



## Comparative Costs and Returns Pattern of Small-scale Groundnut Milling of RMP-12 and Ex-dakar Varieties in Gombe Metropolis, Gombe State Nigeria

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### Abstract

The study determined the costs and returns involved in small-scale groundnut oil processing of two varieties in Gombe metropolis. Twelve markets were purposively selected for their popularity in groundnut oil processing, where 90 processors were selected by simple random sampling technique. Data were collected using structured questionnaires and were analysed using farm budget model, profitability index and t-test analysis. The results revealed that Cost of shelled groundnut constituted the major (92.3% and 91.6%) components of processing costs ( $P < 0.01$ ) for RMP-12 and Ex-dakar respectively. The gross ratios, fixed ratios and operating ratios of the two groundnut varieties were  $< 1$ , meaning that the business was profitable. Also, the returns per naira invested of the respective groundnut varieties was ₦ 0.17 (\$ 0.0006) and ₦ 0.25 (\$ 0.0009) significant ( $P < 0.01$ ). Although, the RMP-12 variety gave higher gross income, but the Ex-dakar variety gave higher profit of ₦ 7,428.80 (\$ 26.20) per tonne per week ( $P < 0.01$ ). To achieve higher profit, the traders should embark on Ex-dakar variety as the main resource input. They should also have access to formal loans so as to improve productivity and efficiency.

**Keywords:** Comparative costs, Groundnut, Small-scale

**JEL Classification:** D24; D61

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### INTRODUCTION

Groundnut is an important oilseed and food for millions of people in the semi-arid regions. It generates employment on the farm during cultivation and in agro-processing units [International Crop Research Institute for the Semi-arid Tropics; ICRISAT] (ICRISAT, 2012). It is the 13<sup>th</sup> most important food crop in the world and the 4<sup>th</sup> most important source of edible oil (Abdulazeez et al., 2012). Food and Agricultural Organisation [FAO] (FAO, 1994) added that, its seeds contain high quality edible oil (50%), easily digestible protein (25%) and carbohydrates (20%). As such, it is an essential food product that enjoys good patronage in both the domestic and international market as a veritable source of edible oil, animals' feed and also consumed as snacks (Nnamdi, 2010). Groundnut undergoes several processes before reaching the ultimate consumer. One of these processes is the processing which involves basically the transformation of the raw

seeds into other finished commodities required by the consumers or for the next stage in a manufacturing chain. Such finished products include groundnut oil, groundnut cake, and animal feeds among others (Abdulazeez et al., 2012). Austin (1982), viewed agro-processing as important component of agricultural marketing as it adds form utility or utility of transformation to the initial raw product; therefore making the products more acceptable to the consumers, increasing its values and shelf life as well as opening new markets for the products. Based on the farm produce, agro-processing industries are normally sited in areas where other industries would be viable which in turns help to increase productivity and incomes of small-scale farmers (Austin, 1982; FAO, 2013).

The profitability of groundnut oil processing depends on reducing the capital and operating costs as much as possible, and at the same time maximising the income from the sales of oil and other by-products. A careful study of all costs is therefore necessary before setting up a processing plant. In particular the cost of the main pieces of equipments, salaries for the expected number of workers, and the prices for raw materials, fuel and power should be assessed. The price that can be charged for oil and by-products depends on a number of factors including quality, packaging, branding and the number, type and quality of competing products. These should each be assessed in order to calculate the likely income at the planned scale of production over certain period of time. The production costs can then be compared with the expected income to calculate the likely profitability. In most cases it is necessary to make full use of the by-products to make the enterprise financially successful (Haruna et al., 2012). Majority of groundnut processors in Gombe State incur great market losses due to erratic electricity supply, far distance from the source of basic raw materials (shelled groundnut), lack of market information, poor storage facilities, insecurity as a result of inter-tribal conflicts and insurgency etc. These problems may cause price instability of groundnut oil thereby constitutes important constraints to the supply of the commodity to retail markets. Another problem of agro-processing is how to manage resources in such manner as to maintain optimum relationship between expenditure and income. In other words, the processing firm must implement efficient conversion of resources so as to provide a supply answering the existing demand. The processing firm should decide what to offer, and how to pick the suitable market in which to offer its supply. To this effect, the research is therefore made to provide answers to the following questions: (i) What is the cost and return of groundnut oil processing? (ii) Is small-scale groundnut oil processing a profitable venture? However, the broad objective of the study was to compare the varietal economic differences of small-scale modern groundnut milling of RMP-12 and Ex-dakar in Gombe metropolis Nigeria, while the specific objectives were to: (i) determine the costs and returns of modern groundnut milling in the study area; (ii) ascertain the profitability indices of modern groundnut milling in the study area.

