

STATISTICAL DETERMINATION OF FACTORS INFLUENCING CUSTOMER SATISFACTION WITH RESEARCH TECHNOLOGIES IN THE KENYA SUGAR INDUSTRY KENYA

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Abstract

The objectives of the Kenya Sugar Research Foundation (KESREF) are to generate and introduce new cane varieties, new or updated cane management policies and practices, and disseminate this information to relevant stakeholders, referred to as clients, the most important ones being the farmers. Adoption of these research technologies is important for the improvement of sugarcane and sugar yields in Kenya. This paper deals with evaluation of factors that influence adoption of research technologies. Logistic regression, in particular binary logistic regression has been used to evaluate these factors, which have been identified as determinants of technology adoption. The extent of adoption of the technologies by the sample farmers has also been determined. The data used was collected from farmers through a survey of 5 sugarcane growing zones. The size of the sample in this study was relatively small, only intended to provide baseline information on clients' adoption of research technologies. From the study, the factors which were found to be significant in influencing adoption of research technologies by farmers were venues of interaction with sugarcane researchers and the frequency of interaction. The extent of adoption by the sample farmers was found to be 24%.

Introduction

The objectives of sugarcane research are important in a development process with anticipated positive changes in farmers' well-being. One of the research institution's desires in the sugar industry is to strengthen the link between research and farmers, millers and out-grower companies to ensure high adoption rate of new technologies. However, there is also a desire to obtain a feedback from stakeholders (clients) on adoption so that research approaches can be revised.

Problem Statement

The sugar research institution has not carried an adoption study since its inception 5 years ago. The problem of this not having been done is that the institution is likely to be utilizing resources in terms of land, labour and capital to generate technologies, which may not add value to the sugar industry if the farmers do not adopt them. New technologies are intended to improve the yields of sugarcane and sugar, but failure or low level of adoption cannot improve the sugar industry. It is from the lack of knowledge on adoption of research technologies that it was found necessary to carry out this study.

Objectives

The main objectives of the study were to: (1) evaluate the factors that influence sugarcane farmers to adopt new technologies that emanate from sugarcane research institution and (2) determine the extent of adoption of research technologies by farmers.

Methodology

Sampling

Stratified random sampling technique was used and simple random samples were taken from each stratum. The strata were the sugar zones and these were West Kenya, Nzoia, Mumias, Chemelil and Sony Sugar. A simple random sample of 8-15 farmers from each of the 5 sugar zones was selected with the assistance of out-grower companies. The total sample for the survey was 50 farmers. The farmers were selected at random to provide assurance of objectivity and prevent bias. The criteria used for choosing farmers was their locations within the zones to ensure they were evenly distributed in each zone, and also the size of their farms to ensure the sample constituted of small, medium and large scale farmers. Pre-designed questionnaires were used to collect information from individual farmers. The data collected included the farmers' cane farming experience, size of their farms, if they had ever heard of the sugarcane research institution, status, frequency and places of interaction with sugarcane researchers, involvement in policy formulation exercise, technologies offered, and if the farmers had adopted these technologies. Data was collected from sampled farmers through personal interviews.

Statistical Analysis

Data was cross-tabulated and the percentages of farmers who have interacted with and offered services by the sugarcane researchers determined. The percentages of farmers who had ever heard of the research institution and

have either adopted or not adopted research technologies were also determined. Makokha *et al.* (1999) carried out a study which tested the hypothesis: farming conditions significantly influence farmers' perceptions of new agricultural technologies and probability of adoption. On the same line of thought, we hypothesized that having knowledge of the sugarcane research institution, having interacted with sugarcane researchers, the venues and frequency of interaction significantly influence farmers' perceptions of research generated technologies and probability of adoption. Misra *et al.* (1993) used ordered probit model to analyse the factors influencing farmers' degree of satisfaction with the overall performance of milk marketing co-operatives. Maskey and Weber (1996) used the logit technique to analyze the relationship between dichotomous reactions of satisfaction (satisfied/dissatisfied) with irrigation system and certain independent variables.

The response on "Adoption of research technologies" was dichotomous, i.e. where a yes/no responses were measured. Logistic regression was used to model how the probability of success i.e. adoption, was affected by selected factors. The yes/no responses are assumed to be independent of each other, taking a value of 1 with probability p and the value of 0 with probability of $1-p$.

The logit model is specified below;

$$\ln \frac{P_i}{1-P_i} = X_i b + e_i$$

where p is the probability of responding yes, and $1-p$ is the probability of responding no.

X_i is a square matrix of the form:

$$\begin{bmatrix} 1 & X_{11} & \Lambda & X_{1n} \\ X_{21} & X_{22} & \Lambda & X_{2n} \\ M & M & \Lambda & M \\ X_{n1} & X_{n2} & \Lambda & X_{nn} \end{bmatrix}$$

b is a column matrix of parameters $[\beta_0 \beta_1 \Lambda \beta]$ and e_i is a column vector of error terms.

X_i is the combined effect of independent variables and β_i is the regression coefficient for the i^{th} explanatory variable.

Hence: $X_i b = \beta_0 + X_1 \beta_1 + X_2 \beta_2 + \dots X_n \beta_n$

Several variables were used to assess client adoption of research technologies. The variables used were:

Knowledge of the research institution i.e. whether the farmer had ever heard of the research institution; State of interaction i.e. whether the farmer had ever interacted with sugarcane researchers; Venues of interaction; Frequency of interaction; Policy formulation i.e. if the farmer had ever been involved in an exercise of policy formulation. Technologies generated and made available to farmers by the research institution involve varieties, soil fertility, weed management, soil and water management and harvesting techniques. The statistical software used for analysis was SPSS.

