



Cost of Rice Production Under Irrigated Systems in the 2017 Cropping Year

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SUMMARY

Tegemeo Institute conducted an assessment of cost of production for irrigated rice for the year 2017 main cropping season. The assessment captured the cost of production for two groups of rice farmers; those operating inside the irrigation scheme and those outside the scheme. The analysis identified the main components of production costs and provided evidence to inform policy decisions aimed at minimizing costs and improving competitiveness of rice production. The findings show varied cost of production across the two categories of producers with farmers within the scheme incurring higher costs. The costs of production per bag were KES 2,415 and KES 2,261 for the scheme and non-scheme farmers, respectively. Labour constituted the major cost component and was associated with non-mechanized activities such as planting, weeding, bird scaring and harvesting. Farmers within the scheme realized better yields owing to use of higher yielding varieties and better access to irrigation water. Hence, they made higher profits of KES 2,985/bag compared to KES 1,339/bag for non-scheme farmers. The study found that productivity improvement is a key component in reducing costs in rice production. The study recommended strategies to improve productivity such as sustainable intensification of rice production; infrastructural development in rice producing areas; employment of policies that will improve credit availability and access to producers owing to the capital intensive nature of the rice enterprise; appropriate mechanization of rice production activities; enhanced development and uptake of innovations to reduce costs and improve production such as water saving rice culture (a tested innovation by JICA); and, use of nets to control migratory pest-birds.

BACKGROUND

Rice is the third most important cereal grain for food security in Kenya after maize and wheat and forms an important diet for majority of urban dwellers. It is also important to the economy as well as livelihood of many rural populations in its production regions. Over the recent years, rice consumption has been on the rise occasioned by the changing consumption patterns in the country (Onyango et al, 2016). This implies a widening gap between production and consumption in the face of national rice production that is far below the demand, with about 80 percent of the total consumption being met through imports (KNBS, 2017).

About 80 percent of rice grown in Kenya is from irrigation schemes with the remaining 20 percent produced under rain-fed conditions (MoALF, 2008). Owing to its increasing importance, promotion of rice production under the two production systems has the potential to improve food security, increase smallholder farmers' incomes, contribute to employment creation in the rural areas and reduce the growing rice import bill. A major determinant of farm level profitability and competitiveness for rice farmers is their ability to produce in a cost effective manner. Periodic monitoring of farm level cost of production is, therefore, crucial for providing evidence from which policies can be formulated, in line with the changing

environment for production, consumption and trade. Interventions targeted at reducing costs of production and increasing farm productivity, will ultimately lead to higher farm returns and improved rice supply for the growing population.

Tegemeo Institute carries out annual cost of production (CoP) assessments for key crops in Kenya to monitor trends in production costs and factors influencing them. In August and September 2017, the Institute conducted an assessment of CoP for irrigated rice for the main cropping season of 2017. The assessment captured the CoP for two groups of rice farmers; those operating inside the irrigation scheme and those outside the scheme.

Objectives

The main objective of this study was to assess the cost of producing rice in Kenya by small-scale farmers under scheme and non-scheme systems. The study specifically sought to:

- Determine the profitability of rice across different production systems
- Assess the main contributors to the cost of rice production

Data and Methods

The typical farm approach as described by Agri benchmark was used to establish the costs of rice production. Deblitz & Zimmer (2005) define a typical farm as one that is representative of the largest share of national/regional output of a given crop, characterized by a certain production system for an enterprise or a combination of enterprises, and well-defined structural features such as land tenure and labour organization.

Two counties were purposively selected as study areas based on their importance in contributing to the overall national rice production. County agriculture officers

assisted in identifying specific areas where predominant production systems were located. The selected study areas were: Ahero in Kisumu County (non-scheme growers) and Mwea in Kirinyaga County (scheme growers).

