



# Production and marketing of rice (*Oryza sativa*) in the community - Tooli sector, Opala territory, Tshopo province. DR Congo

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## Summary

With a view to identifying the production and marketing of rice in the Tooli community-sector, Opala territory, Tshopo province, a study was carried out over the period from 2022 to 2023. The results were as follows:

The Tukey Multiple Comparison of Means Test showed that the averages for areas sown to fields, rice production, quantities of paddy sold and revenue from paddy sales showed highly significant differences ( $p = 0.0000^{***} < 0.05$ ).

The socio-economic analysis showed that operators in the rice-growing sector in our study area are made up of natives (Mbole tribe) 90%, non-natives 6% and non-natives 4%.

The low rice yields from the small areas planted show that rice growing is not booming in Opala.

The structure of the rice market in our study area is oligopolistic, which proves that there is an imbalance between demand and supply, resulting in the enrichment of crooked intermediaries who are few in number and well informed about various market parameters.

**Key words:** Production, marketing; Rice, community - Tooli sector.

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## I. INTRODUCTION

In the Democratic Republic of Congo, rice ranks second in cereal production after maize. The quantity of rice produced in 2019 was 1,378,846 tonnes, compared with 2,138,962 tonnes of maize. According to INS (2020). Paddy rice production in the 2018 season was 457,479 tonnes and in the 2019 season 490,015 tonnes, an increase of 6.64% on the base year (2018). Paddy rice production in Tshopo Province in 2018 was 119,602 tonnes and 128,108 tonnes in 2019, an increase of 7.11% on the previous year.

National consumption is estimated at 7kg of white rice per person per year. However, it reached 9.4 kg in the former Province of Orientale, 19.5 kg in the Province of Kinshasa and 17.5 kg in Sankuru (former Province of Kasai Oriental) and in the Province of Maniema (SNSA, 2018). Rice consumption is currently on the rise in the country's major cities and some urban centres, because it is easy to store and prepare.

As well as providing a livelihood, rice earns a certain amount of income for all those involved in the sector: growers, transporters, processors and traders. World rice trade in the 2018-2019 season was down by around 8% on the previous season, at 42.6 million tonnes, as a sharp contraction in demand from Asian origins far outweighed a modest increase in shipments to sub-Saharan Africa (OSIRIS in France AgriMer, 2020).

Rainfed rice was introduced to the DRC in the fifteenth century by the Arabs. It was not until the 1950s that the country began to grow irrigated rice on an experimental basis, thanks to assistance from the Taiwanese government.

These two types of rice growing are still practised today, with rain-fed rice accounting for 98% of the area sown and irrigated rice for 2%. The bulk of production comes from four provinces: the dismembered former Province Orientale (28%), Maniema (20%), the dismembered former Equateur (13%) and the dismembered former Kasai Oriental (11%), mainly Sankuru, which together account for more than 72% of

national production (UNDP/UNOPS, 2012).

Irrigated rice is grown in Kinshasa, on the Ruzizi plain and on a small scale in the dismembered former Equateur region (Bumba) and in Central Kongo. Rice growing in the DRC is still the preserve of small-scale producers, who farm an average of 0.50 ha of rainfed land and 0.20 ha of irrigated land, producing less than 0.5 and 0.6 tonnes of paddy respectively (INS, 2018).

Tshopo Province has sufficient land and water resources to produce enough rice to feed its growing population. In addition to its natural resources, the young population of Tshopo Province is seen as a major human resource conducive to economic growth over the coming decade. The prospects for young people's involvement in agricultural development in Tshopo Province, particularly in the Opala territory, are enormous.

The marketing of rice, like any other agricultural product, enables it to be transferred from the place of production to the place of consumption. It is therefore a series of interconnected activities involving: production planning, cultivation and harvesting, sorting, packaging, transport, storage, distribution and sale. Such activities cannot be carried out without an exchange of information and are often highly dependent on the availability of adequate funding (Vernin, 1998).

Marketing systems are dynamic. They are competitive and involve continuous change and improvement. The activities that prosper are those that generate lower costs, are more efficient and can supply quality products. Those that generate high costs, fail to adapt to changes in market demand and supply inferior products often go out of business. Marketing must be oriented towards consumers and generate a profit for the grower, transporter, trader, processor, etc. This implies that the players involved in the marketing chains understand the buyer's requirements, in terms of product and economic activity.

