

ECONOMIC VIABILITY AND COST-EFFECTIVENESS OF AGRIBUSINESS ENTERPRISES: EMPOWERMENT PROGRAM OF KANO AGRO-PASTORAL DEVELOPMENT PROJECT/SASAKAWA AFRICA ASSOCIATION IN KANO STATE, NIGERIA

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Abstract

The study assessed the economic viability and cost-effectiveness of agribusiness enterprises supported under the Kano State Agro-Pastoral Development Project (KSADP) and Sasakawa Africa Association (SAA) in Kano State, Nigeria. Using a multistage sampling procedure, data were collected from 225 beneficiaries drawn from five major enterprises: rice parboiling, rice milling, youth spray service provision, onion storage, and agro-input dealerships. The results revealed that all the enterprises with the exception of rice par-boiling were male dominant with relatively large household size ranging from 7 – 11 persons. It was also found that all the enterprises were profitable with positive net incomes and high benefit-cost ratios (BCR) ranging from 1.99 to 5.62 and OR of 0.02 to 0.45. It is concluded that agribusiness enterprises were profitable and cost-effective. It is recommended that the beneficiaries should be encouraged to adopt renewable energy solution and improve market linkages to enhance profitability and sustainability of the enterprises.

Keywords: Agribusiness, Youth and Women Empowerment, Cost-effectiveness, and Kano State

1 Introduction

Agriculture plays an important role in providing not only sufficient food for the country's population but also job opportunities, poverty reduction and raw materials for agro-allied industries [1]. In sub-Saharan Africa, agribusiness has emerged as a key force behind rural change, providing vulnerable populations including women and youth with job opportunities, income generation, and poverty alleviation [2, 3]. The shift from subsistence to agribusiness-oriented farming is essential for improving livelihoods and guaranteeing food security in Nigeria, where agriculture continues to be the largest employer [4]. Particularly in northern Nigeria, where institutional and cultural barriers limit their access to markets and productive resources, youth unemployment and women's low involvement in formal agribusiness continue to be major issues [5, 6].

Kano is the most populous State in Nigeria [7]. However, 66.3 per cent of its population are multidimensionally poor [8]. The State had about 6.58 million youth of which 3.32 million were male and 3.36 million being females [9]. According to NBS [10], 7.6% of the working age group in the State were unemployed and 8.4% of the women among were unemployed.

To address these challenges, Kano State Agro-Pastoral Development Project (KSADP) with the assistance of the Sasakawa Africa Association (SAA), has implemented some agribusiness initiatives aimed at improving the livelihood of youth and women. These include; Agri-input dealerships, youth spray services provision, onion storage management, rice millers and women par-boilers. Through skill development, business assistance, and better market access, these companies were chosen with the intention of empowering marginalized populations, strengthening value chains, and generating jobs and income [11].

based on the sample determined by the research advisors. As such 45 beneficiaries from each of the enterprises were selected making the sample size of 225 respondents across the dominants LGAs selected. See Table 1

Table 1. Sample Size for the 5 Enterprises supported under SAA/KSADP

Survey Type	Target Group	Specific Locations & LGA	Sample Size
	Rice parboilers	Kura, Tudun Wada, Dawakin Kudu, Makoda, Dambatta	45
	Rice Millers	Kura, Dawakin Kudu, Tudun Wada, Bunkure	45
	Agro-input/ Stockiest	All	45
	Onion Storage	Dawakin Kudu, Kura, Tudun wada,	45
	Sprayers Service Providers	Kura, Garum Malam, Tudun wada, Gwarzo	45
	Total		225

2.3 Data Collection

The data for this study were collected using structured questionnaires and schedule questions through the trained enumerators. The information elicited include operational cost, and income-related indicators as contained in the project's logical framework.

2.4 Method of Data Analysis

Descriptive statistics and cost and return analysis were used to analyzed the data collected for this study.

2.4.1 Descriptive Statistics: descriptive statistics such as frequency, percentage and mean were used to summarize socio-economic characteristics of respondents.

