbamrer, R. and Thammachai, A. 2021. A systematic review of factors influencing farmers adoption of organic farming. *Sustainability*. 13(7): 3842.

Sherrick, B. J., Barry, P. J., Ellinger, P. N. and Schnitkey, G. D. 2004. Factors influencing farmers crop insurance decision. *American Journal of Agricultural Economics*. 86(1): 103-114.

Sithole, N. L., Lagat, J. K. and Masuku, M. B. 2014. Factors influencing farmers participation in smallholder irrigation schemes: The case of Ntfonjeni rural development area. *Journal of Economics and Sustainable Development*. 5(22): 159-167.

Solomon, K. A.; Jhonson, J, K. and Joy, M. T. 2015. Principal component analysis of customer satisfaction and repeat purchase behaviour in the mobile telephony market in Ghana. *British Journal of Marketing Studies*. 4(3): 55-70.

Walailak, A. and Wariya, P. 2017. A study on the consumers buying behaviour towards green products in Bangkok. *International Journal of Management and Applied Science*. 3(11): 23- 43.

Zhang, J., Manske., Zhou, P. Q., Tischbein, B., Becker, M. and Li, Z. H. 2017. Factors influencing farmers decision on nitrogen fertilizer application in the Liangzihu Lake basin, Central China. *Environment Development and Sustainability- Springer*. 19: 791-805.