In this study analysing the functioning of rice (*Oryza sativa*) cultivation (production and marketing), our question is: what is the local rice production and marketing system in the community - Tooli sector in Opala territory?

We believe that the local rice production and marketing system in the Tooli sector of Opala is still traditional and still poses problems.

The aim of this study is to highlight the rice production and marketing system in the community - Tooli sector, Opala territory, Tshopo province.

#### ❖ **Environment, Materials and Methods**

The study was carried out in the Opala Territory, the capital of which is located 278 km from Kisangani, in the Tooli local authority area.

Opala is part of Tshopo province, which has seven territories (Bafuasende, Banalia, Basoko, Isangi, Opala, Ubundu and Yahuma). Opala lies between latitude 0° 20' North and latitude 1° South of the town of Kisangani (the urban-rural commune of Lubunga) on either side of longitude 24°. Naturally, the territory is bordered to the north by the territory of Isangi, to the south by the territory of Lomela (dismembered Kasai Oriental), to the east by the territory of Ubundu and to the west by the territory of Ikela (dismembered Equateur Province).

The climate is of the equatorial type, characterised by two short dry seasons from January to February and June to July, and abundant rainfall the rest of the time, with an average rainfall of 1,800 mm. According to KÖPPEN, this is an Af-type climate, with an average temperature of 25.2°C at night and 30-31°C during the day. The average relative humidity is 70° to 80°C (Annual Report, 2004).

Apart from Lobaie, there are other major rivers, including Etoli, Lokana, Lombo, Lokilo, Elila and several streams. The dominant vegetation is that of the dense, primary, lush equatorial forest, with its diversity of species. The secondary forests are also remarkable. The forests of Opala are home to some of the world's rarest animal species, including the Okapi, the Congo peacock and primates such as Makobola (the only one of its kind). The Opala territory is administratively made up of 11 communities, including 6 chief communities and 5 sector communities. The territory has 4 administrative management posts.

The territory of Opala was created by Order no. 70/2 of 01/04/1913 of the General Government of the Belgian Colony of the Aruwimi District.

Its capital is located in the heart of the equatorial forest of the Democratic Republic of Congo, on the banks of the Lomami River, a tributary of the Congo River. It has an estimated population of 178,945. Opala covers an area of 19,239 km<sup>2</sup>, with 9.3 inhabitants per km<sup>2</sup>, as shown in the table below.

**Table 1: Opala population/sex statistics**

N°	Local authorities	Men	Women	Boys	Girls	Total inhab.	%
1	Lobaie	9 443	11 714	5 525	6 543	33 214	18,6
2	Tooli	7 641	9 602	11 063	11 803	40 055	22,4
3	Balinga-lindja	3 060	3 034	6 362	7 804	20 260	11,3
4	Yapandu	2 676	3 168	3 407	3 637	12 888	7,2
5	Yalingo	3 218	3 027	3 354	3 970	13 569	7,6
6	Iye	3 017	2 663	3 630	2 919	12 229	6,8
7	Mongo	2 394	2 327	1 867	1 709	8 297	4,6
8	Kembe	2 965	3 372	3 628	3 367	13 332	7,5
9	Yeyango	2 832	2 247	3 174	3 419	12 672	7,1
10	Yomaie	1 162	1 162	1 346	1 249	4 919	2,7
11	Yawende-Loolo	1 765	1 758	2 016	1 971	7 510	4,2
<b>Total</b>		<b>40 173</b>	<b>44 461</b>	<b>45 921</b>	<b>48 390</b>	<b>178 945</b>	<b>100</b>

Source: Opala registry office 2003 census results

The table shows that the community of Tooli has a larger population than the others, followed by Lobaie. The lowest population is found in the community of Yomaie. This population is essentially made up of a single Mbole tribe with a nuance of dialect, namely :

- The "IMA" spoken in the two district-communities of Lobaie and Tooli (41% of the population);
- The "GOYA" occupy the other nine communities (59% of the population).

## II. Materials And Methods

To make this study feasible, we used the following materials: Survey booklet; Survey questionnaire/farming households; Tape measure (decameter); Scientific calculator; Ordinary calculator; Laptop computer; Bicycle; Honda CB125 and Senke125 motorbikes; Camera; and Recorder.