## **METHOD**

### **The Study Area**

Gombe Metropolis is the principal urban centre of Gombe State which serves as the administrative headquarters of the State and as well as that of Local Government Authority. Situated on longitude 11° 10' E and latitude 10° 17' N, with an altitude of 435.13 meters above sea level and bounded with three Local

Government Areas of the State; Akko, Yemaltu-Deba and Kwami and covering an area of 5.200km<sup>2</sup> [Gombe State Economic Empowerment and Strategy Development; GOSEEDS] (GOSEEDS, 2007). According to National Population Commission [NPC]; NPC (2006), Gombe Local Government Area had human population of 268,536, with males constituting 68.3% with a projection of 285,278 people in 2015 [Gombe State Government; GSG] (GSG, 2015). Gombe metropolis is known as the commercial centre of the North-eastern States Nigeria and served by a station on the eastern mainline of the railway network (GSG, 2012). About 80% of the population engaged in agriculture and agro-allied investments (such as production, processing and marketing). Major crops produced and or marketed include maize, millet, sorghum, cowpea, groundnuts, bambaranuts, rice, vegetables and fruits, and as well as livestock and fisheries. Gombe city is a confluence of economic activities by its position as the meeting point for agro-business people from the surrounding States of Adamawa, Bauchi, Borno, Taraba and Yobe. This advantage made the State vibrant in all respects (GSG, 2012). The area consists of predominantly traders, civil servants, small-scale farmers and other non-agricultural services. It is a multi-ethnic town constituting mainly of Fulani, Hausa, Tera, Bolewa, Tangale and Kanuri while other ethnic groups include; Waja, Tula, Jara, Yoruba and Igbo [Gombe Agricultural Development Programme; GADP] (GADP, 1994). The climate of the area is mainly controlled by the position of the inter-tropical discontinuity zone. It represents the interface between the dry tropical air originating from the Sahara desert and moist Equatorial Ocean zones [Bauchi State Agricultural Development Programme; BSADP] (BSADP, 1994). The study area is characterised by a warm climate, having a mean diurnal temperatures of 35°C – 40°C during the hottest months of (March – May) and to about less than 30°C during harmattan (GSG, 2012). GADP (1994) further reported that, the area has two distinct seasons based on the amount of rainfall received; the dry season (November – April) and the wet/rainy season (May – October) with an average rainfall of 850 mm per annum in 110 – 125 days. The mean relative humidity of the study area is estimated at 61.23% in August and 08.17% in the month of February (GOSEEDS, 2007).

### **Sampling Procedure**

A multi-stage sampling technique was used to select 90 small-scale modern groundnut oil processors. In stage I, Gombe metropolis was purposively selected. The choice was made by the fact that it's the commercial centre of the state and constituted about 85% of the target population for this study. In stage II, six market districts namely; Tudunwada, Jekadafari, Pantami, Herwagana, Bolari and Nassarawo were purposively selected because they were notable and predominant areas for small-scale modern groundnut processing and marketing. In stage III, two markets were selected each from the market districts. In stage IV, a total of 90 groundnut oil processors were selected using simple random sampling proportionate to the number of marketers in each market. In determining the sample size appropriate for this study, the Barlett et al. (2001) model as modified by Alamu & Olukosi (2010) was used, where 20% was suggested when the population is up to 1,000. The study sought to define sample size such that at least 95% level of confidence was obtained as probable error of using a sample did not exceed 5%. According to this model, the appropriate sample size for population of 451 traders

was 90. A proportional allocation technique was then used to determine the number of sample from each market.

