

Research Article

# Rice Farmgate Price Estimation and Collection Modality in Oromia, Ethiopia

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## Abstract

The main aim of this analysis to estimate minimum farmgate price for paddy rice and to indicate paddy rice collection modalities from farmers and provide an overview of current rice production status in Oromia. Rice (*Oryza sativa*) is one of the most stable foods and expected to contribute to ensuring food security in Ethiopia. The success of rice production depends somewhat on its high yield potential, processing technologies and marketing facilities. Improving rice production and productivity as well as facilitating its processing and marketing access is therefore one of a key part of the economic growth strategies in the Oromia government's food self-sufficiency initiatives. Both local production and import are the two key sources of rice grain supply and meet consumption demand of Oromia people. Consumption trends in Oromia as well as in Ethiopia have shown a substantial increase from time to time. Using a quantitative secondary data and a review of existing literature, this study provides an overview of the rice production and estimating the farmgate price of paddy rice. The study stresses the need for estimation of farmgate price, formulation of rice processing technologies and market-enhancing policies, such as supplying and installing rice processing technologies, better access to market facilities and market information and to improve rice productivity.

## Keywords

Paddy Rice, Farmgate Price, Food Self-Sufficiency, Marketing, Oromia

## 1. Introduction

Rice (*Oryza sativa*) is one of the most stable foods providing half of the daily calories for the world's population, including African countries [1, 15, 16]. Rice is the third most cultivated cereal crop in the world, after wheat and maize having 745 million tons of volume production [8]. and the main source of carbohydrates, vitamins, minerals, and protein for the developing countries including Africa [9, 8]. In the world, the largest volume of rice production is concentrated in China, India, Bangladesh, Indonesia, Vietnam, Thailand, Myanmar, Philippines, Pakistan, and Brazil.

Rice is among the targeted commodities which received due attention in transforming agricultural production. Recognizing the comparative advantages of rice over other food crops, it is considered as the "Millennium crop" that is expected to contribute to ensuring food security in the country [11]. Among the existing production ecologies, 81.2% is rain-fed lowland, 18.6% rain-fed upland and 0.2% is irrigated [7]. The country has an extensive and suitable ecology for rice production along with the possibility of growing in water-logged areas, where other crops cannot grow. The crop is

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produced under three main rice ecological zones in Ethiopia, namely rain-fed upland, rain-fed lowland and irrigated. With these ecologies, the country has a great potential of land, estimated at roughly six million hectares, of which 5.6 hectares are for rain fed and 3.7 hectares are for irrigation [11].

The crop has steadily increased in demand and growing area over the last one decade; thus, it becomes evident that it is a strategic commodity in the food security of the country. In Ethiopia in general and Oromia in particular there is potential and suitable agro-ecology for rice production. However, in 2020, the country pays a huge import bill reaching up to \$315.6 million per year to match supply with demand [6]. Rice consumption in Ethiopia has grown to 700 thousand tons per year, but the country only produces about 268.2 thousand tons per year [2, 5].

The gap between demand and production is growing, and the country lacks rice self-sufficiency as a result: (1) Farmers in Oromia have lost interest in producing rice due to marketing issues, inadequate linkage between producers, whole sellers, and retailers, and a shortage of milling machines (2) Rather than utilizing farmer supplies, the country has focused on rice imports (3) Changing consumption patterns of rice (4) Knowledge/skills gaps among rice growers about enhanced rice crop production technology and food processing because the crop is new to our country.

### 1.1. Objectives

- 1) To estimate minimum farmgate price for paddy rice
- 2) To indicate paddy rice collection modalities from farmers
- 3) To estimate financial liquidity required for union to collect rice production

### 1.2. Rice Production Trends Ethiopia and Oromia

In Ethiopia, most regions produce rice, but Oromia and Amhara are currently the most prominent. Data from the Central Statistics Agency [4] indicated that rice production is increasing rapidly in the Ethiopia from total 88.8 thousand tons in 2012 to 268.2 thousand tons in 2021 [5]. Oromia is the largest producer of rice having harvested area of 15,794.3 hectares with production of 804,523 quintals [13] and it has been principally cultivated in western Oromia (Bako, Wama and Gutin) and south west Oromia (Bedele and Jima). Accordingly, rice production in Oromia has increased from a total of 256,367 tons, in 2016 to 804,523 in 2022 [13]. Out of the total rice produced in the country, more 40% is produced in Oromia and out of this 70% is produced in southwestern Oromia.

