

Assessment of Innovation Strategy and Commercialization to Enhance Mango Value Chain: A Case Study of South-Western Nigeria

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Abstract

This study assessed the innovation developed to enhance mango value chain. Purposive sampling procedure was used to select one research institute, one university with a commercial farm and one commercial enterprise to determine the level of commercialization of research products and innovations for social and economic development. The selected institutions were Afe Babalola University Ado-Ekiti (ABUAD FARMS), National Horticultural Research Institute and FUMMAN Agricultural Products Limited. Results showed that the factors that determined the quantity of mango produced were; income realised on past production, accessibility to information on better production practices, educational qualification of respondents and size of land cultivated. Notable constraints attributed to low production of mango plantation among the respondents were bad road networks, high cost of pesticides, and lack of credit facilities and shortage of grafted seedlings. Adopters of improved variety of mango had more quantity of production than the non-adopters of improved variety of mango.

Keywords: Enabling environment, Research results, Innovation, Mango and Development

1.1 INTRODUCTION

The contributions of agricultural science and engineering unprecedentedly offer agricultural development in Nigeria through technological entrepreneurship for competent and production comparative advantages. Technological entrepreneurship is manifested through researchers' technological efforts of discoveries, contributing to improve well being of farming communities and generation of wealth to agricultural producers along the value chain of a selected crop. Nigeria is continually increasing the production of improved varieties of mango, gradually reducing the production of traditional varieties for the local markets while aggressively seeking opportunities in the international market. Mango production is primarily rain fed with a long time of investment before the production of the first fruit, of not lesser than four years and a subsequent fruiting of more than twenty years. On the contrary, technological innovation is a propelling mechanism for better and faster agricultural production. It takes less than a year for the genetically engineered mango and the grafted exotic breed of mango to fruit.

The cultivation of improved mango varieties provide access to big fruit with low fibre content, adequate for fresh consumption, that sell well in the market. Improved mango production aids the diversification of the rural economy of the nation and helps stem climate risks with its prolific fruitage when other crops fail to drought, bolstering the income needs of adopters in rural farm families. Mango aids in fighting heartburn and assist in the digestion of food by humans. It is rich in vitamins, minerals and anti-oxidants with stomach soothing properties. The mango value chain presents gender roles for men and women in production and processing activities. Men engage in cultivation of mango plantation more at the local level while, women are more pronounced in the labour market and trade of mango in Nigeria.

Research attracts technology adoption by potential adopters when research results are commercialized, otherwise research results as technology, remains in the laboratory or at best the research institutions environment without making any impact on the lives of the citizens. This approach to research and development covers all the processes involved in land and water management, production and agronomic practices, processing, packaging and marketing. Research findings are passed through transformative and communicative stages and finally result in improved production. For a private company, high adoption rates and diffusion of its innovations is a sign of success, presuming sound economics. For public agricultural research, adoption is a necessary pre-condition for assessing if the benefits generated by the innovations are worth the research investment.

It is therefore important to examine how market and institutions; policies and technology help in the creation of an enabling environment for the use of research results and innovations for social and economic development in Nigeria. Hence this study sought to provide answers to the following research questions;

- i. What are the socio-economic characteristics of mango producers?
- ii. Are there constraints associated with mango production in the study area?
- iii. What is the quantity of mango produced in the study area? Does improved mango variety have impact on quantity of mango produced?

1.2 Hypotheses of the Study

Ho₁: There is no significant relationship between the socio-economic characteristics of the respondents and quantity of mango produced

Ho₂: There is no significant relationship between constraints being faced by the mango producers and the quantity of mango produced

Ho₃: There is no significant relationship between adoption of improved variety of mango and the quantity of mango produced

1.3 Methodology

This study analyse the factors limiting the adoption of an improved variety of mango which is a research innovation by ABUAD. The characteristics of the improved variety of mango include; resistance to drought, shortness, low fibre, resistance to pests, resistance to diseases, high yield, early maturity and fruiting. This study was conducted in south west, Nigeria. The population for the study comprise of trained contract farmers of FUMMAN juice processing company, trained local farmers by ABUAD farms and trained farmers by NIHORT on growing of improved mango plantation in Nigeria. Purposive sampling technique was used to select FUMMAN Juice Company, ABUAD farms and NIHORT research institute. These organisations were chosen because of the large number of mango production on these farms. Snowballing technique was employed to generate a list of 180 mango producers as contact farmers having selected mango farms, from which simple random sampling technique was used to select one hundred and fifty (150) respondents as the sample size.