2.4.2 Cost and Returns Analysis: this was used to estimate net profit margin, net farm income, return on investment (ROI), benefit–cost ratio (BCR), and operating ratio (OR) for each enterprise. The model can be specified as:

$$\text{Total Revenue (TR)} = \sum (\text{Quantity sold} \times \text{Price per unit sold}) \dots\dots\dots(1)$$

$$\text{Net Profit Margin} = \left(\frac{\text{Net farm income}}{\text{Total Revenue}} \right) \times 100 \dots\dots\dots(2)$$

Where:

$$\text{Net Farm Income} = \text{TR} - \dots\dots\dots(3)$$

$$TC = \sum TVC + \sum TFC \dots\dots\dots(4)$$

2.4.3 Return on Investment (Return Per Naira Invested)

$$\text{Return on Investment (ROI)} = \frac{\text{Net farm income}}{\text{Total cost}} \dots\dots\dots(5)$$

2.4.4 Benefit-Cost Ratio

Benefit-Cost Ratio (BCR) is calculated by dividing the total revenue generated from selling output by the cost production of the output. The higher the BCR, the higher the profit margin. Hence, positive BC Ratio is always desirable and most recommended.

$$\text{Benefit-Cost Ratio (BCR)} = \frac{\text{Total revenue}}{\text{Total costs}} \dots\dots\dots(6)$$

BCR <1 = Means the benefits outpaced the cost of production, indicating that the enterprise is cost-effective.

BCR >1 = Indicates that the enterprise is not cost-effective as the cost is higher than the benefits

2.4.5 Operating Ratio (OR)

This is a financial metric that is used to measure how effective an enterprise use it revenue to cover all operating costs. It is expressed as:

$$\text{Operating ratio (OR)} = \frac{\text{Total variable cost}}{\text{Total net revenue}}$$

Note: A lower ratio indicates higher efficiency, meaning enterprise is cost-effective, spending less of the revenue as operating expenses. While higher ratio suggest inefficiency. i.e more revenue is spent as operating expenses.

3 Results and Discussion

3.1 Socioeconomic Characteristics of the Respondents

The results of the socioeconomic characteristics of the agribusiness participants (beneficiaries) such as age, household size, education are presented in Table 2 below

Table 2. Distribution of Age and Household Size of Parboiling, Millers, SSP, Onion Storage and Agro-dealers

	Women Par-boilers		Millers		SSP		Onion Storage		Agro-dealer	
Variables	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Age (Years)										
18 – 24	2	4.88	2	8.7	2	4.44	3	6.67	0	0
25 – 34	11	26.83	4	17.39	13	28.89	6	13.33	24	53.33
35 – 44	8	19.51	9	39.13	18	40	10	22.22	12	26.67
45 – 54	12	29.27	4	17.39	8	17.78	12	26.67	7	15.56
55 – 64	8	19.51	4	17.39	3	6.67	10	22.22	1	2.22
65+	0	0	0	0	1	2.22	4	8.89	1	2.22
Mean	41.8		40.04		39		46.7		37	

Household Size

1 – 3	5	12.2	7	30.43	10	22.22	5	11.11	3	6.67
3 – 6	19	46.34	5	21.74	10	22.22	7	15.56	17	37.78
7 – 9	4	9.76	4	17.39	16	35.56	12	26.67	12	26.67
10 – 12	4	9.76	2	8.7	2	4.44	6	13.33	6	13.33
13 – 15	7	17.07	3	13.04	2	4.44	8	17.78	1	2.22
>15	2	4.88	2	8.7	5	11.11	7	15.56	6	13.33
Mean	8		7		7		11		9	

Source: Field survey, 2025

The results for the quantitative socioeconomic characteristics of the par boilers, Millers, Youth spraying service providers, Onion storage and Agro-dealers are presented in Table 2 above. The results showed that most (29.27% and 26.67%) of the par-boilers and Onion storage participants respectively were within the age range of 45 – 54 years with the corresponding average age of 41.8 and 46.7 years. While Miller and Youth spray service providers are mostly (39.13% and 40.0%) within the age category of 35 – 44 years with the mean age of 40.04 and 39 years respectively. The results further indicated that majority (53.33%) of the Agro-dealers were between 25 -33 years with the mean age of 37 years. This implies that the agribusiness enterprise of the project are youth friendly however, Millers and YSSP are more youth inclusive than par-boilers and Onion storage. This might be due to the fact that the enterprise is energy-requiring one that need people who are of much younger age to carry out the drudgery form of the work attached to it.

The results also revealed that most (46.34% and 37.78%) of the par-boilers and Agro-dealers had a family size of 3 – 6 persons with an average family size of 8 and 9 respectively. While most (30.43%) of the Millers had 1 – 3 persons and the mean family size of 7, and also most (35.56% and 26.67%) of Youth spray service providers and Onion storage participant respectively had a family size of 7 – 9 persons with the corresponding mean of 7 and 11 persons. The results clearly indicate that the beneficiaries had a relatively large family size which translate to more responsibility reposed in them that necessitated that them to look for an enterprise like agribusinesses to engage in and cater for their immediate family members.