The survey population was made up of farmers, i.e. the head of the household himself and those living under his authority. Members temporarily absent from the household (less than three months) were included in the household population. Visitors and people temporarily present in the household at the time of the study (less than three months) are not considered to be members of the household (Mucchielli, 1989).

In our case, the mother population refers to the inhabitants of the Opala territory, essentially made up of a single MBOLE tribe from the Tooli sector community. This is an agricultural population that also hunts and fishes. Our study focuses on farming households, rice producers and those who trade in paddy.

### 2. Surveys

To carry out our surveys, we used the quantitative method to collect data.

#### ❖ Choice of sampling method nage

We used the simple random sampling method. We had an exhaustive list of the parent population. The sample was drawn from this list, taking care to ensure that each item on the list had the same probability of being included in the sample. The sample size was 30 households per site. Using this list, we carried out a random sample from which we drew a completely random sample using a table of numbers. In practical terms, this was a multi-stage survey (groups: 1<sup>er</sup> stage; villages: 2<sup>ème</sup> stage and households: 3<sup>ème</sup> stage).

#### ❖ Choice of groups and villages

In the first stage, all the groups in the Tooli district were numbered. Using a table of random numbers, the following four clusters were selected. At 2<sup>ème</sup> level, the villages were selected in the same way as the groups.

**Table 2: Selected groups and villages**

Groups	Villages
Yaikoli	Yaila

Yakonda	Yaleko
Yawelo	Yapehe
Yaisa	Yaongama

As with the first two levels, here we numbered all the households in the selected villages and used the random number table to draw the 30 households in each village.

### **3. Data collection techniques**

The questionnaire was administered individually to farm households in the various villages. The questionnaire was drawn up in French and translated orally into Lingala, Swahili or the local language as required. Most of the questions were closed and some were multiple choice (this questionnaire).

### **4. Variable specification**

The following variables were selected for this study:

- ✓ Area planted ;
- ✓ Production of paddy rice ;
- ✓ Production costs ;
- ✓ Cost ;
- ✓ Quantity of paddy sold ;
- ✓ Income from paddy sales.

### **5. Collection of data**

#### **a. Area sown**

The area sown is a production factor whose size determines the size of harvests on a traditional farm. (Timberlake, 1988). We know from the theory of agricultural economic space that the further farms are from a consumer market, the less intense the production of marketable products, all other things being equal (Guigou, 1970).

Indeed, if this is the case, farmers tend to substitute cash crops for cash crops, as transport costs take the place of profit, putting out of economic reach any production that could be developed in remote areas.

The area under cultivation varied according to whether it was primary or secondary forest and the size of the household.

In our study area, to determine the area to be sown, each head of household has a roll of nylon thread 100 metres long, with a knot every 10 metres. He also has two stakes.

Nylon wire is used for measuring, while stakes are used to align the area to be sown. During our assessments or sporadic checks, we used the tape measure (roll).

For a field with a recognised regular geometric shape, the known formula is used (e.g. square:  $C^2$ ).

For a field with an irregular geometric shape, the triangulation method was used.

#### **b. Paddy rice production**

After harvesting, the panicles are dried in the sun. The panicles are then threshed.

The quantity of paddy rice (all the grains) obtained is weighed to determine the actual weight. This operation is mainly carried out when a customer (buyer) arrives.

Often, a measuring container is used: a bucket or a bag whose contents (weight) have already been tested (approximate weight); for example 10kg for a bucket and 100kg for a bulging bag.

So, at the end of the harvest, the entire production will be known.

#### **c. Cost of production**

The cost of production is the sum of the cost of purchasing the raw materials and supplies used and the costs added by the enterprise (farmer) during production operations (Courtois., 1982).

In our study, the cost of production is the sum of the cost of purchasing seeds and the occasional labour used for clearing, felling, skidding, sowing and harvesting.

Mathematically it translates into:

$$CT = CVT + K \text{ (1)}$$

With TC: Cost of production CVT: Total variable cost K: Fixed cost

#### **Cost price**

The cost price is the sum of production costs and product distribution costs.

Formula:  $CR = CT + FDD$  (2) With CR: Cost of goods sold

TC: Production Cost

FDD: Distribution costs (transport, handling, display tax, storage, etc.).

