Research Application Summary

Determinants of adoption of butternut squash (*Cucurbita moschata*) farming among small-holders in Suba district, Kenya

Isaboke, H.N.[1], Mshenga, P.[1], Mutai, B.K.[1] & Saidi, M.[2]

[1]Department of Agriculture Economics and Agribusiness Management,
Egerton University, P. O. Box 536 - 20115 Egerton, Kenya
[2]Department of Crops, Horticulture and Soils, Egerton University, P. O. Box 536 - 20115,
Egerton, Kenya
Corresponding author: hisaboke@gmail.com

Abstract

Butternut squash (*Cucurbita moschata*) is an emerging economic crop in Kenya with ready market and high nutritional value. Despite this, its adoption as a major cash crop in Suba District has remained low. The aim of the study was to investigate the determinants of adoption and extent of adoption of butternut squash. The study area was chosen due to persistence of poverty despite the fact that the area has conditions that are favourable for the production of high value crops like butternut squash. Cross-sectional data were collected from a sample of 120 farmers selected through multi-stage sampling. The data were subjected to the Heckman two-step regression analysis to obtain the determinants of adoption and the extent of adoption. Data obtained revealed that the adopters of butternut squash were mostly the male married farmers. Results further showed that household size, land tenure, access to credit, membership to a group, market information and access to extension services significantly and positively affected the likelihood of adopting butternut squash; while age, participation in off-farm activities and distance to the market were significant with negative effect. Education, access to market information, man hours and years of experience were significantly related to adoption of the crop with positive effects, while land size was statistically significant with a negative effect. This study therefore, recommends that government and other stakeholders should formulate and implement policies related to promotion of adoption and production of butternut squash.

Key words: Adoption, butternut squash, Heckman two-step model, Kenya

Résumé

La courge musquée *(Cucurbita moschata)* est une culture économique émergente au Kenya dans le marché et avec une haute valeur nutritionnelle. Malgré cela, son adoption en tant que principale culture de rente dans le district de Suba est restée

faible. Le but de cette étude était d'étudier les déterminants de l'adoption et l'importance de l'adoption de la courge musquée. La zone d'étude a été choisie en raison de la persistance de la pauvreté malgré le fait que la zone présente des conditions favorables pour la production de cultures de grande valeur, comme la courge musquée. Les données transversales ont été recueillies auprès d'un échantillon de 120 agriculteurs sélectionnés par échantillonnage à plusieurs niveaux. Les données ont été soumises à l'analyse de régression en deux étapes de Heckman pour obtenir les déterminants de l'adoption et de l'importance de l'adoption. Les données obtenues ont révélé que les adoptants de la courge musquée étaient pour la plupart des agriculteurs-hommes mariés. En outre, les résultats ont montré que la taille du ménage, le régime foncier, l'accès au crédit, l'appartenance à un groupe, les informations sur le marché et l'accès aux services de vulgarisation ont significativement et positivement affecté la probabilité de l'adoption de la courge musquée, tandis que l'âge, la participation à des activités non agricoles et la distance par rapport au marché ont été significatifs avec un effet négatif. L'éducation, l'accès aux informations sur le marché, les heures de travail et les années d'expérience ont été significativement liés à l'adoption de la culture avec des effets positifs, tandis que la taille du domaine d'exploitation était statistiquement significative avec un effet négatif. Ainsi, cette étude recommande que le gouvernement et les autres intervenants doivent élaborer et mettre en application des politiques relatives à la promotion de l'adoption et de la production de la courge musquée.