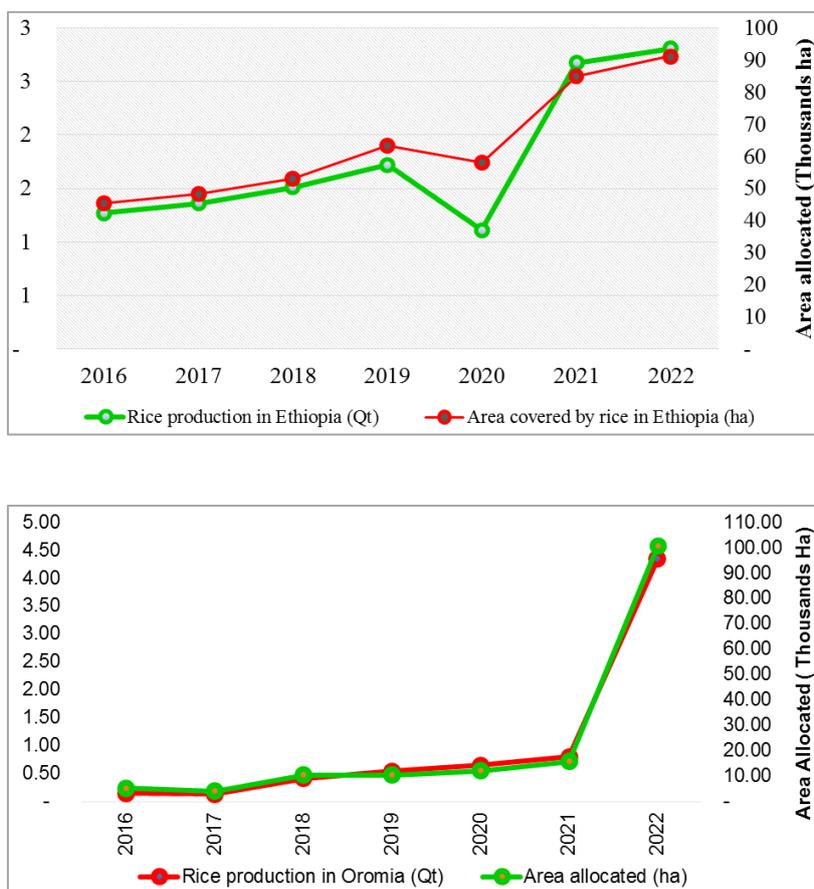


Figure 1. Trends in rice production, area coverage and productivity in Oromia vs Ethiopia (2016-2022).

Therefore, the regional government of Oromia better sets the floor paddy rice prices for producers. The benefit of setting floor paddy rice prices guarantees the farmer to get a fair profit for his crop if the market price falls, price stabilization, encourages production and food security.

## 2. Methodology

Data was collected from farmers, experts, and Development agents through telephone interview. Besides, secondary data was collected from selected zones and Oromia Bureau of Agriculture to estimate cost of production and minimum farmgate price. The collected data was then analyzed using gross margin and break-even analysis. The major return and cost components included

- 1) Operating Costs
  - a. Pre-harvest (Seed, fertilizer, chemicals, labour and operating cost of machinery/oxen)
  - b. Harvest cost (oxen operating cost/rental cost and labour)
  - c. Land cost for one year
- 2) Gross (total) revenue: This is the total value of output produced. Total revenue is calculated as total number of units produced  $\times$  price per unit of output.
- 3) Gross margin: is the total revenue less total variable costs incurred, i.e.  $\text{Gross margin} = \text{Gross revenue} - \text{Total variable cost}$
- 4) Farm profit: This is total revenue less total cost, i.e.  $\text{Farm profit} = \text{Total revenue} - \text{Total cost}$ .
- 5) Break-even budgeting

Break-even budgeting attempts to determine the minimum level of yield that would make total cost equal to total revenue at given prices of outputs and inputs, or the minimum level of output price that would make total costs equal to total revenue at given level of yield and input prices [3].

