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Role of local innovation in mechanisation of maize shelling: Evidence from Igabi, Chikun and Kajuru Local Government Areas, Kaduna State Nigeria

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The study assessed the benefits of a mechanical maize sheller made by a local artisan based on data from 90 farmers selected randomly and equally from Igabi, Chikun and Kajuru Local Government Areas of Kaduna State, Nigeria. Results of the study showed that 76.7% of the respondents adopted the maize sheller made by the local artisan as compared to 23.3% still engaged in hand-shelling of maize. Regarding performance of the maize sheller, 93.3% of the respondents indicated that they were very satisfied, while 3.3% stated that they were satisfied. Farmers agreed that the maize sheller was beneficial to them in 'terms of time saving, ease of operation, availability of the sheller in the community, local arrangement for maintenance, reduction in wastage of grains, creation of employment for youth and access to the equipment by female farmers. However, most of them felt it was not affordable. The results of the study have shown that it is possible for local artisans, and farmers to play a significant role in the process of developing innovations that will enhance agricultural productions. Hence, convergence of ideas and expertise from both formal and non-formal institutions in a multi-stakeholder framework is likely to be more beneficial to farmers.

Key words: Local innovation, maize shelling, adoption, Nigeria.

INTRODUCTION

Nigeria is the tenth largest producer of maize in the world with an annual production of 7.3 million metric tonnes in 2010 (FAO, 2011). Maize is grown primarily for human consumption, animal feed and raw material for industries. After harvesting, the major operations involved in processing of maize for food are drying, de-husking, shelling and milling. Maize shelling is probably the most important operation as far as utilisation of the commodity is concerned because of its effect on subsequent processing and storage. Shelling is the process of removing the seeds from maize cobs and is usually done by hand or by using mechanical shellers. In Nigeria, majority of farmers shell their maize manually and this is time consuming and labour intensive. Mechanical threshers are mostly used where maize is cultivated on a large scale. Some agricultural research centres in Nigeria are mandated to design and fabricate simple agricultural implements and equipment to boost mechanisation of agricultural activities. Innovations in agricultural mechanisation from the national agricultural research system include hand-made

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hand-made shellers and engine-operated sheller and de-husker. The uptake of these innovations is relatively poor among small-scale farmers in Nigeria, mainly because the necessary information about the implements and equipment is not well disseminated. In addition, not much attention has been given to farmers' priorities in the development of innovations in agricultural mechanisation by the research centres.

In Nigeria, agricultural research and development still operate around the transfer of technology model, which is based on the assumption that innovations generated mainly by the national agricultural research system will be transmitted to farmers for adoption through the network of the extension system at the national and state level (Biggs, 1990). In this case, farmers are generally regarded as the recipients and users of agricultural innovations with little or no input to the development of the final products (Leeuwis and Van de Ban, 2004). Even though this approach has recorded notable achievement in some cases (the development of improved varieties of crops with high yield and resistance to diseases), it has often led to the development of agricultural innovations that are not being utilised by farmers. There is, however, an increasing recognition by development practitioners that innovation is not a linear process from formal science through extension to farmer adopters, and that scientists are not the sole and are seldom the most important generators of knowledge (Bebbington, 1989; Biggs, 1990; Schreiber, 2002). It is becoming more widely accepted that innovation is a social process involving a multitude of different actors, and that innovation processes can be enhanced by creating more possibilities for diverse stakeholders to interact (Roling, 1996; Engel, 1997; Douthwaite, 2002; World Bank, 2006). This suggests that other stakeholders in agricultural development such as farmers, artisans and NGOs may also be developing innovations for enhanced agricultural production apart from the formal national agricultural research system in the country. Valuable experiences are being generated across the world on how diverse actors can be encouraged to work together and how new ideas and products whether from formal research and from other sources can be transformed into innovations that benefit thousands of resource-poor farmers (Waters-Bayer et al., 2008). A convergence of stakeholders in a participatory innovation development framework is likely to be more beneficial to farmers than the present technology-transfer approach to innovation development. PROLINNOVA-Nigeria is a network of stakeholders in the agricultural research and development aimed at promoting and adding value to innovations generated by local farmers and their associates in solving their own problems.