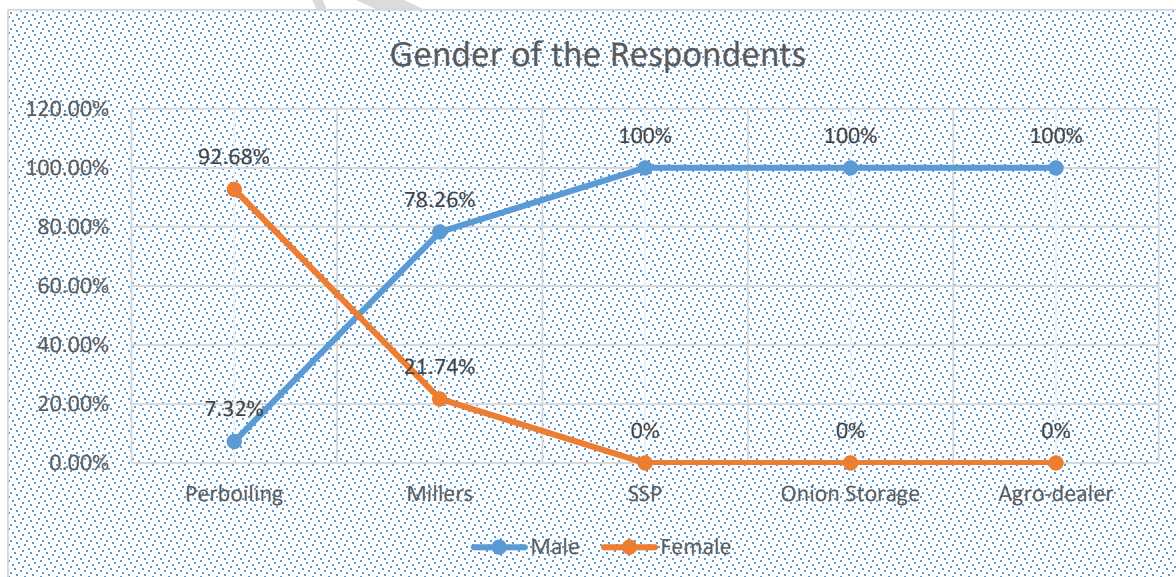


Fig. 2. Gender of the Respondents (Beneficiaries)

From the results in the Figure 2 above, majority (92.68%) of the Par-boilers were females. This indicates that rice parboiling enterprise is female dominance, this was due to the fact that the program targeted women for this enterprise. The results also revealed that majority (78.26%) of the Millers were males and all (100%) of the Youth spray service providers, Onion storage and Agro-dealers were male. This implies a greater dominant of male in these enterprises that calls for gender balance to ensure the female counterpart also benefit from these businesses.