### 6) Break-even yield

The break-even yield is the yield at which total cost is equal to total revenue, or where profit is zero, given some output and input prices. Break-even yield is calculated as:

$$7) \text{ Break even yield} = \text{Total costs/Product price}$$

Break-even yield has an interesting interpretation. If the actual yield is higher than the break-even yield, it will be profitable for the farmers to grow the crop. Conversely, if actual yield is lower than the break-even yield, farmers grow the crop at loss.

### 8) Break-even price

The break-even price is the product price needed to just cover all costs at a given production level. In other words, the break-even price is the price level at which profit is zero for a given yield level [10].

$$\text{Breakeven price} = \text{Total cost/Yield}$$

$$\text{Gross profit} = \text{Total revenue} - \text{Total cost}$$

$$\text{Markup Percentage} = (\text{Gross Profit Margin/Unit Cost}) \times 100$$

$$\text{Sales Price} = \text{Cost} \times \text{Markup Percentage} + \text{Cost}$$

$$\text{Gross profit margin percentage} = (\text{Gross Profit/Revenue}) \times 100$$

## 2.1. Cost of Production and Farmgate Price Estimation

Using an expected yield of 36.9 quintals per hectare in 2023/24 production season with total costs 89,107.50 ETB per hectare, the break-even price is ETB 2,416.1 per quintal as indicated in Table 1. Assuming 25 percent of markup percentage the farmers mean value of farmgate price of paddy rice is ETB 3,020.2 per quintals with gross return of ETB 111,384.4 per hectare.

At 3,020.2 farmgate price and yield 36.9 Qt/ha the net profit of farmers is ETB 22,276.9 per hectare. The profit margin with this minimum price will be 20%. The break-even yield at this farmgate price is 29.5 Qt/ha and if actual yield is lower than this break-even yield, farmers grow the crop at loss. According Langemeier, M. and E. Yeager, 2018, farmers are encouraged to farms when an operating profit margin ratio of at least 20 percent as their benchmark.

**Table 1.** Costs of production and return for rainfed paddy rice per hectare.

Cost Items	Unit	Total Cost and return ETB/Ha
A. Labor cost		
Land preparation cost	ETB	12,000.00
Person required to ploughing	Person/oxen	8.0
Frequency of ploughing	Round	3.0
Labor wage to ploughing	Wage/oxen	500.0
Sowing	ETB	5,600.00

Cost Items	Unit	Total Cost and return ETB/Ha
Person required for sowing (person day/ha)	Person/oxen	16.0
Labor wage to sowing (wage/person)	Wage	350.0
Weeding cost	ETB	12,250.00
Labor wage for weeding	Wage	350.0
Frequency weeding	Round	1.0
Person required to weed	Person	35.0
Harvesting cost	ETB	12,250.00
Person required to harvest	Person	35.0
Average Labor wage to harvest	Wage	350.0
Labor cost for threshing and winnowing	ETB	12,330.00
Labor wage for threshing and winnowing	Wage	350.0
Person required to threshing & winnowing	Person	30.0
Transporting cost	ETB	1,830.0
B. Material input cost	ETB	
Seed cost	ETB	6,000.00
Amount of seed	Kg	100.0
average seed unit cost	ETB/kg	60.0
Herbicides cost	ETB	3,100.00
Amount of 2-4, D	Liter	2.0
Average 2-4, D unit cost	ETB/liter	1,100.0
Labor cost for 2-4, D spraying	Wage	700.0
Sprayer rent	Cost	200.0
Fertilizer cost	ETB	10,097.50
Amount of fertilizer NPS	Kg	100.0
Average fertilizer cost NPS	ETB	40.4
amount of Fertilizer urea	Kg	150.0
Average fertilizer cost urea	ETB	40.4
Sacks cost	ETB	1,480.00
Sacks	No	37.0
Unit price of sack	ETB	40.0
Other costs	ETB	14,000.00
Land rent/Contract	ETB	14,000.0
Total cost	ETB	89,107.50
D. Break-even price and Return		
Rice yield from pre-harvest assessment of 2016 E.C	Qt	36.9
Break-even price	ETB	2,416.1
Break-even yield	Qt	29.5
Minimum selling price of paddy rice @25% markup percentage	ETB	3,020.2
Total Revenue @25% Markup Percentage	ETB	111,384.4

