International Journal of Research in Agriculture and Forestry
Volume 5, Issue 11, 2018, PP 10-14
ISSN 2394-5907 (Print) & ISSN 2394-5915 (Online)

Comparing Perception Indexing with Linear Regression methods in Estimating Farmers' demand for Improved Cassava and Status of the Seed Dissemination in Coastal Kenya

Danda M. K[1], Munga T. L[2]. and Chiro C. T[3].**

[1]*Agricultural Economist, Kenya Agricultural and Livestock Research Organization (KALRO), Mtwapa centre*
[2]*Plant Breeder, Kenya Agricultural and Livestock Research Organization (KALRO), Mtwapa centre*
[3]*Environmental Scientist, Kenya Agricultural and Livestock Research Organization (KALRO), Mtwapa centre*

***Corresponding Author:** Danda M. K, Agricultural Economist Kenya Agricultural and Livestock Research Organization (KALRO), Mtwapa centre.*

ABSTRACT

The act and purpose of publishing is achieved if the target end-user community is reached and fully understands the content and context of the manuscript thereof. Scientific writing employs statistical approaches for analysis and reporting. Conventionally, methods for estimating or predicting outcomesof variables of interest have often used of regression techniques. Modeling perceptions against desired outcomes has also been used by some authors. This paper presents a case of using likert scale data on severity perceptions of some cassava variety attributes and other factors to estimate demand levels and dissemination status of improved cassava seed respectively in Kenya. Two methods were used; a perception severity indexingapproach and linear regression modeling techniques and the results compared for sufficiency in estimating the dependent variables of interest. The results demonstrated that the perception severity indexing method gives similar results as of the linear regression models with elaborate mean separations done using the least significant difference test. The implications of these results are that the perception indexing methods also have predictive power and can therefore be used in place of simple linear regression as long as linearity of the independent and dependent variables is tested and justified.

Keywords: *Perceptions, likert scale data, severity perception index, regression, estimation, demand for and dissemination, improved cassava seed*

INTRODUCTION

Readers and end users of published work require explicit presentations from the manuscripts that provide ease understanding of the analytical procedures used and the content and context of the results. Schoenbach (2014) asserts that data do not "speak for themselves". They reveal what the analyst can detect and interpret. A good section of scholars from different disciplines consider statistics, statistical procedures and their results difficult to understand while the basic reason for writing and publishing remains that of communicating and sharing new knowledge.

This is not always the case especially with the section of readers that have difficult in understanding the statistical rigor (Bond, et al, 2012). The choice of statistical procedures is influenced by the underlying objectives of the study and there are sometimes no options (Dynarski, et al, 2014). Studies also demonstrate that the decision framework of farm households involved in the production segments of commodity value chains is much influenced by perceptions over the commodities they produce or wish to produce (Borges, et al, 2015). This phenomenon qualifies perceptions as a basic concept for consideration in evaluating the probability of any level of adoption of a technology.

Further, this paper recognizes that regression procedures (of different nature) have for long been in use with some reservations on their understanding to a section of the readers and/or end users (Dynarski, et al, 2014).Perception dynamic indices were used by Sendilkumar (2012) and Danda (2014) to present results of some studies on the empowerment pyramid proposed by Abdolmaleky, (2012) as alternate methods of evaluating perceptions that may

predict an outcome of interest. This implies that the stage is open for other simple approaches to be proposed and demonstrated for sufficiency in estimating and interpreting perceptions similar to what regression procedures do. Pickens (2005) further linked perceptions and attitudes to be influenced by tri-component model which brings together the roles of feelings, beliefs and action.

This paper therefore provides an alternate and simpler approach of using likert scale data from a study on evaluating factors that determine the status of cassava seed access to farm households in coastal lowland Kenya and compares it with a conventional regression procedure.

The Econometric Framework

In this paper a major relationship is assumed between the demand for improved seed and the status of cassava seed dissemination such that the expression can be summarized as below

- Sdd = Sds only if the dissemination efforts are perfect and therefore all targeted seed beneficiaries access and accept the seed
- Sdd> Sds if the seed demanded or number of farmers who wish to benefit or quantity of seed they wish to access from the improved seed is greater than seed target of the dissemination efforts or the quantity of seed disseminated
- Sdd< Sds is the reverse of (ii) above where Sdd is the number of farmers demanding seed or quantity of seed demanded and Sds is the target number of seed beneficiaries or amount of seed availed by the distribution efforts. Hence, the review postulates that
- $Ydd = \mu + \beta1X1 + \beta2X2 + \beta3X3 \ldots\ldots + \varepsilon ij$, while using the conventional regression model for predicting dependent variables estimation of parameters associated with the predictive covariates where; Ydd=the predicted demand level for or status of dissemination for the improved cassava seed,X1…Xn are the independent attributes or factors influencing demand levels of dissemination status and
- $\hat{Y}ij = f(1/n\Sigma(X1) \ldots\ldots\ldots\ldots 1/n\Sigma(Xn))$ for the discrete perception indices data where; $\hat{Y}ij$is the mean index of perceived demand for or dissemination status of the improved cassava seed and the X1…..X2 are the independent covariates such as variety attributes or logistical problems to seed dissemination.

