Potential adoption of the cassava peeling machine in Southwest Nigeria

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Abstract

Data obtained from three (3) commercial cassava peeling machine fabricators and 90 cassava processors were used to examine the potential adoption of available cassava peeling machines in southwest Nigeria. The commercially available machines are: WAMABCO Peeling Machine (available in three different sizes with capacities of 2 tonnes/day, 4 tonnes/day and 6-7 tonnes/day sold at US$1500; US$3000 and US$3600 respectively); A&H Peeling Machine of 6-7 tonnes/day capacity and FATAROY Peeling Machine of 6-7 tonnes/day capacity sold at US$2500 each. However, 51.7percent of the cassava processors were not aware of the machines and 79.3 percent do not have the machine available either at their processing sites or located somewhere close. But majority of the processors (85.6%) were willing to adopt the use of the machine. There were significant relationships ($p < 0.05$) between income ($r=0.80$), number of trainings($r=0.92$) and the potential adoption of the machine. Yet, majority of the cassava processors (78%) never attended any training in cassava processing. A significant difference ($p<0.05$) was found between the cost of manual peeling and cost of mechanical peeling ($t=8.33$). The study concluded that processors are willing to adopt the use of the peeling machine if efficient, available and affordable. Commercial fabricators "need" to make the machines more widely available by offering to sell at varying sizes and affordable prices or facilitate arrangements through which processors would have access to use the machine nearby and at reasonable fees.

Introduction

Failure to adequately develop post-harvest systems for cassava has been a major bottleneck for many years and has limited the contribution of the crop to economic growth and poverty reduction. All processed products of cassava roots in Southwest Nigeria require peeling, yet newly developed processing technologies have been widely adopted for every other stage in the processing of cassava roots to reasonable extents and efficient peeling remains a bottleneck in cassava processing systems. A considerable time is spent in peeling of cassava roots with the indigenous way of using knives. Even though peeling machines believed to be faster and more convenient have been developed locally, however the profitability of these machines has not been tested and the potential adoption has not been ascertained. Against this background, this study examined the potential adoption of commercially available cassava peeling machines in southwest Nigeria. It hypothesized that:

Ho$_1$: There is no significant relationship between the socio economic characteristics of cassava processors and the potential adoption of the cassava peeler.

Ho$_2$: There are no significant differences in the profitability of the different options for peeling cassava roots.

Methodology

Three commercially active cassava peeling machine fabricators were purposively selected from the four fabricators identified in southwest Nigeria. These are:

3.   1. Engineer. T.A. Diallo of West African Machine Building Company , Monatan, Ibadan, Oyo State.

4.   2. Alhaji Ahmed of A&H Technical Metal Works, Iwo, Osun State and

5.   3. Mr. Fatai of Fataroy Steel Industry, opposite University College Hospital Mokola Ibadan, Oyo State

A purposive sampling method was also adopted to select cassava processing sites located very close to the commercially producing cassava peeling machine fabricators. Four (4) processing sites were selected from Oyo state, two (2) from Ogun and Osun States. In these locations all the cassava processors on-site made up of forty (40) processors from Oyo State, twenty-two (22) from Ogun State and twenty-eight (28) from Osun State were interviewed for this study.

Questionnaires (containing structured and open-ended questions) and focus group discussions were used to obtain data from selected cassava processors while an interview guide was applied to fabricators. Primary data were obtained from the fabricators on the characteristics of their machines. Primary data were also obtained from cassava processors on their socio-economic characteristics; awareness of the peeling machine; availability of the machine; potential adoption of the machine; the profitability of their peeling operations; opinions on characteristics of a peeling machine that will predispose it for adoption and their willingness to pay for the machine. The reliability of selected questions in the questionnaires were determined by the test-retest method. The coefficients of stability obtained ranged from $r = 0.75$ to $r = 0.78$. Also, content and face validity tests were carried out on the research instruments by known experts.

Chi square analysis was used to test the relationship between the some socio economic characteristics (measured at nominal and ordinal levels) of cassava processors and the potential adoption of the cassava peeling machine. The Pearson Product Moment Correlation was used to test the relationship between the socio economic characteristics of the processors that are measured at interval and ordinal levels. The Students' t- test was used to test the differences in the mean profitability of adopting alternative peeling options.