Cost Items	Unit	Total Cost and return ETB/Ha
Net profit (TR_TC)@25% Markup Percentage	ETB	22,276.9
Benefit Cost Ratio (BCR) @25% Markup Percentage		1.3
Minimum selling price of paddy @30% markup percentage	ETB	3,141.0
Break-even yield	Qt	28.4
Total Revenue 30%	ETB	115,839.8
Net profit (TR_TC) @30% Markup Percentage	ETB	26,732.3
Benefit Cost Ratio (BCR) @30% Markup Percentage		1.3
Minimum selling price of paddy @40% markup percentage	ETB	3,382.6
Break-even yield	Qt	26.3
Total Revenue 40% Markup Percentage	ETB	124,750.5
Net profit (TR_TC) @40% Markup Percentage	ETB	35,643.0
Benefit Cost Ratio (BCR) @40% Markup Percentage		1.40

Source: Own computation based on secondary data, 2023

### 2.2. Rice Collection Modality

Currently the production of rice is based on small-scale which strike the linkage of market between producers and processing unit. Hence, the farmers are need to be organized in cooperative/Union that support the bulking of paddy rice to supply to the processing market and then delivered to the processors through union (Figure 2).

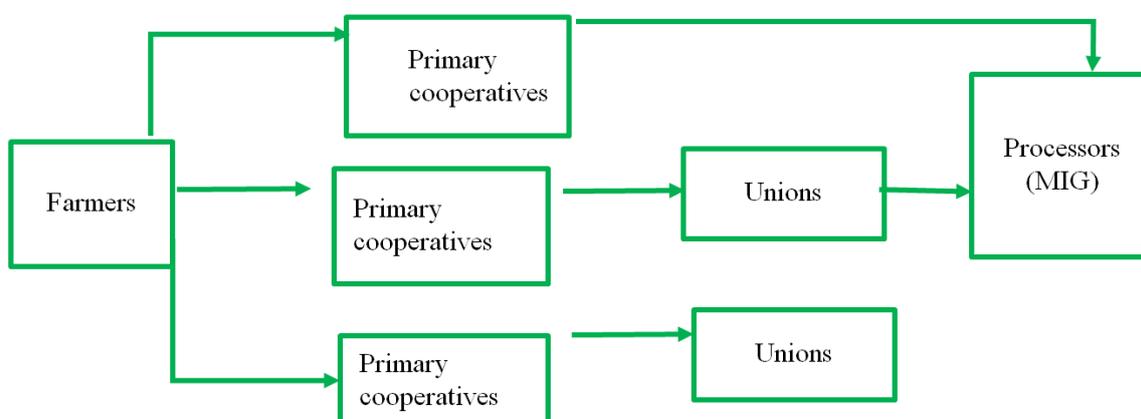
### 2.3. Marketing Cost of Primary Cooperative and Union

Based on the assumption of 25% markup percentage of the

farmers, the minimum support price was estimated to be 3,020.2 ETB/Quintals. In paddy collection and supply to processors, the primary cooperatives and union marketing cost are transportation cost, loading/unloading cost, containers (sacks), storage cost and other administration cost Table 2.