Members of the network carried out a field survey covering three LGAs t in 2010 to understand the nature of existing local capacities for addressing problems relating to agricultural production and natural resource management in the community (PROLINNOVA Annual Report, 2011). The report of the field survey showed some of the local ideas and methods used by farmers in some parts of Kaduna State to address their production challenges. One of the innovations was a mechanical maize sheller made by Sule Magaji, a local artisan. Maize production is one of the major income-generating agricultural activities in the study area. Threshing of the maize after harvesting and drying has always been a constraint especially for women and children in view of the time consumption and drudgery associated with the operation. Discussions between farmers in Kasuwan Magani in Kajuru LGA and the local artisan in the community led to the recognition of the need for mechanical shellers. The local artisan got a mechanical sheller from an external source and made another one using materials available in the community. Several units of the new mechanical shellers are now being used by farmers in the community. A local NGO in the area also contracted the artisan to make mechanical maize shellers for distribution to farmers in 10 communities. Members of PROLINNOVA-Nigeria facilitated a meeting between the local artisan and officials of Faculty of Agricultural Engineering Institute of Agricultural Research Ahmadu Bello University to explore opportunities for adding value to the mechanical sheller through expert input. Following the inspection of the sheller and the demonstration of its operation, the experts suggested the inclusion of another material that will make it possible for the sheller to be used for the shelling of groundnut as well thus expanding the scope of its utilisation by farmers.

It is against this backdrop that a study was conducted by members of PROLINNOVA-Nigeria to assess the role of the local innovation by the artisan and farmers in mechanisation of maize shelling in the area. The specific objectives of the study were to:

i. Analyse the socioeconomic characteristics of participating farmers in the study area;
ii. Assess the level of farmers' adoption of maize sheller made by the local artisan; and
iii. Evaluate farmers' perception of benefits of the maize sheller made by the local artisan.

METHODOLOGY

Study area

Kaduna State lies in northwest Nigeria and occupies about 5% of the total land mass of the country with 46,053 km^2. It is the fourth largest state by area and the third most populous in Nigeria. The State has a population of about 6 million people with about 60% living in rural areas (NPC, 2006). The rural population density is about 500 persons per km^2 in the Kaduna/Zaria areas and in the neighbouring villages (Kaduna State Government, 2008). Kaduna State has an altitude of 500–1000 m above sea level and an annual average rainfall of 1272 mm. Agriculture is the largest employer of labour with about 80% of the population being engaged in farming, though with relatively poor productivity (World Bank, 2008). The State is divided into 23 Local Government Areas (LGAs) including Chikun, Igabi and Kajuru

The study was conducted in three LGAs of Kaduna State, namely Kajuru, Igabi and Chikun, which were purposively selected on

Table 1. Socioeconomic characteristics of respondents (n = 90).

Characteristics	Frequency	Percentage
Age		
Below 20	15	16.67
20-29	23	25.56
30-39	25	27.78
40-49	12	13.33
50-59	8	8.89
60-69	3	3.33
70 and above	4	4.44
Gender		
Male	47	52.22
Female	43	47.78
Marital status		
Single	14	15.56
Married	75	83.33
Separated	1	1.11
Household size		
1-5	32	35.56
6-10	34	37.78
10 and above	24	26.67
Farming experience		
Less than 5 years	9	10.00
5-10 years	24	26.67
11-15 years	14	15.56
16-20 years	13	14.44
Above 20 years	30	33.33
Level of Education		
No Formal Education	37	41.11
Primary Education	30	33.33
Secondary Education	19	21.11
Tertiary Education	4	4.44
Membership of Association		
Yes	30	33.33
No	60	66.67

Source: Survey Data, 2011.

account of the local farmers' awareness and local spread of the mechanical maize sheller made by an artisan in the area. Thirty farmers were selected randomly from each LGA, giving a total of 90 respondents. Primary data were collected by means of a structured questionnaire. Questionnaires were administered by members of Prolinnova-Nigeria through personal interview of the respondents on issues relating to the adoption of the mechanical maize sheller made by the local artisan.

Descriptive statistics such as frequency and percentage were used to analyse socioeconomic characteristics of the respondents, access to rural infrastructure on maize production, adoption of the locally fabricated maize sheller and farmers' perception of benefits of the equipment. Farmers' perception of the benefits of the maize sheller was measured on a 4-point Likert-type scale of strongly agree, agree, disagree, and strongly disagree with 4, 3, 2 and 1 as assigned weights, respectively. In calculating perception of benefit of the maize sheller, the mid-point values of the scale were added up and then divided by four to obtain a mean score of 2.5. Any mean score that was equal to or greater than 2.5 was perceived by farmers as 'benefit' while a mean score that was less than 2.5 was perceived as non-benefit.

RESULTS AND DISCUSSION

The distribution of socioeconomic characteristics of respondents is presented in Table 1. About 28% of the

Table 2. Percentage distribution of respondents by access to technical support on maize production (n = 90).

