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Policy Briefing

ALTERNATIVE STRATEGIES TO REDUCING POST-HARVEST LOSSES OF RICE IN NIGERIA

Summary:
Food losses not only have effects on a social and economic scale, but also represent a waste of resources used in production such as land, water, energy and other inputs. This paper has the objective of identifying the major causes of post-harvest losses in the rice value chain in Nigeria. The paper also makes recommendations for mitigating post-harvest losses in Nigeria based on best practices from similar ecological zones. The paper recommends for the provision of credit, improvement of storage facilities and the use of the ASI thresher cleaner among rice value chain actors in Nigeria.

1. INTRODUCTION

Nigeria, almost food self-sufficient in the 1960s, has become a food-deficit country relying on large quantities of imported foods. In 2010, the value of Nigeria's imports of food and beverages was EUR 2.974 million (NBS, 2011). About 85 per cent of Nigeria's total land area is agricultural land (78.5 million hectares) out of which 39.5 million ha is arable. Of the available arable land, only 60 per cent so far has been cultivated.

Rice is a major staple food in Nigeria. Due to its large population, Nigeria is also the continent's largest consumer of rice in absolute terms. The country's estimated annual demand for milled rice is 5.2 million tonnes, while the average national production is 3.3 million tonnes. The supply and demand gap of 1.9 million tonnes can only be bridged by importing rice. Nigeria's rice processing capacity is 2.8 million tonnes of paddy (JICA, 2013)[1].

[1] Status of NRDS Implementation in Nigeria, Presentation at the Fifth General Meeting of CARD, 5-6 February 2013, Dakar, Senegal

In spite of these sizeable food imports, the Food and Agriculture Organization (FAO, 2014)[2] states that in 2012 about 9.4 million Nigerians or about 6 per cent of the population were undernourished and the poverty level in 2010 was estimated at 69 per cent (NBS, 2012)[3].

Given this level of poverty, food insecurity and undernourishment in Nigeria, food losses and waste, which occur along the entire food value chain, are unacceptable.

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2. CAUSES OF POST-HARVEST LOSSES IN THE RICE VALUE CHAIN IN NIGERIA

Post-harvest handling and processing of rice consists mainly of manual operations in harvesting, threshing, drying, cleaning, parboiling, milling, and packaging with attendant contamination and high crop losses.

Rice crop loss mainly occurs through: disease and pest by bacteria, rodents and birds; quality degradation arising from immature rice; inappropriate drying; and threshing, drying, sorting, storage, parboiling, milling and transportation. Quality control of un-husked and un-milled rice also presents additional problems to post-harvest processing.

2.1. Harvesting:

Harvesting of rice is greatly under-mechanized in Nigeria, which leaves farmers struggling with high and sometimes unaffordable labour wages. In some instances, there is outright lack of labour to meet harvest schedule. Late and untimely harvesting, which is due to lack of available labour and excessive competing demand for existing labour, results in poor quality paddy harvest. In addition, high rate of broken rice due to weather extremities is prevalent.

2.2. Drying:

Direct sun drying and sorting of harvested and parboiled rice on bare ground, by roadside, on tarpaulin, or on used plastic bags spread on the ground introduce foreign matter, small stones and other impurities to rice. Platform for drying of rice is predominantly insufficient.

2.3. Threshing:

The traditional threshing methods employed in Nigeria introduce impurities into the rice and are inefficient and labour intensive.

2.4. Parboiling:

Parboiling facilities are established close or adjacent to farm areas and mills to allow for simultaneous operations. Official parboiling manuals are not available leaving the operators at the mercy of experienced expatriates. Sorting of rice using traditional crude method permits further introduction of impurities.

2.5. Market Infrastructure:

The city, town and village public markets in existence in Nigeria are open air and lack the required facilities, a situation that fosters spoilage of agricultural products especially during the rainy season.

2.6. Storage:

Use of available storage capacity by rice marketers is considered to be low. This in turn lowers marketing efficiency by imposing constraints on volume of rice transactions. The quality of produce is also compromised by pests and rodents due to poor storage infrastructure.

[2] FAO (2014): FAOSTAT database, Food and Agriculture Organization, Rome, Italy, URL: http://faostat.fao.org

[3] The Nigeria Poverty Profile 2010 Report of the National Bureau of Statistics Harmonized Nigeria Living Standard Survey (HNLSS)

2.7. Access to finance:

Rice value chain actors require credit for equipment and technology upgrading as well as improving quality of produce. Producers and marketing actors also require credit to pre-finance production of their supplies.