Mots clés: Adoption, courge musquée, modèle en deux étapes de Heckman, Kenya

Background

In Kenya, the production of horticultural crops such as vegetables, forms an important source of income for small-holder farmers, who produce more than 70% of the crop output (McCulloch and Ota, 2002). Horticultural crop production has higher returns than most other cash crops, and is suitable for production both on small and marginal farms in varying climatic conditions (Minot and Ngigi, 2004). The horticultural industry (cut flowers, fruits, vegetables) is the fastest growing agricultural sub-sector in Kenya, contributing more than 10 % of total agricultural production (Poverty Reduction and Economic Management Unit Africa Region-PREMU, 2009). The main vegetable crops grown by small-holder farmers for both subsistence and commercial purposes in Kenya include

cabbages, tomatoes, onions and indigenous vegetables such as the African leafy vegetables (ALVs) like amaranth and some cucurbits (Omiti *et al.,* 2004).The common cucurbit species include pumpkin (*Cucurbita moschata/maxima*), bottle gourd (*Ligenaria siceraria)*, cucumber (*Cucumis sativus*) and courgette (*Cucurbita pepo*). In the recent past, there has been promotion of the production and consumption of butternut squash (*Cucurbita moschata*), as a nutritious crop especially for children and as a security crop for food insecure families. Butternut squash is an emerging economic crop with ready market and high nutritional value. Despite this, its adoption as a major cash crop in Suba District has remained low and it is not clear whether butternut squash could address the problem of low income.

Literature Summary

Adoption is the degree of use of new technology in the long run equilibrium when a farmer has all the information about the new technology and its potential (Feder *et al.,* 1985). A wide range of economic, social and technical aspects may influence the adoption of agricultural technologies. In practice the social-economic factors such as age, marital status, education, household size, and farm size of the farming households are the most cited as influencing technology adoption. These aspects were examined in this study in relation to adoption of butternut squash as a commercial crop.

Study Description

The study was carried out in Suba District. Suba is one of the Districts that make up Nyanza Province. It boarders Bondo District to the north across lake Victoria, Homabay District to the east, Migori District to the south and Lake Victoria to the west. Suba is located between longitude 34^0 E and 34^0 20'' E and latitudes 0^0 20'' S and 0^0 52''S. The District covers an area of 641.8 km², has a population of 103,054 people, 21,416 households and it comprises two divisions; Central Suba and Gwassi. The target population of the study was small-holders who comprised the adopters and non adopters of butternut squash farming. The Heckman two-step procedure was used to determine the factors influencing adoption and extent of adoption of butternut squash. The procedure was chosen for estimation to correct the sample selection bias as proposed by Heckman (1979). In addition, post estimation of the selection equation results was done to determine marginal effects of variables for use in interpretation.

Research Application | The descriptive results on the household characteristics for the small-holder farmers in Suba district, Kenya comprised the adopters and non adopters of butternut squash. The results have been disaggregated by adoption status as presented in Table 1.

Table 1. Descriptive statistics of selected variables.

Variable	Adopters	N=60	%	Non-Adopters	(N=60)	%
Male headed household (1=male)		44	73.33		46	69.67
Age of household head (mean age)	41.52			37.73		
Marital status (married)		54	90		46	76.67
Household size (number of persons)	7			5		
Farm size (hectares)	1.84			1.24		
Credit access (Access=1)		54	90		10	16.67
Group membership (membership=1)		54	90		12	20
Distance to market (kilometers)	10.06			10.83		
Income from livestock (Shillings)	18,919			9,578		
Own livestock		59	98.33		55	91.67
Man hours on butternut (average hours)	273.87					
Access to extension (number of contacts)		46	76		36	60
Years of experience in butternut (mean years)	2.94					
Occupation of the household head						
Formal & informal employments & trade activities		43	71.67		39	65
Fishing activities		17	28.33		21	35

Adoption of butternut squash was low and male farmers adopted butternut squash more than the female farmers. In addition, there were more married farmers who adopted butternut squash, possibly because married women participated in actual farming of butternut squash while the male farmers played the role of accessing relevant information. Further it was established that the farmers produced butternut squash for food so as to cushion themselves against moments of total lack of food for their families. Nine variables significantly influenced the adoption of butternut squash and they are critical to the practice of butternut squash farming (Table 2) while five variables influenced the extent of adoption (Table 3). Farm size had a negative influence on adoption of butternut squash. This indicated that adoption of butternut squash is not contingent upon having large tracks of land; hence butternut production is an appropriate technology that needs to be promoted in the rural settings with land fragmentation.