The quantitative data for this study were obtained through the use of structured interview schedule concerning the objectives and hypotheses of the study. The data collected were analysed using both descriptive (frequency counts, percentages, and means) and inferential statistics (multiple regression and Chi-square). Quantity of mango produced was measured as; below 100 tonnes = 1, 101tonnes – 200tonnes = 2, 201 tonnes – 300 tonnes = 3, 301tonnes – 400tonnes = 4 and 401tonnes – 500tonnes = 5. The sum of respondents score is the quantity of mango produced. The mean of mango produced was obtained as 347tonnes while a maximum of 417tonnes and a minimum of 32tonnes were obtained as the respondents' quantity of mango produced. Respondents having below 347tonnes were categorised as having low quantity of mango produced, while those having above 347tonnes had high quantity of mango produced in the study area. The average production of farmers who adopted the improved variety of mango was higher than 347tonnes as a result of increased mango productivity it offers compared to non adopters with low mango productivity even with the same farm size. Constraints faced by the respondents in mango production were measured as; very severe = 3, severe = 2, not severe = 1 and not a constraint = 0.

1.4 RESULTS AND DISCUSSION

Socio-economic Characteristics of Mango Producers

Ho₁: There is no significant relationship between the socio-economic characteristics of the respondents and quantity of mango produced

Data analysis involved the use of stepwise multiple regression procedure (backward solution) to examine the relationship between the socio-economic characteristics of respondents (independent variables) and quantity of mango produced (dependent variable).

Regression Analysis of Socio-Economic Variables on Respondents' quantity of mango produced

Table 1: Analysis of Variance

Sources of variance	Df	SS	Ms	F-ratio	P
Due to regression	13	14347.55131	1170.62928	3.275*	0.001
Due to residual	222	18324.70627	336.88125		
Total	235	31672.25758			

Multiple R = 0.85254

R Square = 0.79580

Standard Error = 11.07986

The results show that the use of 13 socio-economic variables (age, gender, educational qualification, years of farming experience, information access, indigenous agricultural knowledge system, modern agricultural knowledge system, social participation, income, tenancy status, size of land cultivated, marital status, and part-

or full-time farming) to predict farmers' quantity of mango produced yielded a co-efficient of multiple regression (R) of 0.85254 and multiple regression square (R^2) of 0.79580. The results also show that analysis of variance of the multiple regression data yielded an F-ratio of 3.275 (significant at 0.001 level). The results show that the socio-economic variables explained or predicted 79% contribution to the quantity of mango produced by the respondents.

TABLE 2 : RELATIVE CONTRIBUTION OF THE INDEPENDENT VARIABLE TO THE PREDICTION

The study reveals that the independent variables, income, educational qualification, information access, reliance on modern knowledge and size of land cultivated had significant relationship with the quantity of mango produced by the respondents.

Variable No	VARIABLE	Beta (b)	SE (b)	T-ratio
1	Gender	.062956	3.956220	.504
2	Education	.251403	1.452251	2.398*
3	Experience	.323491	2.374042	.315
4	Age	.271548	1.437482	1.320
5	Mode of farming	.0342038	5.972526	.308
6	Marital status	.251808	8.720491	.452
7	Tenancy status	.149136	7.342821	.830
8	Income	.429716	1.102131	2.759*
9	Land size	.074625	2.683921	2.259 ^x
10	Social participation	.261128	2.982327	1.315
11	Media in use	.212687	19.262348	2.101*
12	Reliance on local knowledge	.057283	2.063765	1.002
13	Reliance on modern knowledge	.271568	1.856643	2.124*

Significant at the 0.05 level.

The significant correlation between income and quantity of mango produced as revealed by the present study is consistent with the findings of previous investigations such as Osuji (1983) and Atala (1984) that income is crucial in agricultural research results use, because the higher the income of the adopter, the more likely he would seek and obtain information for use. With improved income, the adopter will be better disposed to spend more on recommended farm practices that would further increase his farm earnings. However, most of the small scale farms in Nigeria are poor and have little or no access to credit facilities. They therefore have no access to modern farming inputs which involve huge capital outlay that is far beyond their financial resources. Poverty is the denial of opportunities and choices (UNDP,1997). The poverty profile of Nigeria is so high that the World Bank (2006) considered it crucial for targeted efforts aimed at reducing the depth and severity of poverty in all regions of the country.