Technical support	Frequency	Percentage
Sources of information		
Input dealer	5	5.56
Other farmers	80	88.89
Farmers' association	5	5.55
Sources of seeds		
Input dealer	4	4.44
Open market	17	18.89
Other farmers	6	66.67
Seeds from previous harvest	63	70.00
Sources of fertiliser		
Local Government	4	4.44
Input dealer	5	5.56
Open market	76	84.44
Other farmers	2	2.22
Not applicable	3	3.33
Sources of finance		
Personal savings	68	75.56
Friends and relatives	3	3.33
Local money lender	19	21.11
Ownership of mobile phone		
Yes	47	52.22
No	43	47.78

Source: Survey Data (2011).

respondents were within the age range of 30 to 39 years, followed by 26% with 20 to 29 years and 17% below 20 years of age. Thus, 71% of the farmers were less than 40 years while 30% were above the age of 40. This shows that the majority of the farmers were in the middle-age bracket. According to NBS/FMARD (2011), 70.9% of farmers in Kaduna State were between 39 and 49 years of age. Male and female farmers constituted 52 and 48% of the respondents, respectively. The marginal difference in male and female respondents is an indication of the appreciable involvement of women in farming activities in the study area. In Kaduna State, 98% of farmers are male while 2% are female (NBS/FMARD, 2011). About 83% of the respondents were married while 15% were single. The farmers were in favour of larger household size as 64% of them had more than six persons as compared to 36% with less than six persons in their households. Farmers with farming experience that is ≥ 20 years comprised 33% of the respondents, followed by those having 5 to 10 years' experience with 26%.

In other words, 64% of the respondents had ten years of farming experience or more, while 36% had <10 years' experience. Farmers with no formal education made up 41% of the respondents while those with primary and secondary education constituted 33% and 21% in that order. Regards association, 67% of the respondents did not belong to any association while 33% identified with one farmers' association or the other.

In terms of access to technical support on maize production (Table 2), the study showed that almost 89% of the respondents relied on other farmers in their communities for advice while others depended on input dealers (5.6%) and farmers' associations (5.6%) for advice. This shows that farmers only had access to information from these sources. The result of the survey shows that 70% of the respondents got their maize seeds from previous season's harvest, meaning that the farmers depended on their own internal arrangements and their local expertise in seed preservation and storage. About 19% of the respondents got their seeds from the open market while input dealers (4.4%) and other farmers (6.7%) were the sources of maize seed supply for other respondents.

The open market was the dominant source of fertilizer supply with patronage from 84% of the respondents (84%) followed by input dealers (5.6%), Local

Table 3. Percentage distribution of respondents by maize shelling options (n = 90).

Maize shelling method	Frequency	Percentage
Hand shelling	21	23.33
Patronise people in the community who have locally made mechanical sheller	25	27.78
Use community owned locally made maize sheller	43	47.78
Use personal locally made mechanical maize sheller	1	1.11
Total	90	

Source: Survey Data (2011).

Table 4. Percentage distribution of respondents' perception of locally made mechanical Maize Sheller's performance (n = 90).

Respondent's perception	Frequency	Percentage
Very Satisfied	84	93.33
Satisfied	3	3.33
Not Satisfied	0	0
I have not used it	3	3.33
Total	90	

Source: Survey Data (2011).

Table 5. Perceived benefits of locally made mechanical maize sheller by respondents.

Benefit	Mean Score	Standard Deviation
Time saving	3.43*	0.498
Easy to operate	3.19*	0.578
Available in the community	2.83*	0.738
Affordable to many farmers	2.38	0.646
Can be repaired in the community	2.78*	0.667
Reduces wastage of grains	3.17*	0.707
Creates employment for youth	3.12*	0.419
Can be used by women	2.67*	0.636

*Benefit.

Government (4.4%) and other farmers (2.2%). This implies that subsidisation of fertiliser by the government was not really beneficial to farmers in the study area as most of them still procured the material at market prices from the open market. Personal savings constituted a major source of financing of farm operations by 75.6% of the respondents, followed by 21% (local money lender). Over half of the respondents (52.2%) owned mobile phones. The availability of mobile phones among the farmers in the study area presents a potential avenue for them to access information about market sources for grains and other farm inputs.

Distribution of respondents based on maize shelling options adopted as presented in Table 3 indicates 47.8% of the respondents used maize sheller fabricated by local artisan and owned by the community while 27.8% used maize sheller fabricated by local artisan but owned by individuals in the community. Only 1.1% of the respondents used locally fabricated maize sheller that belonged to them. This means that a total of 76.7% of the respondents adopted the use of maize sheller fabricated by local artisan as compared to 23.3% that were still engaged in hand shelling of maize.