Results

Descriptive Analysis using Cross-tabulations

Results are provided in graphically in Figures 1, 2 and 3 in the Appendix. Figure 1 shows a combination of four variables which had a dichotomous response, while Figures 2 and 3 show places and frequency of interaction respectively.

Logistic Regression

"Adoption of research technologies" was subjected to logistic regression, and models that included the selected variables were fitted and assessed. Only those variables which were significant when assessed individually were combined in the final model, whose results are in Table 1 in the Appendix.

Discussion

From descriptive statistics, 80% of the sample farmers had heard of the research institution while the remaining 20% had not. 48% of the sample farmers indicated that they had interacted with sugarcane researchers at some time. Farmers' involvement in policy formulation was quite low with only 6% of the sample farmers having been involved. From the sample, 24% of the farmers had adopted research technologies while 76% had not.

Field days appear to be the most common places of interaction among the defined venues, followed by agricultural shows, research activities, home visits and least common being open days with 1% of sample farmers having been in

this venue. However, the highest percentage of the sample farmers i.e. 41.0% reported not having interacted with researchers in any venue. As far as frequency of interaction is concerned, 53.1% of the sample farmers reported that they do not interact with sugarcane researchers at all, while 36.7% do not have a definite time of interaction. 4.1% interact with sugarcane researchers monthly, while 6.1% interact with them annually.

From Table 4, the logistic model explained 87.5% of the total variation in adoption of research technologies by farmers. The place of interaction and the frequency of interaction significantly influenced the adoption of research technologies. The overall relationship between the place of interaction and adoption was positive ($\beta_2 = 0.625$). The likelihood of implementing research technologies increases by a factor of 1.868 for the farmers who have interacted with sugarcane researchers at any defined place. In other words, interaction of farmers with sugarcane researchers leads to higher likelihood of technology adoption. When farmers interact with research officers at the defined places i.e. field days, open days, home visits, ASK shows, in research activities, they are advised on the latest technologies generated from the research institution and the benefits of adopting them.

The likelihood of adopting research technologies by farmers was also significantly influenced by the frequency of interaction. Contrary to expectation, the coefficient corresponding to frequency of interaction was negative ($\beta_3 = -2.659$). The likelihood of adopting research technologies decreases by a factor of 0.07 with the frequency of interaction. This result may be due to the fact that frequency of interaction is minimal, such that it has no positive impact. Probably farmers rarely have anyone to remind them or offer advice on the stages of adoption of the technologies. Descriptive statistics probably explain this better, as the monthly frequency of interaction had low percentage of sample farmers, while none of the sample farmers had ever interacted with the sugarcane researchers on a weekly or daily basis.

To assess the differences between the places of interaction and adoption of research technologies, the predicted probabilities were calculated on average per place of interaction (Table 2 in Appendix). Farmers who are visited at home have the highest rate of adoption for research technologies, followed by those who attend field days and ASK shows, and the lowest rate is with those who interact with sugarcane researchers in research activities. Home visits are face to face interactions between the officers and the farmers; hence all the attention is on the farmer. He/she is therefore likely to implement the technologies because there is better understanding of what is offered by the officers. During field days, farmers are addressed in a large group without individual attention, while in ASK shows, most farmers may want to take as little time as possible for advice from research officers so that they may have time to visit most of the other stands in the show. However, sugarcane researchers hardly involve farmers in their research activities. There is need for more participatory research that is almost lacking.

Conclusions

This adoption survey is the first to be undertaken in the sugarcane zones to provide baseline information on how research technologies and extension services are perceived by farmers. The venue of interaction was found to be a suitable factor influencing adoption of research technologies by farmers. The venue increases the likelihood of adoption, and hence sugarcane researchers should continue interacting with the farmers. Though field days featured as common venues from the descriptive statistics, predicted probabilities showed home visits to have the highest probability of influencing farmers to adopt new technologies, followed by field days and ASK shows. These 3 venues should therefore continue to be used as information dissemination approaches.

Frequency of interaction with sugarcane researchers was another factor that was found suitable in influencing adoption of research technologies. It was found to decrease the likelihood of adoption. If the frequency of interaction is more, it is expected that the likelihood of adoption would increase. The extent of adoption of research technologies by farmers in the selected zones was found to be 24%. The relatively low level of interaction between sugarcane researchers and farmers, and the fact that only 24% of the sample farmers had adopted the research technologies, indicates that there is immense potential for improving research and extension services to the sugarcane growers.

Recommendations

The following recommendations have been suggested to improve the likelihood of farmers adopting research technologies: (1) the research institution should improve its human as well as physical capacities in order to improve its research and extension coverage. This should then enhance the frequency of interaction with clients to weekly basis, and this is expected to influence adoption positively; (2) Home visits should be preferred places of interaction, since the probability of farmers adopting research technologies is highest. Field days should however be maintained as interaction places; (3) Participatory research should be institutionalised as a method of disseminating technology information; (4) The research institution should set up field demonstrations and have more field/open days, increasing the locations and frequency in order to reach as many clients as possible and (5) Billboards indicating the title, time, purpose and collaborators should be erected in areas where the research institution has set up field demonstrations.

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