Results and discussion

Commercially available cassava processing machines

The commercially available machines are: WAMABCO Peeling Machine (available in three different sizes with capacities of 2 tonnes/day, 4 tonnes/day and 6-7 tonnes /day sold at US$1500; US$3000 and US$3600 respectively); A&H Peeling Machine of 6-7 tonnes/day capacity and FATAROY Peeling Machine of 6-7 tonnes/day capacity sold at US$2500 each.

Description of selected cassava processors

Table 1 shows that majority (93.1%) of the cassava processors were females and were mostly married (95.4%). Most (89%) belong to household with 3-6 persons; and about two-thirds had formal education (at least completed primary education); but had not attended any traing in cassava processing. More than half (51.7%) were not aware of the existence of cassava peeling machines and 79.3 percent do not have the machine available either at their processing sites or located somewhere close.
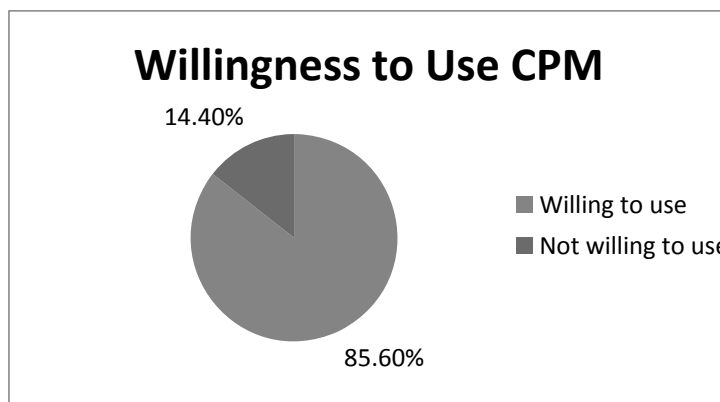
Table 1. Socio-economic characteristics of the cassava processors N= 90

Variables	Mode (Mean)	Standard Deviation
Age	84% 25-50 years old (41 years old)	9.861
Sex	93.1% Female	
Religion	62.1% Christianity	
Marital Status	95.4% Married	
Household size	89% 3-9 persons (6 persons)	2.790
Educational Status	66.7% Formal education	
Number of training	87% None (0.13)	0.389
Number of group affiliated to	65.5% None (0.5)	0.760
Ancestry	53.0% Non-native	

Source: Field survey 2008

Majority of the processors (85.6%) were willing to adopt the use of the machine. Majority (67.1%) of the cassava processors said they were willing to use the machine if is affordable and can completely peel the cassava fed into it without discrimination as claimed by the fabricators, 2.3% wanted the machine in a very comfortable way of operation given that women were the major population in cassava processing, the machines should be fabricated in such a way that it will be easy for the women to operate it as against looking for help from their male counterparts. Washing and offloading channel was another quality the respondents wanted in a cassava peeling machine before deciding to use it, 8.8% of the respondents were under this category.

Figure 1 shows that majority (85.6%) of the cassava processors, were willing to use the machine and (14.4%) were not willing to use the machine. Willingness to use the machine in this study was seen as a proxy for potential adoption. The reasons given for their not wanting to use were social problems and illiteracy on the part of some of the respondents. This is in line with studies that have shown that the factors influencing technology adoption can be social, economic, innovation related, process related or exogenous (Rogers, 2003; Collinson *et al*., 2001; Agbamu, 1995, Adebayo *et al*., 2003). In Owe village for example where the IFS funded machine was demonstrated, there was a

Figure 1. Cassava processors' willingness to use cassava peeling machine

social problem of who will manage the machine if donated to them, though they claimed that the peeling machine was not needed at the time of the demonstration, that they would have preferred hydraulic press instead, but there was an undertone of social problem in the discussions had with them.