#### **d. Sold production of paddy rice**

In our research environment, the production sold is the difference between the production achieved minus the quantity consumed by the members of the household and the part given to third parties who carried out the harvest as payment in kind.

We then calculate  $QV * PV$  (3)

With QV: Quantity sold PV: Selling price

#### **e. Revenue from paddy rice sales**

This was the revenue (in cash) realised after the sale of the quantity of paddy rice made available by the farmer for the commercial transaction.

Formula:  $R = Q_o * P$  (4)

With R: Revenue

$Q_o$  : Quantity offered P: Price

#### **Margin**

This is the difference between the selling price and the cost price.

Formula:  $MB = PV - CR$  (5)

With MB: Profit Margin PV: selling price

COGS: Cost of Goods Sold

#### **Financial profitability**

This is the quotient of the profit margin divided by the cost price multiplied by 100.

It is expressed as a percentage.

$$\text{Formula: } RF = \frac{MB}{CR} \times 100 \text{ (6)}$$

We determined our study universe or sampling frame by describing the population. To determine our sample, we used the simple random sampling method.

### **III. PRESENTATION AND DISCUSSION OF THE RESULTS**

#### **1. Average field area and average production in relation to the study sites**

Data on rice area and production in the study area are given in Table 03.

**Table 03: Average area and production per study site**

Villages	Area of fields (ha)	Rice production (t/ha)
YAHILA	0,440 <sup>b</sup>	1,275 <sup>b</sup>
YALEKO	0,659 <sup>b</sup>	0,945 <sup>b</sup>
YAPEHE	1,446 <sup>a</sup>	2,386 <sup>a</sup>
YAONGAMA	0,708 <sup>b</sup>	1,230 <sup>b</sup>
Meaning (p)	0,0000 <sup>***</sup>	0,0000 <sup>***</sup>

Means with equal letters, no significant differences for  $p > 0.05$  according to Tukey's Multiple Comparison

of Means Test

p: probability

0.0000\*\*\* : very highly significant differences

At the 5% significance level, the Tukey Multiple Comparison of Means Test shows highly significant differences ( $p = 0.0000*** < 0.5$ ) between the areas sown to rice fields at all the sites. The same is true of average paddy rice production at the 4 sites.

## 2. Average weight of paddy rice per field and recipe

The results relating to the weight of paddy rice and the recipe produced are presented in Table 4.

**Table 4.** Average weight of paddy rice per field and average revenue in relation to the study sites

Villages	Quantity of paddy sold (kg)	Receipts from paddy sales (FC/kg)
YAHILA	423,33 <sup>b</sup>	249210,0 <sup>b</sup>
YALEKO	636,83 <sup>b</sup>	35385,0 <sup>b</sup>
YAPEHE	1414, 67 <sup>a</sup>	778066,01 <sup>a</sup>
YAONGAMA	687,33 <sup>b</sup>	378011,0 <sup>b</sup>
Meaning (p)	0,0000***	0,0000***

Means with equal letters, no significant differences for  $p > 0.05$  according to Tukey's Multiple Comparison of Means Test

p: probability

0.0000\*\*\* : very highly significant differences

The Tukey Multiple Comparison Test of Means shows at the 5% significance level highly significant differences ( $p = 0.0000*** < 0.05$ ) between the quantities of paddy sold (Kg) in the 4 sites. The same is true for paddy sales revenue (FC/Kg).

## 3. Transaction settlement method

Self-financed farmers (18%) sell their produce in cash, while those financed by wholesalers (commercial intermediaries) 82% sell in cash, but sometimes on supplier credit.

Transactions between wholesalers and retailers are settled by cash payment. Consumers generally use cash for transactions with retailers. However, retailers sometimes sell their goods (rice) on credit to trusted customers (consumers).

## 2. Market structure

A market can be defined in terms of its structure. This means considering the number of competitors present and the number of potential buyers. Depending on the structure of the market to which the producer (the company) is going to address, the possibilities for action and the marketing decisions are different (Sylvie et al., 2003).

In the case of our study, the market is oligopolistic in the sense that there are a small number of suppliers (producers) facing a large number of demanders.

## 3. Retail price structure

The consumer price per kilogram of rice is broken down into profit margins and costs borne by each operator in the chain.