**Data Collection and Data Analysis**

Data for this study were collected using structured questionnaires; this was supported with personal interview in situations where the respondents did not understand the questions. Data were then analysed using farm budget model, profitability indexes and t-test analysis. To determine the costs, gross and net returns; the gross margin analysis as a popular model was used, which also measured profitability of the enterprise. According to Salako et al. (2013), the Gross Margin (GM) equation was specified as:

$$GM = TR - TVC \dots\dots\dots (1)$$

However, Profit = Total Revenue – Total costs; expressed as;

$$\pi = TR - (TFC + TVC) \dots\dots\dots (2)$$

also,

$$TC = TFC + TVC \dots\dots\dots (3)$$

Where:

- GM = Gross Margin (₦)
- TVC = Total variable Costs (₦)
- TFC = Total Fixed Cost (₦)
- TC = Total Costs (₦)
- TR = Total Revenue (₦)
- $\pi$  = Profit (₦)

Moreover, the profitability indices such as the gross ratio, operating ratio, fixed ratio and returns to naira invested were used to further ascertain the profit level of each enterprise and in different markets. According to Daneji et al. (2006), the profitability indexes were specified as;

$$GR = TC:TR \dots\dots\dots(4)$$

$$OR = VC:TR \dots\dots\dots (5)$$

$$FR = FC:TR \dots\dots\dots (6)$$

$$R/\text{₦} = NI:TC \dots\dots\dots (7)$$

where;

GR = Gross Ratio; OR = Operating Ratio; FR = Fixed Ratio; R/₦ = Returns per naira

- NI = Net Income (₦)
- VC = Variable Cost (₦)
- FC = Fixed Cost (₦)

However, the Paired t-test analysis was used to test for significance of costs, returns and profitability levels of the respective groundnut varieties. The model was assumed appropriate to compare the means of the two sample groundnut varieties.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \dots\dots\dots (8)$$

Generally the model was specified as;

Where:

$t$  = t-value calculated

$\bar{X}_1$  and  $\bar{X}_2$  = Arithmetic means for the two sample groups

$S_1$  and  $S_2$  = Variances of the two sample groups

$n_1$  and  $n_2$  = Sample sizes of the two group

But in a more explicit form, the model is specified as;

$$t = \frac{\bar{X}_A - \bar{X}_B}{SED} \dots\dots\dots (9)$$

Where:

$t$  = t-test value

$\bar{X}_A$  = Arithmetic mean of the variables of RMP-12 variety

$\bar{X}_B$  = Arithmetic mean of the variables of Ex-dakar variety

SED = Standard error of the difference; and SED is determined as;

$$SED = \sqrt{(SE_A)^2 + (SE_B)^2} \dots\dots\dots (10)$$

where;

$(SE_A)^2$  = Standard error of RMP-12;  $(SE_B)^2$  = Standard error of Ex-dakar

To take decision on whether or not the difference between the two varieties is significant, the confidence limit was set at 0.05 (Williams, 2006).

## RESULTS AND DISCUSSION

### Comparative Costs and Returns of Groundnut Processing of RMP-12 and Ex-dakar Variety

Costs are the actual expenses incurred in the process of marketing agricultural products. Saleh (2006) reported that, marketing costs comprises of the actual expenses incurred in the performance of the marketing activities as the commodity moves from the farm to the ultimate consumer. Costs in processing and marketing of groundnut products were grouped basically into two; the fixed costs and the variable costs, while returns were obtained from the sales of the products (oil and cake). Also, profits and/or lost were determined from the differences between the total revenue and the total costs incurred in marketing. However, the average total costs and returns from processing of average 3.12 tonnes of shelled groundnut per trader per week were determined and presented in Table 2. The results revealed, the average total costs of processing 3.12 tonnes of shelled groundnut per week, was ₦ 417,959.13 (\$ 1,474.28) and ₦ 386,596.21 (\$ 1,363.66) for RMP-12 and Ex-dakar respectively, and was significant ( $P < 0.01$ ). This was because the buying cost of raw RMP-12 was than that of the Ex-dakar variety. Also the results depicted that, fixed cost components were merely 0.42% and 0.47% of the average total costs of processing RMP-12 and Ex-dakar respectively. The cost of raw RMP-12 variety accounted for 92.25% while that for Ex-dakar variety constituted 91.62% of the average total costs. In terms of returns, the average gross margin (GM) of ₦ 73,786.77 (\$ 260.27) and ₦ 96,964.69 (\$ 342.03) ( $P < 0.01$ ) were realised from the sales of 1,606 litres (oil) and 1.53 tonnes (cake) obtained from RMP-12; and 1,512.7 liters (oil) and 1.63 tonnes (cake) obtained from Ex-dakar respectively. This however reveals that groundnut oil accounted for 67.54% of gross income from RMP-12 and 64.67% from Ex-dakar, with the remaining proportion (32.46% and 35.33%), accounted for revenues realised from the sales of groundnut cake of the respective groundnut varieties. This implies that both the products must be sold jointly so as to cover the total variable costs and make optimum profit.