Note: The coding of the explanatory or independent and dependent variables was done on an ascending order of the likert scale as indexed below;

- Dependent variables: 1=Very poor, 2=Poor, 3=Fair (Its picking and encouraging), 4=Good, 5=Very good
- Independent variables:1=Very low/insignificant, 2=Low, 3=Observable level,4=Highprevalence,5=Highly prevalent

Further, the model assumes that assessment of the levels of demand for cassava seed and status of the improved seed dissemination are not only influenced by the prevalence of desirable or undesirable attributes but by the severity of those attributes which represent the value and subsequent utility that consumers will derive from consumption of the products (Zeithmal, 1988).

Materials And Methods

The data used for the methodological comparison in this paper was based on the econometric framework stated earlier. Out of the stated variables influencing demand for improved cassava seed and status of improved seed dissemination, variety attributes and logistical problems were selected for testing the sufficiency of each of the methods in explaining or estimating the critical attribute or problem respectively.

A set of likert scale data (on perceived severity of variety attributes and logistical problems along with perceived demand and status of seed dissemination) was extracted from the study and subjected to two different analytical approaches; severity perception indices (SPI) estimation and the conventional linear regression procedures. The SPI estimation was further subjected to a least significant difference test (LSD) while the regression statistics results were also examined and evaluated for prediction power.

Discussion

Tables 1 and 3 demonstrate the role of variety attributes on the demand for improved cassava and by extension the demand for its seed. Table 1 presents poor germination potential of the seed, roots' bitterness, low marketability, excessive root yield and prevalence of fibre as

significant attributes that are work negatively for the improved varieties.

RESULTS

Table1. *Perception indices for severity of variety attributes and their predictive power on demand for improved cassava seed*

Variety attribute	Mean severity perception index (SPI)	Standard error (±)	Significance (at p<0.05)
Poor germination	1.40	0.126	**
Prevalence of fiber	3.28	0.142	*
Prevalence of bitterness	4.11	0.158	**
Low dry matter	2.62	0.181	NS
Low marketability	3.53	0.213	**
Low tuber yield	1.73	0.167	**
Excessively high tuber yield	3.65	0.212	**
Pests and diseases incidences	2.59	0.200	NS
Low utility range	2.48	0.207	NS
Mean SPI	2.82		
LSD Value	0.7019		

Table2. *Perception indices for severity of logistical attributes and their predictive power on the status of dissemination on improved cassava seed*

Variety attribute	Mean severity perception index (SPI)	Standard error (±)	Significance (atp<0.05)
Distance to source of seed	3.19	0.186	**
Cost of seed	2.68	0.198	NS
Transport costs	2.18	0.200	NS
Delays in delivery of seed	3.27	0.205	**
Inadequate seed	2.54	0.191	NS
Poor road network	1.45	0.111	**
Incomplete seed delivery arrangements	3.18	0.216	**
Mean SPI	2.50		
LSD Value	0.538		

Table3.*Regression statistics for variety attributes on their predictive power on demand for improved cassava seed*

Variety attribute	Coefficient	Standard error	t-value	Sig
Poor germination	-0.457	0.191	-2.400	0.020**
Prevalence of fiber	-0.218	0.122	-1.794	0.079
Prevalence of bitterness	0.164	0.144	1.139	0.040 *
Low dry matter	0.027	0.150	0.878	0.858
Low marketability	-0.189	0.100	-1.877	0.046*
Low tuber yield	0.67	0.143	0.471	0.639
Exc. High tuber yield	0.109	0.109	1.003	0.320
Pests and diseases	0.189	0.117	1.608	0.114
Low utility range	0.022	0.112	0.196	0.846

Table4.*Regression statistics for logistical attributes on their predictive power on the status of dissemination of improved cassava seed*

Logistical variable	Coefficient	Standard error	t-value	Prob (Sig)
Distance to seed source	-0.93	0.112	-1.715	0.045**
High cost of seed	0.102	0.118	0.864	0.392
Lack of transport	0.083	0.115	0.724	0.472
Delayed seed distribution	-0.214	0.115	-1.859	0.052**
Inadequate seed	0.013	0.117	0.113	0.910
Poor road networks	0.109	0.195	0.560	0.578
Incomplete delivery	-0.009	0.102	-0.085	0.933

This may be due to the fact that cassava is a basic food crop in the region (Mwamachi, et al, 2005) and therefore has to meet the consumption attributes for which prevalence and

severity of bitterness and fibre are crucial eating attributes therefore negatively affected marketability. Perceptions on bitterness and fibre for cassava and their effect on variety preference were cited by Danda, (2014). Zeithaml (1988), asserts that consumers buy attributes which translate into consumer utility and therefore may be the case for low marketability of the roots from the improved cassava varieties.