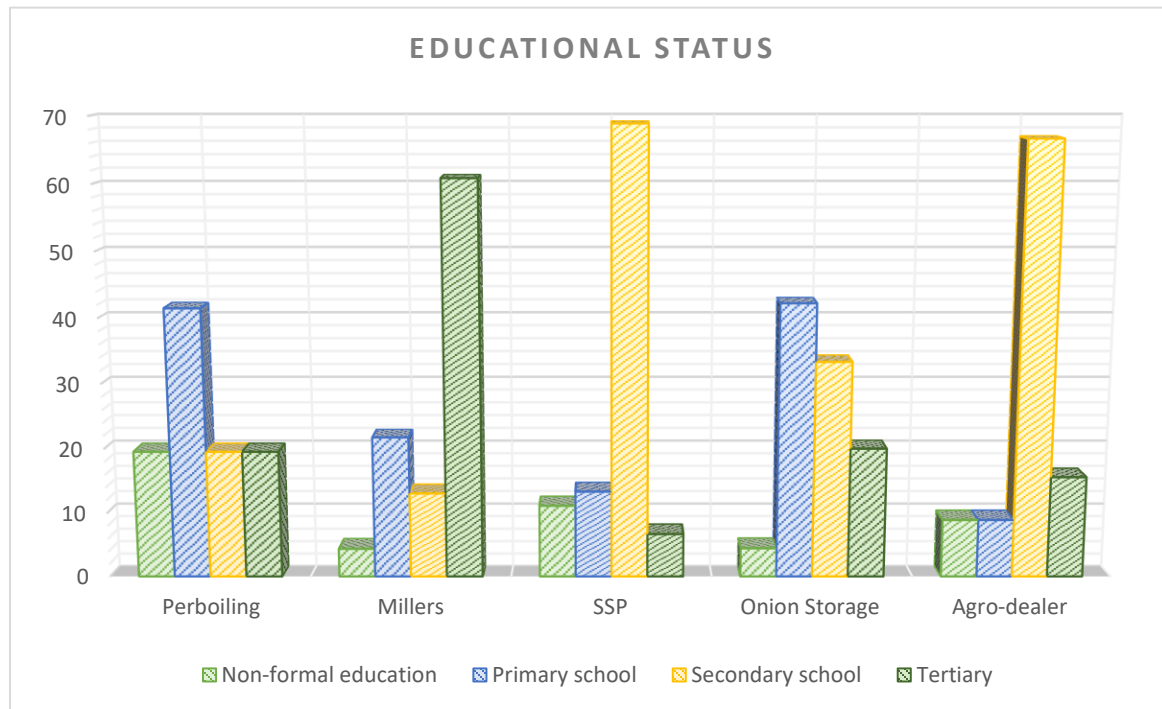


Fig. 3. Educational Status of the Respondents (Beneficiaries)

Figure 3 presents the results of the educational status of the respondents. It was found that majority (80.49%, 95.65%, 88.89%, 95.56% and 91.11%) of the Par-boilers, Millers, Youth spray service providers, Onion storage and Agro-dealers respectively had some of formal education. This showed that they are literate, and therefore, can adopt innovation and can also help them to keep important records of their businesses.

3.2 Cost, Revenue and Profitability of Contract Spraying Service Provision among Beneficiaries of KSADP/Month

Contract spraying service is gaining momentum as a way of job creation for young people in agriculture. It involves the process of training and empowering young people to offer pesticide spraying services to farmers during the cropping season and during off-season. Providers of such services are however, required to be sufficiently trained in the knowledge of appropriate pesticides to use, the correct dosages, the appropriate method of application and when to apply them [16].

The costs and revenue involved in contract spraying services by beneficiaries during peak and off-peak season are presented in Table 3.

Table 3. Cost, Revenue and Profitability of spraying service provision among beneficiaries of KSADP/month

Variables	Peak Period	Off- Peak
	Amount(₦)	Amount(₦)
Transportation cost	11,906.06	6, 212.32
Sprayer Assistant	9,761.4	4, 706
Amortization cost	1,461.55	1,461.55
Total cost of spraying enterprise	23,129.01	12,379.87
Revenue	119,538	69,600
Gross Income	97,870.54	58,681.68
Net Income	96,408.99	57,220.13
Return on Investment (ROI)	4.17	4.62
Benefit Cost Ratio (BCR)	5.17	5.62
Operating Ratio (OR)	0.18	0.16

Source: Field survey, 2025

During the peak season (farming season), the average total cost of providing spraying service was ₦23,129.01 per month, comprising of ₦11,906.06 for transportation, ₦9,761.4 for wages of spraying assistant and ₦1,461.55 as amortization cost for equipment depreciation. The total revenue during this period was ₦119,538. When the total service cost is deducted from this, it gives a gross income of ₦97,870.54 and a net income of ₦96,408.99 per month. The ROI is 4.17, BCR 5.17 and operating cost 0.18, all indicating high levels of profitability within a month.

Similarly, during the off-peak season the total cost of spraying service per month was ₦12,379.87, comprising of ₦6,212.32 for transport cost, ₦4,706 as wages for spraying assistant and ₦1,461.55 as amortization cost for equipment depreciation. The total revenue realized was ₦69,600 per month. When the total spraying cost is subtracted from this, it gives a gross income of ₦58,681.68 and a net income of ₦57,220.13 per month. The ROI is 4.62, BCR 5.62 and operating ratio 0.16. All these indicate that spraying service is also profitable and cost-effective during the off-peak season.

The analysis shows that the service was profitable in both periods. It is however noted that even though the gross and net incomes were lower during the off-peak season, the ROI, BCR and operating ratio were higher than those of the peak season. This implies that though demand for spraying services during the off-peak season may be low due to seasonality of the business, on the aggregate, it is profitable and lucrative. Therefore, the contract spraying service should be encouraged by the government not only as a means of job creation, but as a way of enhancing the incomes of young people.