Assumption:

- 1) Union rent 1000-2,000 tons capacity storage with 50,000 ETB per months
- 2) The union will store less than 1 months
- 3) 2% of profit margin for both primary cooperatives and union are considered



Source: Own computation, 2023.

Figure 2. Paddy rice collection modality.

**Table 2.** Paddy rice marketing cost of primary cooperative/union per quintals.

S.N	Cost variable	Marketing cost of Primary cooperative/Union (ETB/Qt)
1	Transportation	38.2
2	Loading/unloading	40.00
3	Sack	40.00
4	Storage Rent	-
5	Admin cost	30.00
	Total estimated cost	148.00

Based on this marketing cost of primary cooperative and union, the paddy rice prices was estimated. Accordingly, selling price of primary cooperative/union are described below in the [Table 3](#). Finally, the primary cooperative/union will supply the paddy rice to the final processors (MIG) at 3,200.2 ETB per quintal at union site or supply to MIG by 3,433.00 ETB at Gambella processing price.

## 2.4. Price and Expected Profit Estimation for Primary Cooperative and Union

**Table 3.** Estimated price, marketing cost and margin for actors ETB per quintals.

Actors	Marketing cost	Purchasing price	Expected markup percentage (@1%)	Selling price
Producers	-	-		3,020.2
Primary cooperatives/Union	148.2	3,020.20	31.68	3200.08

Source: Own computation, 2023.

## 2.5. Price and Expected Profit/Loss Estimation for MIG

The MIG owned by Saudi Star Agricultural Development PLC rice processing factories have different processing efficiency and stage to be conducted at Gambella and Bishoftu.

The Gambella factory process only brown rice whereas the Bishoftu factory process both table rice and broken rice. Based on the purchasing modality, the MIG could purchase the paddy from different actors in the proxy area, Ilu Ababa bor zone. Based on these modalities, the profit margin was calculated as indicated on the [Table 5](#).

Proportion of rice conversion standard in [Table 4](#).

**Table 4.** Rice Business Profitability Analysis for MIDROC Investment Group (MIG).

Rice products	International Rice Ratio	MIG Rice Ratio	Farmers Rice expected Ratio
Paddy rice	100%	100%	100%
Brown rice	78%	78%	78%
Head rice	25%	19%	16%
Broken rice	55%	60%	65%
Bran	16%	16%	15%
Dust	4%	5%	4%

Source: MIG, 2022

**Table 5.** Rice Business Profit/Loss Statement (If purchased from PC @3200.20 ETB/Quintal) MIG.

Description	Unit Cost (ETB/qt)	Total Cost (ETB)	Total Amount (ETB)
<b>A. Cost</b>			
Purchase Amount of Paddy Rice	3,200.00	3,104,000,000.00	
Cost of Transport (Bedele to Gambella)	233.00	226,010,000.00	
Cost of Transport (Gambella to Bishoftu)	538.00	407,050,800.00	
Processing Cost of Paddy Rice to Final		411,288,310.72	
Total cost			4,148,349,110.72
<b>B. Revenue</b>			
		Quantity (Quintal)	
Head Rice	7,200.00	121,056.00	871,603,200.00
Broken Rice	6,500.00	491,790.00	3,196,635,000.00
Bran	1,500.00	113,490.00	170,235,000.00
Total revenue			4,238,473,200.00
Difference (Gain/Loss)			90,124,089.28
Profit margin			2%

Source: Computation from MIG 2022

*NB in addition,*

The MIG could sell bran for poultry feed preparation whereas sell the husk for livestock feed or paper factories. But, it could not possible to indicate the prices of these product on market to include in revenue item.