## 4. Market transparency and fluidity

Admittedly, there is no official marketing structure responsible for informing rice growers of supply and demand trends and prices. However, "word of mouth" works perfectly well through private contacts and informal networks, so that the price charged is very uniform. On the market, supply adapts well to demand, resulting in a wide variation in prices depending on the relative scarcity of the product (rice).

## 5. Price calculations.

The table below summarises the different prices.

**Table 8.** Summary of calculations of paddy selling price/Kg - cost price/Kg - gross margin/Kg - financial yield/Kg

Market level	Price level (FC/Kg)			
	PV	CR	MB	RF (%)
From the producer (paddy)	550	350	200	57
From wholesalers (Milled rice)	1 900	1 083	817	75
Retailer (Milled rice)	3 000	2 400	600	25

Source: study data (raw data in appendix)

A careful reading of this table reveals that the most profitable link is that of the wholesalers (intermediaries), with a profit margin of 817 FC/Kg, equivalent to 75% financial return. This means that this link is made up of experienced traders who are well informed about developments on the rice market. Next come the producers (rice growers) with a profit margin of 200 FC/Kg, equivalent to 57% financial return. Rice growers benefit from the help of family members (family solidarity) and the village community (village solidarity) in field work. As a result, the cost of production is relatively lower (low labour costs). Finally, the retailer has a profit margin of 600 FC/Kg, giving a financial return of 25%.

#### **IV. DISCUSSION**

An analysis of the market structure reveals that local rice has a strong loyal customer base. Overall, the market is oligopolistic.

The ratio of the profit margin to the selling price shows that wholesalers (intermediaries) have the highest margin (817 FC/Kg). The ratio of profit margin to selling price for retailers is 25%. This is much higher than the norm, which is between 5 and 8% for rice in developing countries (N'dri 2003). Poelmans (1997) found similar results between retailers and consumers of local rice. The author explained these excessively high margins by a lack of competition between retailers. They tacitly agree on prices to be charged by all.

The study reveals that margins and charges are evenly distributed between operators, in line with the idea that commercial intermediaries exploit producers. This result confirms the work of Jones (1972), for whom there is no evidence that long chains of intermediaries increase marketing costs and are a source of market inefficiency.

In fact, some traders, particularly wholesalers, are able to achieve higher profits by implementing more complex commercial strategies involving speculation and *termaillage* (forward buying and selling).

Speculation involves buying and storing paddy in times of plenty, then selling white rice in times of shortage. Fifty-five percent of traders say that they use this strategy, but only for small quantities, because storage requires adequate conservation conditions, and therefore investment.

*Termaillage* is practised by commercial intermediaries who finance production or lend money to producers who have pressing needs, such as children's schooling and medical expenses. The latter are obliged to sell them their produce under a contract between the two parties.

The practice of lending to farmers is to their disadvantage, as they sell at a price lower than the forward market price. Diomande (1995) observed the same phenomenon in western Côte d'Ivoire, where farmers often sell their paddy at a low price in order to pay for their children's schooling. The assertion by Dembele et al (1987) that the rice marketing circuit is characterised by a readiness to meet farmers' financial needs at any time needs to be qualified. In fact, as Hirsch (1993) has noted, the method of payment is the dominant factor in farmers' prices.

#### **V. CONCLUSION**

This study focused on the production and marketing of rice in the Opala area, in the case of the Collectivité-Secteur. We used random sampling to obtain a sample of thirty farming households per site (village) in our study area. We also used the documentary method to gather more information about our study. We used the agro-socio-economic analysis model to process the data.

We found that the agro-economic factors, the Tukey Multiple Comparison of Means Test shows that the averages for the area sown to fields, rice production achieved, quantities of paddy sold and income from paddy sales show highly significant differences ( $p = 0.0000^{***} < 0.05$ ).

Socio-economic analysis shows that rice-growing operators in our study area are 90% indigenous (Mbole tribe), 6% non-indigenous and 4% non-indigenous.

The low rice yields from the small areas planted show that rice growing is not booming in Opala. The structure of the rice market in our study area is oligopolistic, which proves that there is an imbalance between demand and supply, resulting in the enrichment of crooked intermediaries who are few in number and well informed about various market parameters.

The different price levels for marketing local rice show that wholesalers (commercial intermediaries) have the highest profit margin, i.e. a financial return of 75%.

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