For excessive tuber yields (large size of roots), these stimulated fear for health risks as reported by Kimenju et al (2005) in the case of genetically modified and highly productive maize. Table 3 presents regression statistics for the variety attributes and how they predict demand for the improved cassava seed and demonstrates that poor seed germination potential, severity of bitterness and low marketability as significant to estimating demand for the improved seed just as presented by the mean PSIs presented in table 1.

Tables 2 and 4 (for mean PSIs and regression statistics respectively) estimating dissemination status of improved cassava seed also demonstrate that distance to source of seed, and delayed seed delivery were significant factors captured by both analytical approaches while poor road network and incomplete delivery arrangements such as delivery of seed to agricultural extension service providers' offices were significant from the PSI approach. In both tables (2 and 4), the critical factors are isolated but table 2 provides additional insights and a basis for rethinking for corrective interventions.

CONCLUSIONS

The choice of predictive tools needs to be largely influenced by the ease to construct those tools as well as ease of interpretation of the results. Use of the PSI method demonstrates an easy approach in construction (computation of means and least significant difference values) and subsequent testing/comparison of those means.

On the other hand, use of the linear regression technique employs a number of stages which begins with model specification, fitting and doing some model diagnostics or evaluation of the regression statistics for predictive power. All these steps require a priori understanding of basic statistics which is never friendly to most readers.

Considering this scenario what results of tables 1 and 3 and 2 and 4 demonstrated respectively, this paper concludes that use of PSIs can be used to estimate predictive power of society perceptions particularly for outcomes (dependent variables) that have linear relationships with the independent variables.

REFERENCES

[1] Abdolmaleky M., (2012): Predictions of Small-Farmers' Empowerment to success in Farm Operations in Lorestan Province, Iran.

[2] In the World Applied Sciences Journal, 20 (10): 1416-1422, 2012, ISSN 1818- 4952

[3] Bond, M. E., Perkins, S. N.and Ramirez, C. (2012): Students' perceptions of statistics: an exploration of attitudes, conceptualizations, and content knowledge of statistics

[4] Borges, J. A. R., Foletto, L. and Xavier, V. T. (2015): An interdisciplinary framework to study farmers' decisions on adoption of innovation: insights from expected utility theory and theory of planned behavior

[5] Danda, M.K. (2014): Determinants for the market competitive edge ofthe new cassava seed: A case study of Mtwapa mandate area inthe Coastal lowlands of Kenya. Unpublished MS thesis, Jomo Kenyatta University of Agriculture and Technology. Nairobi, Kenya: JKUAT

[6] Danda M. K., Gichinga L. and Murithi F. M. (2014):Group Approach Makes a Difference in Technology Adoption: Evidence from a Case Study of Small Holder Cassava Farmers in the Coastal Lowlands of Kenya

[7] Dynarski, M. and Kisker, E. (2014). Going public: Writing about research in everyday language. U.S. Department of Education, June 2014

[8] Kimenju, S. C., De Groote, H., Karugia, J. Mugo, S. and Poland, D. (2005):Consumer awareness and attitudes toward GM foods in Kenya; In the African Journal of Biotechnology Vol. 4 (10), pp. 1066-1075, October 2005

[9] Pickens J. (2005). Attitudes and Perceptions, Book Chapter 3.

[10] Schoenbach+ J. V. (2014): Data analysis and interpretation; Concepts and techniques for managing, editing, analyzing and interpreting data from epidemiologic studies

[11] Sendilkumar R., (2012). Empowerment of farmers through GALASA-A journey for Sustainable Agriculture Development. In the Indian Res. J. ext. educ., 12 (3) September 2012

[12] Zeithaml, V. A. (1988): Consumer perceptions of price, quality and value: a means-end model and synthesis for evidence. In the journal of marketing Vol. 52 (July 1988).

Citation: *Danda M. K, Munga T. L. and Chiro C. T."Comparing Perception Indexing with Linear Regression methods in Estimating Farmers' demand for Improved Cassava and Status of the Seed Dissemination in Coastal Kenya" International Journal of Research in Agriculture and Forestry, 5(11),pp 10-14.*