The cost includes only transportation cost and paddy rice purchasing cost

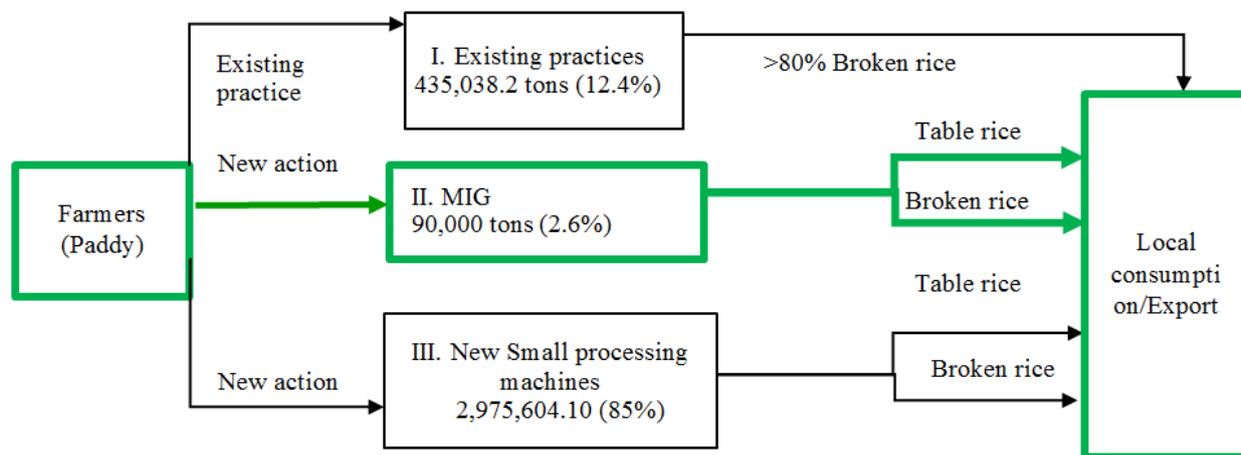
The Gambella processing factory gives 78% (100kg paddy rice gives 78kg brown rice) of brown rice and 22% of husk (The Bishoftu Transportation was calculated with 78% of paddy rice transportation cost) [12].

Paddy rice supply Route

The expected paddy rice production in Oromia is 4.4 mil-

lion tons in 2023/24 production season from which 3.1 million tons of paddy rice will be collected through primary cooperatives [14]. However, both the primary cooperatives and union have no enough capital to collect all these yield from farmers. Therefore, the union need financial liquidity from the regional government.

On the other hand, the rice production will be expected to flow in different supply routes based on the previous assessment. Accordingly, rice-processing factory owned by MIG will be supposed to handle 90,000 tons of paddy rice in Illu Aba Bor zone whereas the remaining 2.98 million tons of paddy rice will be supposed to flow in another route.



**Figure 3.** Scenarios for rice marketing.

#### Route 1: The supply for MIG

The total amount of 90,000 tons of paddy rice will be expected to be supplied to MIG through union with the estimated price of 3200.2 ETB per quintal. Minimum selling farmgate price of farmers will be 3020.2 ETB

#### Route II: Supply to other processing unit

The union aggregates the rice production through its primary cooperatives to supply the paddy rice to the other processors.

### 3. Conclusion and Recommendation

Rice processors or other actors should purchase paddy rice from farmers with an estimated minimum farmgate price of 3,020.2 or above depending on market price situation. Paddy rice collection, bulking and delivery need to be administered under union.

- 1) MIG will purchase paddy rice from Union (at Union store) by 3200.00 ETB
- 2) MIG will purchase paddy rice from Union at Gambella by 3433.00 ETB

Government interventions are needed to regulate brokers and illegal traders involved on rice marketing and facilitate rice transportation and marketing. Government should strengthen private investors to invest on rice processing machine and involved on rice marketing. Union/primary cooperative should play leading role in rice collection from farmers and processing of rice.

### Abbreviations

MIG	Midroc Investment Group
CSA	Central Statistics Agency
EIAR	Ethiopian Institute Agricultural Research
MoARD	Ministry of Agriculture and Rural development
TR	Total Revenue
TC	Total Cost
BCR	Benefit Cost Ratio
ETB	Ethiopian Birr

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### Author Contributions

Addisu Hailu is the sole author. The author read and approved the final manuscript.

### Conflicts of Interest

The authors declare no conflicts of interest.

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