Data was obtained through focus group discussions (FGDs) with farmers, local agro-dealers, traders and Ward Agricultural Officers (WAOs). Data was analysed and presented in three scenarios:

- **Scenario I:** Actual cost of production
- **Scenario II:** Cost of production with land rent
- **Scenario III:** Cost of production using subsidized fertilizer

Results

Table 1 shows farm level characteristics of rice farms. Farmers in irrigation scheme used less basal but more top-dressing fertilizer compared to non-scheme farmers. They also used 15kg of seed for Basmati while non-scheme farmers used 25kg of IR variety. Average land devoted to rice was 2 acres in both farming systems.

Table 1: Characteristics of rice farms

Characteristics	Scheme	Non Scheme
Total land owned (acres)	2.25	3
Acreage under rice	2	2
Seed (kg/acre)	15	25
Seed variety	Basmati	IR-2793
Fertilizer source	Commercial	NAAIAP
Basal fertilizer (kg/acre)	75	100
Top dressing fertilizer (kg/acre)	150	100

The CoP for scheme and non-scheme farmers is presented in Table 2. Results show that scheme farmers had better yields of 25 bags per acre and better produce prices of KES 5,400 compared to non-scheme farmers who harvested 16 bags and sold it at KES 3,600. Scheme farmers, therefore, realized higher revenue but their costs were also higher. Results show that the costs for planting, fertilizer, weeding, pesticide application, irrigation, bird scaring and post-harvest handling were substantially higher among rice producers in the scheme. Non-scheme farmers, however, used subsidized

fertilizer and accessed free water, which reduced their costs substantially. Nevertheless, they incurred higher land preparation cost of KES 10,900 compared to KES 8,200 for the scheme based farms.

Table 2: Rice CoP per acre in 2017

Item/activity	Scheme	Non Scheme
Yield (90 kg bags)	25	16
Price (90 kg bag)	5,400	3,600
Total revenue	135,000	57,600
Nursery costs	500	500
Land preparation	8,200	10,900
Planting	4,900	3,000
Planting fertilizer	4,740	0
Topdressing fertilizer	5,400	0
Seed	1,500	1,600
Weeding	6,250	3,500
Pesticides	600	350
Harvesting	7,000	7,200
Post-harvest	4,875	2,760
Bird scaring	9,000	3,000
Other labour*	250	1,000
Other intermediate	3,200	0
Working capital	3,949	2,367
Total production costs	60,364	36,177

Table 3 shows shares of different cost components in rice production. For non-scheme farmers, land preparation accounted for the largest share at 30 percent, followed by harvesting (20 percent). Weeding was done manually and it accounted for 10 percent of the total costs.

On the other hand, fertilizer accounted for the major share of the total cost of production at 17 percent for scheme based farms. This was attributed to the use of commercial fertilizers applied at 215 kg per acre. Bird scaring was the second most important component, accounting for 15 percent of the total cost, followed by land preparation at 14 percent.

Table 3: Cost shares in rice production

Activity	Scheme	Non scheme
Nursery costs	0.8	1.4
Land preparation	13.6	30.1
Planting costs	8.1	8.3
Fertilizer	16.8	0.0
Seed	2.5	4.4
Weeding costs	10.4	9.7
Pesticides	1.0	1.0
Harvesting	11.6	19.9
Post-harvest	8.1	7.6
Irrigation water	5.0	0.0
Bird scaring	14.9	8.3
Other labor	0.7	2.8
Working capital	6.5	6.5

Table 4 presents an analysis of returns in rice production under scenarios I and II. In scenario I (the actual production), the average cost of producing a 90-kg bag of rice was KES 2,415 and KES 2,261 for scheme and non-scheme farms, respectively, with profits of KES 2,985 and KES 1,339 per bag, respectively. The total cost of production per acre was KES 60,364 and the break-even yield was 11 bags for scheme farms, while non-scheme farms had a total cost of KES 36,177 and a breakeven yield of 10 bags per acre.

Scenario II is where land was valued at rental values. Land rent was KES 50,000 per acre in the scheme and its inclusion nearly doubled the cost of producing a bag of rice from KES 2,415 to KES 4,415. Hence, profit reduced by a substantial amount from KES 2,985 to KES 985 per bag (i.e. 67% drop), and the breakeven yield increased substantially from 11 to 20 bags. For non-scheme producers, land rent was KES 10,000 per acre and it reduced profit per bag by about 50% to KES 714.