3. ALTERNATIVE STRATEGIES TO REDUCING POST-HARVEST LOSSES OF RICE

The following strategies have been proven to be appropriate in handling post-harvest losses of rice.

3.1. Creating Access to Microcredit/ Finance:

Through low-interest loans, 27,000 small farmers in Madagascar's Village Community Granaries scheme stored 80,000 tons of paddy rice, increasing their output by 50 percent.

This experience shows that it is possible to organize sound village-based inventory credit systems within a strong movement of rural credit unions or rural banks. Madagascar's Village Community Granaries scheme is shared in box 1.

Box 1: The Village Community Granaries (GCV) Scheme - Madagascar

The scheme involves farmers who produce rice and other agricultural commodities on small plots, mainly for home and local consumption. The scheme started in the early 90s, and by 2003 involved 27,000 small farmers holding 80,000 tonnes of paddy in stores with capacity ranging from 5 to 120 tonnes each. Fraslin (2005)[4] claims that by enabling farmers to store longer, it has provided them with a financial surplus equivalent to a 50 percent increase in paddy yield, as well as contributing to the stabilization of prices regionally.

The scheme was set up by a large network of village-based credit unions (the 'Caisses d'Epargne et de Crédit Agricole Mutuels', or CECAM), which enjoyed the assistance of an NGO, various French agricultural unions, European cooperative bankers (Rabobank and Crédit Agricole Mutuel) and several donors. According to Fraslin (2004)[5], a key to this achievement was the members' subscription of substantial equity capital, which at once committed them to the Endeavour, and helped in obtaining soft loan funding from the public treasury. The network expected to break even by 2006.

The CECAMs provide members with inventory credit along with seasonal production credit, leasing, and other credit products, and there is also a more modest savings facility. Together with its regional federation (URECAM), they also provide a complete supervisory structure for ensuring correct storage protocols and the integrity of the inventory credit system.

3.2. Adoption of Improved Storage Facilities:

Box 2: Improved technologies for reducing post-harvest losses in Afghanistan

In the northern region of Afghanistan where more than half of the country's cereals are produced, many farmers store their crop in plastic and fibre bags or in farm buildings without proper flooring, doors and windows. This offers limited protection, resulting in significant post-harvest losses. The Government requested support from FAO to provide silos for communities and farming households for grain storage.

With funds provided by the Government of the Federal Republic of Germany, FAO implemented a project from 2004 to 2006 with the objectives reducing postharvest losses and enhancing the technical capacity of local tinsmiths, blacksmiths and craftsmen for construction of metallic grain silos.

Seven main grain producing provinces were selected as focus areas. Technical personnel from the Ministry of Agriculture and NGOs trained 300 local artisans in the manufacture of silos, while contracts were issued to over 100 tinsmiths who built metallic silos ranging from 250 to 1 800 kilogram capacity for distribution in local communities. The project also oversaw the construction of grain warehouses for community use in 12 sites and trained beneficiaries on how best to operate and manage the facilities.

It was found that the use of the metallic silos had reduced storage loss from 15-20 percent to less than 1-2 percent, grains were of higher quality (as protected from insects, mice and mould) and could be stored for longer. Based on the training received, tinsmiths, blacksmiths and craftsmen are now fabricating silos as a profitable enterprise.

Source: FAO (2010) *Technical input for the Hague Conference on Agriculture, Food Security and climate Change*, 31 October to 5 November 2010.

3.3. Harvesting:

[4] Fraslin, J-H. 2005. Une expérience de warrantage à Madagascar. Le crédit Grenier Commun Villageois (GCV) des CECAM (Caisses d'Epargne et de Crédit Mutuels). Paper presented at the Methodological Capitalization Workshop on Inventory Credit, Niamey, February 2-3, 2005.

[5] Fraslin, J-H. 2004. CECAM: A cooperative agricultural financial institution providing credit adapted to farmers' demand in Madagascar. Paving the Way Forward for Rural Finance,' an International Conference on Best Practices. Case Study. Madison, WI: BASIS – Broadening Access and Strengthening Input Market Systems

Use of mini-combine harvesters may offer opportunities to farmer groups to reduce labour requirements and gather a full harvest. The costs of the technology are high, so the benefits may only apply where the crop is sufficiently valuable, for example in SSA's expanding rice industry. Currently, in most situations it is unlikely that changes can be made to traditional smallholder harvesting methods[6].