1.5 Constraints Associated With Mango Production

Constraints are limitations or restrictions indicated by the respondents, militating against their mango production enterprise. The identified constraints are itemised below in order of severity. The results reveals that majority of the respondents identified bad road network (82.0%), high cost of pesticides (70.4%), lack of credit facilities (85.9%) and shortage of grafted seedlings (62.6%) as very severe constraints. These imply that the basic social infrastructures were insufficient for the respondents to use, farmers had low capital base with low accessibility to credit which could boost their production. The credit constrained farmers were denied access to grafted seedlings of improved mango variety for planting. These would automatically affect the quality, quantity and sales of mango products by the respondents negatively.

Hypothesis 2: there is no significant relationship between constraints faced by mango producers and the quantity of mango produced

The chi-square analysis reveals that there was a significant relationship between the constraints associated with mango produced and the quantity of mango produced. These imply that constraints experienced by the mango producers were many and greatly contributed to the low quantity of mango produced in the study area. Chi-square analysis also shows that the adoption of improved variety of mango strengthens the quantity of mango production. This could be that improved variety of mango fruits grow very fast and produce bigger fruits, unlike the local and indigenous mango fruits with longer years of maturity that is characterised by smaller fruits.

Chi-square test of relationship between constraints faced by mango producers and the quantity of mango produced

Variable	X^2	Df	P-value	Remark	Decision
Constraints	13.930	2	0.001	S	Reject H_0
Adoption of improved variety of mango	14.631	3	0.004	S	Reject H_0

$p < 0.05$ –significant (S); $p > 0.05$ –not significant (NS); df – degree of freedom

1.6 Quantity of Mango produced

The mean score of the respondents on the quantity of mango produced was obtained as 347 tonnes while a maximum of 417 tonnes and a minimum of 32 tonnes were obtained as the respondents' quantity of mango produced. Therefore, respondents having less than 347 tonnes were categorised as having low quantity of mango production, while those having more than 347 tonnes, had high quantity of mango production in the study area. The result shows that more than half (52.7%) of the respondents had low level of mango production while 47.3% had high level of mango production. This shows that the attributed constraints associated with mango production is a major cause of low mango production in the study area.

Distribution of respondents based on the quantity of mango production

Quantity of Mango produced	Scores	Frequency	Percentage (%)	Mean	Maximum Score	Minimum Score
High	347 and Above	71	47.3	347	417	32
Low	1-347	79	52.7			

Source: Field survey, 2016

1.7 Conclusion

The research innovation in this study was the development of a genetically improved variety of mango for farmers' adoption. The study assessed the adoption of the innovation and its effects on the quantity of mango produced. The innovation was developed by Afe Babalola University Ado Ekiti farms to enhance mango value along the production, harvesting, processing and marketing chains. The aim is to improve mango productivity, reduce drudgery, reduce fruiting time, enhance quality and increase farmers' income. The study also aimed at the valorisation of this research innovation in developing the entire value chain, to pivot Nigeria to a competitive production base for local and international export. Results of the study showed that adopters of the innovations were more productive than the non-adopters with the same level of resources. The crucial factors that determined the quantity of mango produced were adoption of improved variety, accessibility to information on better production practices, educational qualification of respondents and size of land cultivated. Notable constraints attributed to low production of mango plantation among the respondents were bad road network, high cost of pesticides, lack of credit facilities, low savings and shortage of grafted seedlings. These imply that the basic social and institutional infrastructures were insufficient to drive policy and create enabling environment for the valorisation of research innovation. Farmers had low capital base with low accessibility to credit which could facilitate adoption of innovation and boost their production.

1.8 RECOMMENDATIONS

Based on the findings of the study, it is recommended that:

- Government and private sector collaboration should develop affordable technology for pest and diseases management, availability of grafted seedling, improve the network of rural- feeder roads for better adoption rate of innovation.
- Government should create enabling environment to stimulate and effectively manage the flow of knowledge and technology of improved mango production adaptable to local conditions through the synergy of universities, research institutes and companies for farmers' adoption and better market for sales.
- Government should increase funding through private sector collaboration for increase funding allocation to academic and research institutions.
- Invention in technology should be encouraged among researchers through commercialization of innovation for farmers' usage.

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