Moreover, the revenues from edible oil accounted for 78.84% and 80.95% of the total costs of processing RMP-12 and Ex-dakar respectively. This implies that, for processors to make sufficient profit they have to sell both the cake and the oil. Similar findings were made by Daneji et al. (2006); Hamidu et al. (2007); Iliyasu et al. (2008); Hussaini et al. (2010) who reported that, to cover up the variable costs and make reasonable profit both groundnut oil and cake must be sold jointly. The result further showed the respective average net returns of ₦ 72,458.65 (\$ 255.59) and ₦ 95,636.57 (\$ 337.34) were made, and the difference was significant ( $P < 0.01$ ). This implies that net revenue of about ₦ 23,223.93 (\$ 81.92) and ₦ 30,652.75 (\$ 108.12) per tonne were realised from RMP-12 and Ex-dakar respectively. This is in line with Olumakinde (2013), who reported ₦ 20,000.00 (\$ 70.55) – ₦ 30,000.00 (\$ 105.82) profit was realised from processing one tonne raw groundnut in South East Nigeria. This translates that the business was profitable, as further confirmed by the rate of return to investment of 17.34% and 24.74% meaning that for every ₦ 1 (\$ 283.50) invested, ₦ 0.17 (\$ 0.0006) and ₦ 0.25 (\$ 0.0009) were realised as net returns from the respective groundnut varieties. This agrees with Danwanka et al. (2005) and Haruna et al. (2006) that groundnut oil processing and marketing was a profitable venture in Bauchi State. Although, the level of profit was low, which was attributed to low price paid for the products and coupled with high cost of groundnuts (Ilyasu et al., 2008). The high cost of groundnuts which is a cash crop may be attributed to the decline in its production due to negligence by the government since the discovery of petroleum in 1960s (Rahman, 2003; Talawar et al., 2003).

Table 1. Costs and returns of small-scale groundnut milling of RMP-12 and Ex-dakar variety per week

Elements			Amount (₦)		Relative % of TC	
Variable Costs	Quantity	Unit	RMP-12	Ex-dakar	RMP-12	Ex-dakar
Cost of shelled groundnut						
		tonnes				
Salt	3.12	grams	385,576.52	354,213.60	92.25	91.62
Onion	25.2	kg	98.83	98.83	0.023	0.026
Water	0.95	litres	184.67	184.67	0.044	0.048
Firewood fuel	300	kg	154.22	154.22	0.037	0.04
Advertisement	250	.	269.69	269.69	0.064	0.07
Transportation	.	.	134.66	134.66	0.032	0.035
Labour	.	Man	5,368.56	5,368.56	1.28	1.39
Security	4	day	7,805.56	7,805.56	1.858	2.017
Plastic oil containers	1	night	330.3	330.3	0.079	0.085
	65	Gallons	15,676.66	15,676.66	3.731	4.051
Poly-sacks	22	Pieces	1,031.34	1,031.34	0.245	0.266
<b>Total Variable Costs</b>			<b>416,631.01</b>	<b>385,268.09</b>	<b>99.58</b>	<b>99.53</b>
<b>Fixed Costs</b>						
Depreciation on durable items	.	.	512.17	512.17	0.1256	0.5191
Union dues	.	.	328.77	328.77	0.079	0.085
Tax	.	.	54.79	54.79	0.013	0.014
Electricity	.	.	423.39	423.39	0.101	0.11
Phone calls	.	.	424.44	424.44	0.102	0.11
<b>Total Fixed Costs</b>			<b>1,328.12</b>	<b>1,328.12</b>	<b>0.42</b>	<b>0.47</b>
<b>Total Costs</b>			<b>417,959.13</b>	<b>386,596.21</b>	<b>100</b>	<b>100</b>