Test of hypotheses

Table 2 shows that there are no significant relationships between sex; religion; marital status; educational status; occupation and the potential adoption of a cassava peeling machine. This implies that the potential adoption of a cassava peeling machine depends on other factors apart from all these factors, whether or not, a processor is well educated, and either male or female does not determine his choice of being ready adopt the use of a cassava peeling machine. There is however a significant relationship between ancestry and potential adoption of cassava peeling machine. This implies that being a native of the study area can affect the choice of adopting the use of a cassava peeling machine. A native can decide to use the machine to improve his livelihood status, he can even take the option of acquiring the machine and use for commercial purposes whereby he serves as an itinerant operator and other cassava processors come for the services at a given fee. There could be a slight difference in the case of a non-native because he could face some social problems which might not enable him to operate successfully as a native would do.

Table 2. Results of Chi-square analysis (Dependent variable = Potential adoption of cassava peeling machine)

Variable	Chi-square value	Df	Asymp. Sig. (2-sided)	Decision*
Sex	0.169	1	0.681	NS
Religion	0.328	2	0.849	NS
Marital status	0.752	1	0.386	NS
Educational status	2.534	4	0.639	NS
Major occupation	3.957	7	0.785	NS
Ancestry	8.816	1	0.003	S

* = Decision criterion is significant when p<0.05
Df = Degree of freedom

Table 3 shows significant relationships between household size; number of training; income and the respondents' potential adoption of cassava peeling machine. This implies that the willingness to adopt the use of a cassava peeling machine can be determined by the household number whereby the family labour involved in cassava peeling is not sufficient enough for each production and using a machine for the same purpose will increase production at the end.

The number of training in cassava processing could also positively affect the choice of adopting the use of a machine whereby the processors had attended a couple of trainings in the enterprise and had been enlightened to the advantages of mechanical post harvest techniques in cassava processing especially cassava peeling. Income can also affect the potential adoption of the cassava peeling machine; the higher the income, the higher the tendency of wanting to use a machine for peeling. A processor with a high income can afford to pay for the services of a cassava peeling machine or can even afford to buy one.

Table 3 also revealed that there were no significant relationships between years of experience in cassava processing; number of group affiliated to and the potential adoption of the machine. The potential adoption of a cassava peeling machine is not also determined by the number of group affiliated to; the group a processor belongs to might have nothing to do with cassava processing, it could be a religious group which might not affect the choice using of adopting a cassava peeling machine.

Table 3. Results of Pearson Product Moment Correlation (Dependent variable = Potential adoption of cassava peeling machine)

Variable	R value	Approx. value (Sig.)	Decision
Household size	0.86	0.02	S
Number of training	0.92	0.01	S
Income	0.80	0.03	S
Exp. In cassava processing	0.21	0.14	NS
Number of group affiliated to	0.41	0.09	NS

Decision criterion is significant when $p< 0.05$

The Students' t-test analysis revealed there are differences in the alternative peeling options considered in this study (Table 4). The options were manual peeling; willingness to pay if cassava peeling machine is stationed in their processing sites; willingness to pay if machine is stationed 2km away from their processing sites and the willingness to buy a machine. The respondents were willing to pay less than the amount they were presently paying for manual peeling if the machine is brought to their processing sites and operated by an itinerant operator. The situation is also similar that the respondents were willing to pay less and adopt the use of the machine if stationed two kilometers away from their processing sites.

Table 4. Results of t-Test analysis (Dependent variable = Manual peeling for Gari production)

Variable	t-value	df	Sig. (2-tailed)	Decision
Willingness to pay if located at the cassava processing site	8.329	69	0.00	S
Willingness to pay if located 2km away from the processing site	3.629	56	0.00	S
Willingness to buy a cassava peeling machine	4.720	52	0.00	S

Decision criterion is significant when $p< 0.05$.

Conclusion and recommendations

The study concluded that processors are willing to adopt the use of the peeling machine if efficient, available and affordable. The major constraints in the use of cassava peeling machine as found out in this study is the awareness and availability of the machine. The categories of cassava processors who were privileged to have the machine available were processors in research institutes. An average processor was not even aware of the existence of the machine not to talk of having it available for use. Commercial fabricators "need" to make the machines more widely available by offering to sell at varying sizes and affordable prices or facilitate arrangements through which processors would have access to use the machine nearby and at reasonable fees.

Acknowledgement

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