This study has drawn attention to the information that can guide policy towards adoption of butternut squash (a high value crop) in recognizing its potential and practical benefits to the farming

Table 2. The Heckman two step selection equation results.

Variable	Coefficients estimates	Std.Err	P>|z|	Marginal effects
Gender	3.8387	2.3346	0.100	0.7112
Agehh	-0.3456	0.1157	0.003***	-0.0093
Educlevel	-1.6425	1.1060	0.138	-0.0444
HHsize	1.8690	0.4636	0.000***	0.0505
Farmsize	0.0299	0.0995	0.978	0.0008
Ladten	12.2272	2.0890	0.000***	0.9167
Crdacc	12.5290	2.2598	0.000***	0.9945
Grpmbr	3.9210	1.5892	0.041**	0.4349
Offactvty	-10.3758	1.8179	0.000***	-0.8955
irrigwater	6.2637	4.4112	0.156	0.1677
distancemkt	-0.4304	0.2005	0.032**	-0.0116
Mktinfo	8.2944	1.4844	0.000***	0.9210
Acssextn	6.1298	2.4441	0.012**	0.7397
livestockinco	0.0001	0.0001	0.164	2.31e-06
Cons	-7.6242	5.4819		
Mills lambda	1.14e+09		0.092*	

**Significant at 5%, ***Significant at 1%, χ^2=45.46.

Table 3. Heckman two-step outcome equation results.

Variable	Coefficients	Std.Err	z	P >|z|
Gender	0.0453	0.0363	1.24	0.214
Agehh	0.0018	0.0013	1.33	0.182
Educlevel	0.0016	0.0080	2.01	0.045**
HHsize	0.1578	0.0033	0.47	0.635
Farmsize	-0.1187	0.0294	-4.03	0.000***
Landten	0.1136	0.0916	1.24	0.215
Crdacc	0.0181	0.0696	0.26	0.795
Offactvty	-0.3325	0.0339	-0.98	0.327
Grpmbr	0.0344	0.0634	0.54	0.588
Irrigwater	0.0383	0.0374	1.02	0.306
Distancemkt	0.0035	0.0031	1.12	0.263
Acssextn	-0.0185	0.0411	-0.45	0.653
Livestockinco	4.78e	1.33e	0.36	0.720
Mktinfo	0.0512	0.0308	1.66	0.096*
Manhours	0.0003	0.0001	2.80	0.005***
Yrsbut	0.0305	0.0184	1.65	0.096*
Cons	-0.0669	13.961	-0.41	0.683

*Significance at 10%, **Significant at 5% and ***Significance at 1%.

households in terms of food and income; hence there is a great need to increase the production levels of the crop. Therefore, the study makes the following recommendations: Butternut squash has a potential for being adopted in Suba District where it would play an important role in enhancing the incomes of the farmers. In addition other benefits could accrue such as providing

alternative employment in the District. It could also be used to improve the food security situation first, by being used directly as food by the households, and second, through commercialization, the income obtained would be used to improve consumption. Butternut squash is a highly nutritious crop thus it would check malnutrition disorders especially for the children. A timely implementation of a policy on collective action is vital. Group influence is very important in dissemination of new knowledge. In addition groups and associations are in a better position to engage in, and negotiate other arrangements such as contract farming where farmers are guaranteed markets. Another benefit is that of controlling transaction costs especially due to the poor rural transport network in quest to reach potential urban markets. Furthermore, organized groups can enhance links of accessing both formal and informal credit facilities that would enhance obtaining farm inputs. A policy focus on education is essential. This is because education was found to influence extent of adoption of butternut squash. This implies that a more educated society could be in a position to appreciate new ideas for example, in the case of maintaining the conventional crops as food and also explore alternatives such as butternut squash farming. Finally, it is necessary to carry out further studies on value addition to butternut squash which would stimulate demand for the crop. It is also necessary to evaluate the effects of adoption of butternut squash on the poverty levels and food security.

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