Elements	Amount (₹)		Relative % of TC Relative % of TR	
<b>Returns</b>				
From oil	331,215.56	311,875.00	67.54	64.67
From cake	159,202.22	170,357.78	32.46	35.33
<b>Total Returns</b>	<b>490,417.78</b>	<b>482,232.78</b>	<b>100</b>	<b>100</b>
Gross Margin	73,786.77	96,964.69		
Net Profit	72,458.65	95,636.57		
<b>Paired t-test</b>	<b>Total costs</b>	<b>Total returns</b>		
Means	-15,198.889	8,185.0		
Standard error	1,189.666	2,324.296		
Degree of freedom	89	89		
t – values	-12.776***	3.521***		
P – values	0.000	0.001		

Source: Field survey data (2015)

Note: \$ 1 = ₹ 283.50; \*\*\* P<0.01

### **Comparative Profitability Analysis of Groundnut oil Processing of RMP-12 and Ex-dakar Variety**

Profitability analysis is a component of enterprise resource planning that allows producers and marketers to forecast the profitability of a proposal or optimize the profitability of an existing business. It can anticipate sales and profit potential specific to aspects of the market, such as customers' socioeconomic status or product types (Margaret, 2015). The profitability ratios used to measure financial success of groundnut processing include: gross ratio (GR), operating ratio (OR), fixed ratio (FR), and rate of return to investment (ROR), which were presented in Table 2. Gross ratio shows the relationship between the total revenue and the average total costs. The GR evaluates the performance of the business, such that lower ratio of < 1 is considered desirable (Daneji et al., 2006). This entails higher returns per Naira invested. From the results, the gross ratio for RMP-12 (0.8523) and Ex-dakar (0.8017) were recorded. This implies 85.23% and 80.17% of the total revenue gives to pay for the total costs of processing the respective groundnut varieties. This suggests the reason Ex-dakar variety gave higher average net return (profit) than the RMP-12 variety, because 14.77% and 19.83% of the total returns of the respective groundnut varieties were retained as profit, and the difference was highly significant ( $P < 0.01$ ).

Operating ratio is a ratio of a firm's variable costs to its total revenue. A positive and lower ratio of < 1 is desirable as this indicates that in the event of decline in sales or revenue, the firm will maintain its profitability status. A lower ratio is an indicator of operational efficiency of a business especially when compared to same ratio for competitors. The OR does not guaranty debt repayment or expansion of the firm's venture. Table 2 shows operating ratio of 0.8495 and 0.7989 for RMP-12 and Ex-dakar varieties, respectively. Meaning that, 84.95% and 79.89% of the total revenues were used to pay for the variable costs of the respective groundnut varietal processing with the remaining 15.05% and 20.11% constituted their gross margins. However, the difference was significant ( $P < 0.05$ ). Fixed ratio measures firm's ability to pay for all its fixed charges with its income. The FR also viewed as a solvency ratio (SR) as it shows how easily a firm can pay its bills when they are due. The higher the ratio the better and firms are less at risk to invest.

Lower FR shows firm's inability to meet its durable liabilities from the total revenue. The result showed the FR of 0.0027 and 0.0028 were recorded from processing of RMP-12 and Ex-dakar respectively. Implying that, only 0.27% and 0.28% of the total revenues went to pay for the fixed costs of the respective groundnut varietal processing. This implied that the processing firms had the ability to meet their long term debt obligations by 99.73% and 99.72% of the respective groundnut varieties; this entails non-significant (NS) difference in solvency ratios of the two groundnut varieties. The rate of return to investment was 0.1734 (RMP-12) and 0.2474 (Ex-dakar), which further confirmed the relative profitability of the two enterprises; meaning that for every one naira invested in small-scale groundnut processing of RMP-12 and Ex-dakar varieties; ₦ 0.17 (\$ 0.0006) and ₦ 0.25 (\$ 0.0009) were realised, with the later (Ex-dakar) had more profit and the difference was significant ( $P < 0.01$ ). This was because the RMP-12 variety incurred higher average total variable costs of ₦ 31, 362.92 (\$ 110.63) than Ex-dakar variety. The average cost of shelled RMP-12 variety was ₦ 123,582.22 (\$ 435.92) per tonne while that of Ex-dakar was ₦ 113,530.00 (\$ 400.46) (Table 1). Adinya (2009), reported similar findings of ₦ 0.22 (\$ 0.0008) was realised as return per naira invested in groundnut marketing in, Cross River State. Also, Iliyasu et al. (2008) recorded the return on investment in groundnut processing in Maiduguri metropolis as 40% of the total investment, which means for every one naira invested, 40 kobo was realised. Since the prevailing interest rate on savings is 20%, therefore, it is better to invest in groundnut oil and cake processing than to save money in these commercial bank.