Table 4: Margins in rice production

Scenario	Description	Scheme	Non Scheme
	Yields (90kg bags)	25	16
Revenue	Price (90kg bag)	5,400	3,600
	Revenue/acre	135,000	57,600
	Costs/acre	60,364	36,177
Scenario I	Cost/bag	2,415	2,261
	Profit/bag	2,985	1,339
	Breakeven yield	11	10
	Land rent/season	50,000	10,000
Scenario II	Cost/bag (+ LR)	4,415	2,886
	Profit/bag (+ LR)	985	714
	Breakeven yield	20	13

Table 5 presents profitability of rice farming under two scenarios regarding fertilizer sources: fully subsidized fertilizer and partially subsidized fertilizer. Majority of farmers in the scheme used commercial fertilizers and incurred KES 2,415 to produce a bag of rice. If the farmers had used partially or fully subsidized fertilizer, they would have saved KES 148 and KES 406 per bag, respectively. The scheme farmers' break-even yield reduced to 10 and 9 bags under partial and full fertilizer subsidy, respectively.

For non-scheme farmers, if they had used

commercial fertilizer, the cost of production would have been KES 2,711 per bag. Under the other two scenarios, the costs would be lower. Farmers would save KES 125 and KES 450 per bag, when using partially subsidized and free fertilizer, respectively. Access to fully subsidized fertilizer enabled the farmers to break even at 10 bags per acre as opposed to 12 bags had they used commercial fertilizers.

Table 5: Cost savings from fertilizer subsidy

Costs	Full subsidy	Partial subsidy
Scheme farmers		
Fertilizer cost	0	6,450
Total costs	50,224	56,674
Cost/bag	2,009	2,267
Profit/bag	3,391	3,133
Cost saving/bag	406	148
Breakeven yield	9	10
Non-scheme farmers		
Fertilizer cost	0	5,200
Total costs	36,177	41,377
Cost/bag	2,261	2,586
Profit/bag	1,339	1,014
Cost saving/bag	450	125
Breakeven yield	10	11

Key Findings

The key findings from the study are summarized as follows:

1. Cost of rice production per acre was KES 36,117 and 60,364 for non-scheme and scheme-based farmers, respectively. The difference in costs mainly arose from fertilizer, irrigation water, weeding and bird scaring costs, which were higher among scheme farmers. This translated to KES 2,261 and KES 2,415 per bag of rice, respectively.
2. Despite the higher costs for scheme-farmers, they registered a higher profit of KES 2,985 per bag, compared to KES 1,339 among non-scheme farmers. This was attributed to yield and output price differentials.
3. Land preparation, harvesting, bird scaring, planting and weeding were

the highest contributors to total costs for both categories of rice producers.

4. Rice production is a high cost but profitable enterprise in Kenya even where land is hired, despite the high land rates. However, renting-in land would lead to a drop of about 50-70% in profit.
5. Although contribution of irrigation water to costs of production was relatively low, water availability and access is crucial in rice production as evidenced by productivity differences between scheme-based and non-scheme farmers.

Recommendations

1. There is need to enhance development and uptake of innovations to reduce costs of production and enhance productivity. Some of the innovations include systems of sustainable rice intensification and use of nets for bird control.
2. Bird control is a substantial contributor to rice production costs. A coordinated multi-stakeholder approach between the national government, counties, Kenya wildlife services (KWS), agro-chemical companies and farmers would be key in surveillance, monitoring and control of migratory pest-birds in rice growing regions.
3. There is need to improve efforts in rice production and productivity through expanding area under irrigated rice, exploring opportunities for upland rice and intensification of rice production.
4. With the high capital requirement for rice production, affordable credit facilities to entrepreneurs in the rice value chain, especially producers, would be an incentive to improve participation in the enterprise. Given that rice production is a profitable business, financial institutions need to consider financing the enterprise to promote local production.



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