The respondents' perception of performance of the maize sheller made by the local artisan is presented in Table 4. About 93.3% of the respondents stated that they were very satisfied while 3.3% stated that they were satisfied. Others (3.3%) could not comment on the performance of the maize Sheller because they did not use it. Generally, farmers were quite satisfied with the performance of the maize Sheller made by the local artisan.

Table 5 shows the mean scores of respondents on the basis of benefits derived from the adoption of maize

Sheller made by the local artisan. Of the 8 variables describing the benefits of the maize Sheller, farmers were in agreement over 7 while 1 variable was not regarded as a benefit. The 7 benefits as agreed by farmers included time saving, ease of operation, availability of the Sheller in the community for purchase, affordability, local arrangement for maintenance, reduction in wastage of grains, creation of employment for youth through maize shelling service provision, and access to the equipment by female farmers. Generally, farmers were of the opinion that the maize Sheller was not affordable. This is corroborated by the fact that of 90 farmers who participated in the study only 1 individual has a maize Sheller while others relied on maize shellers owned by the community and other individuals in the communities who used maize sheller for commercial purposes.

CONCLUSION AND RECOMMENDATION

The results of the study have shown that it is possible for local artisans, and farmers to play a significant role in the process of innovation development. Ideas and expertise of local people are often disregarded by the formal agricultural research system. This seems to entrench the assumption that agricultural innovations can only come from the formal agricultural sector and that other stakeholders have nothing to contribute. In this regard, it is suggested that a scoping of innovations developed by local people will provide the opportunity and entry point for a strategic interaction among stakeholders in the sector.

The formal agricultural sector should take responsibility for identifying local innovations that farmers depend on and seek to add value where necessary to the local ideas and expertise, thus ensuring that the final outputs are more relevant to the needs of the farmers. It cannot be overemphasised that convergence of ideas from both formal and non-formal agricultural sector is quite critical for addressing farmers' challenges and developing innovations that will enhance agricultural production in a sustainable manner. Efforts should be made by the government at all levels to improve the capacity of farmers to use both human and material resources at their disposal in developing potential solutions to their field problems. Innovators from the non-formal agricultural sector should also be recognised for their contributions to agricultural development.

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Conflict of Interest

The authors have not declared any conflict of interest.

REFERENCES

Food and Agricultural Organisation (FAO) 2011. FAO STAT. Accessed at: www.fao.org

Bebbington A (1989) 'Institutional options and multiple sources of agricultural innovation: Evidence from an Ecuadorian case study'. Agricultural Research and Development Network Paper 11, Overseas Development Institute, London.

Biggs SD (1990). 'A multiple source of innovation model of agricultural research and technology promotion'. World Dev. 18(11).

Douthwaite, B. (2002) Enabling Innovation: A Practical Giude to Understanding and Fostering Technological Change. Zed Books, London.

Engel P (1997). The Social Organisation of Innovation. Royal Tropical Institute, Amsterdan, The Netherlands.

Kaduna State Government (2008). 'Kaduna State'. www.kadunastate.gov.ng

Leeuwis C, Van den Ban A (2004). Communication for Rural Innovation: Rethinking Agricultural Extension, Third Edition. Blackwell Science, Oxford, UK.

National Population Commission (NPC) (2006).

National Bureau of Statistics/Federal Ministry of Agriculture and Rural Development (2011) Collaborative Survey on National Agriculture Sample Survey (NASS).

PROLINNOVA (2011) Annual Report.

Roling N (1996) 'Towards an interactive agricultural science'. Eur. J. Agric. Educ. Ext. 2(4):35-48.

Schreiber C (2002). 'Sources of innovations in dairy production in Kenya'. International Service for National Agricultural Research, The Hague, The Netherlands. Briefing Paper 658.

Waters-Bayers A, Sanginga PC, Karia S, Njuki J, Wettasinha C (2008). Seeking New Ways of Enriching Farmers' Livelihhods. In: Sanginga, PC, Waters-Bayer A, Kaaria S, Njuki J and Wettasinha C (eds.), Innovation Africa: enriching farmers' livelihoods. London: Earthscan Publications Ltd. pp. 2-5.

World Bank (2008). 'Project Information Document.' World Bank Washington DC. Report no AB 3515.

World Bank (2006). Enhancing Agricultural Innovation: How to go beyond the strengthening of agricultural research. World Bank, Washington, DC.