Table 2. Profitability analysis of groundnut oil and cake processing of RMP-12 and Ex-dakar variety.

Markets	Gross ratio		Operating ratio		Fixed ratio		Returns per naira	
	RMP-12	Ex-dakar	RMP-12	Ex-dakar	RMP-12	Ex-dakar	RMP-12	Ex-dakar
Tudunwada	0.8381	0.8007	0.8307	0.7693	0.0029	0.0033	0.1552	0.2208
Jekadafari	0.8732	0.8069	0.8798	0.8896	0.0021	0.0019	0.2012	0.2886
Pantami	0.8591	0.8014	0.8678	0.8466	0.0023	0.0021	0.1906	0.2701
Herwagana	0.8316	0.7987	0.8193	0.6997	0.0035	0.0037	0.1401	0.2097
Bolari	0.8591	0.8012	0.8597	0.7995	0.0026	0.0026	0.1902	0.2575
Nassarawo	0.8528	0.8011	0.8395	0.7886	0.0028	0.0032	0.1631	0.2377
<b>Total</b>	<b>5.1139</b>	<b>4.810</b>	<b>5.0968</b>	<b>4.7932</b>	<b>0.0162</b>	<b>0.0168</b>	<b>1.0404</b>	<b>1.4844</b>
Minimum	0.8316	0.7987	0.8193	0.6997	0.0021	0.0019	0.1401	0.2097
Maximum	0.8732	0.8069	0.8798	0.8896	0.0035	0.0037	0.2021	0.2886
<b>Means</b>	<b>0.8523</b>	<b>0.8017</b>	<b>0.8495</b>	<b>0.7989</b>	<b>0.0027</b>	<b>0.0028</b>	<b>0.1734</b>	<b>0.2474</b>
<b>Paired t-test</b>								
Means	0.5065		0.5060		- 0.00010		- 0.07400	
Standard error	0.00529		0.1778		0.00011		0.00339	
Degree of freedom	5		5		5		5	
t – values	9.578 ***		2.846 **		- 0.889 NS		- 21.822 ***	
P – values	0.000		0.036		0.415		0.000	

Source: Field survey data (2015)

Note: \*\*\*  $P < 0.01$ ; \*\*  $P < 0.05$ ; NS = Non significant



## CONCLUSION

Based on the results obtained from this study, it may be concluded that the enterprise is profitable, that Ex-dakar variety gave higher gross margin. The traders were regarded small-scale considering their working capital, work force, firm size, and sources of initial capital. The profitability indices and the returns per naira invested revealed the business was profitable. The demand for the commodities especially the groundnut cake (which was not meant for human consumption but for animal feeds' formulation and other industrial purposes) was found to be relatively high especially during the lean period. Instability of prices in conjunction with low quality shelled groundnut were among the factors that could lead to business failure of the traders. The major impediments to groundnut oil processing in the study area also include; security challenges, costs of inputs, inadequate capital, erratic power supply, low prices of the products and poor market information. In order to achieve sufficient profit in small-scale modern groundnut oil processing in Gombe metropolis, the following recommendations were made based on the findings of this study: The traders are encouraged to join cooperative associations to have access to formal loans for expansion, and to create other market linkages with a view of maximising advantages of distant markets. Also, Government and other lending agencies should do more to assist the marketers with soft loans; this will help solve problems of inadequate capital. The needed infrastructures; electricity, good roads, storage facilities etc. should be adequately provided by the government and other donor agencies in order to reduce marketing costs. The processors are encouraged to utilise Ex-dakar variety as their main resource input based on its high gross margin. Marketing operations should be improved for enhanced efficiency in all the markets in the study area.

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