3.4. Drying grain:

The type of equipment employed depends on the scale of farm production; tarpaulins can be used to cover small quantities of grain in damp weather, whereas larger quantities may be put into drying cribs or processed in various types of mechanical dryers. Mechanical dryers would be more appropriate for farmer groups than for individuals[7].

3.5. Threshing, shelling, and winnowing of grain:

Mechanized rice threshers/winnowers and maize shellers can speed up postharvest operations and deliver improvements in grain quality and quantity. Diagne et al. 2009[8], reported a collaborative program between WARDA[9] and IRRI[10]. The program identified an improved rice thresher-cleaner and engaged local manufacturers and end users to develop an African technical solution that is affordable, locally constructed, and acceptable to farmers in the rice-growing areas. (Box 3)

Box 3: Promotion of new rice thresher in the Senegal River valley.

The problem of high losses of manual threshing had been identified in Senegal in the mid-1990s (FAO 1994). A collaborative program between WARDA and IRRI identified an improved rice thresher-cleaner and then engaged local manufacturers and end users to develop an African technical solution that is affordable, locally constructed, and acceptable to farmers in the rice-growing areas.

The new rice thresher produces 6 tons of rice per day with a grain-straw separation rate of 99 percent, compared with manual threshing, which yields only 1 ton of rice per day and requires additional labour for winnowing (Diagne et al. 2009). A high internal rate of return made the new thresher extremely attractive for use in the Senegal River valley, but the average purchase price of US$5,000 makes it unaffordable for many smallholders. When the thresher is used for 90 days, the benefit t-cost ratio reaches 2.3, well above unity.

The economic life of the new thresher is five years, with a salvage value of 30 percent of the purchase price (Diagne et al. 2009). The technology became so popular in the Senegal River valley, following its commercial release in 1997, that its impact was recognized in 2003 when the president of Senegal presented the ASI team with the special prize for science research. Today, more than 50 percent of total paddy produced in Senegal is threshed with the ASI thresher cleaner, and there are the spill-over effects in other West African countries (Table 1).

[6] IBRD., The World Bank.; NRI,, and FAO (2011): *MISSING FOOD: The Case of Postharvest Grain Losses in Sub Saharan Africa* Economic and Social work - report number 60371-AFR

[7] IBRD., The World Bank.; NRI,, and FAO (2011): *MISSING FOOD: The Case of Postharvest Grain Losses in Sub Saharan Africa* Economic and Social work - report number 60371-AFR

[8] Diagne, A.; S. A. Adekambi; F. P. Simtowe And G. Biaou, (2009). The Impact Of Agricultural Technology Adoption On Poverty: The Case of Nerica Rice Varieties in Benin.

[9] West Africa Rice Development Association

[10] International Rice Research Institute

Table 1: Spill over from the ASI thresher cleaner

Country	Local name	Partners	Machines in use	Use rate (%)
Senegal	ASI	WARDA, ISRA, SAED, SISMAR, GRITECH, Local artisans, Producer groups	>250	75
Mauritania	SAC	SONADER, CNRADA, EL MALLY, GIE	>50	15
Mali	AC-IER	IER, Office du Niger, local artisans	>100	10
Burkina Faso	ANADI	INERA, CGF, PAFR, producer groups, local artisans	10	10
Ghana	GHAVIWA-TC	MADR, World Bank, KAPONG Project	11	NA
Côte d'Ivoire	ASI	ANADER, Local artisans	7	NA

Source: Africa Rice Centre (WARDA) Annual Report 2004.2005

4.0 RECOMMENDATIONS

This paper makes the following recommendations:

1. The Federal Ministry of Agriculture and Water Resources, farmer based credit unions and other relevant stakeholders should consider the provision of inventory credit along with seasonal production credit, leasing, and other credit products to rice value chain actors in Nigeria. The relevant bodies should however, provide a complete supervisory structure for ensuring correct storage protocols and the integrity of the inventory credit system.

2. The JAK Foundation, together with other stakeholders should provide support to Rice value chain actors in Nigeria through the improvement of storage facilities. With technical personnel from the Federal Ministry of Agriculture and Water Resources and NGOs, local artisans could be trained in the manufacture of silos. Tinsmiths could also be contracted to build metallic silos for distribution in local communities. This would not only reduce post-harvest losses of rice, but create employment as well.

3. The use of the ASI thresher cleaner is recommended to the Federal Ministry of Agriculture and Water Resources and all rice value chain actors/ stakeholders in Nigeria. The Federal Government and other donor agencies/ financial institutions should however, support value chain actors, especially small holder farmers with subsidies and credit in the acquisition of the technology.

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