It is however, recommended as suggested by [16], that the beneficiaries should be sufficiently trained on the knowledge of appropriate pesticides to use, the correct dosages, the appropriate method of application and when to apply them because this service is a crucial process in the crop production process. Similarly, in order not to be idle during the off-peak season, beneficiaries could be trained on other agricultural activities like processing which can keep them busy and productive during this period.

3.3 Cost, Revenue and Profitability of Agro-Inputs Enterprises among Beneficiaries of KSADP/SAA

Agro-inputs supply constitutes a major factor in the agricultural production process as without these inputs production may not necessarily take place. These inputs have to be of the right quality, quantity and price and supplied at the right time to enhance effective and timely agricultural production. So farmers should be made to have easy access to them. However, according to Isah et al. [17], Nigerian farmers are not only having trouble receiving the necessary inputs on time and in excellent quality and quantity, but are also paying exorbitant prices due to Nigeria's fragmented input supply sector. It is therefore, necessary for the input supply sector to be developed and diversified so that farmers can have easy access to quality inputs and on time. To do this, more agro-input dealers have to be encouraged to go into the market by the government.

Table 4 presents the costs, revenue and profitability of agro-input enterprises among project beneficiaries per month.

Table 4. Cost, Revenue and Profitability of Agro-Inputs Enterprises among Beneficiaries of KSADP/Month

Variables	Amount (₦)
Monthly Supply Value	1,551,062.78
Transportation and other Marketing Cost	18,873.09
Shop Keeper' Wage	19,285.71
Depreciation on Equipment	2,082.22
Total Marketing Cost	1,591,303.8
Monthly Sale Value	1,766,207.17
Gross Income	176,985.59
Net Profit	174,903.37
Return on Investment (ROI)	4.35
Benefit-Cost Ratio (BCR)	5.35
Operating Ratio (OR)	0.02

Source: Field survey, 2025

The average total marketing cost of inputs per month was ₦1,591,303.8, comprising of monthly supplies of ₦1,551,062.78, ₦18,873.09 for transportation and other miscellaneous marketing costs, ₦19,285.71 for shop keeper's wage and ₦2,082.22 for depreciation on fixed marketing equipment. The average total monthly sales stood at ₦1,766,207.17 and when the total marketing cost is deducted from it, it gives a gross income of ₦176,985.59 and a net profit of ₦174,903.37 per month. Furthermore, the ROI is 4.35 meaning that for every ₦1 invested in agro-input business, a return of ₦4.35 is expected which is very high. The BCR is 5.35 while the OR is 0.02. Since the BCR is much higher than unity and the OR much lower than 1, it implies that the input enterprise generates sufficient revenue that can cover all marketing costs incurred and still have excess as profit for the marketer. The enterprise is therefore viable and profitable and should be encouraged.

3.4 Cost, Revenue and Profitability of Women Parboiling Enterprise/Month Beneficiaries of KSADP/SAA of Kano State

In Nigeria, women participate actively in agriculture in one way or the other. However, their participation on the average, does not result to enhancement of their economic and social status due to cultural beliefs and uneasy access to resources and opportunities. But if given easy access to resources and opportunities, they can participate better and enhance their productivity, income and social status [18].

Parboiling is the process of heating paddy rice in boiling water for some hours so as to reduce the breakage of the grains during further processing of rice. It is an important activity in the rice processing business that enhances the quality and profitability of rice marketing. Mustapha [18] opined that parboiling is a profitable agro-business which women can embark in so as to enhance their income and social status if given the necessary encouragement in terms of resources, training and empowerment.

The costs and returns involved in rice parboiling service by women beneficiaries per month are presented in Table 5.

Table 5. Cost, Revenue and Profitability of Women Parboiling Enterprise

Variables	Quantity/ltr/bag	Unit Cost (₦)	Amount (₦)
Fuel-wood		1,012.68	95,566.61
Water	339.73	50	16,986.5
Amortization Cost			2,742.04
Total Parboiling Cost			115,295.15
Parboiling Charges (Revenue)	94.37	2,613.4	246,626.56
Gross Income			134,073.45
Net Parboiling Income			131,331.41
Return on Investment (ROI)			1.14
Benefit-Cost Ratio (BCR)			2.14
Operating Ratio (OR)			0.457

Source: Field survey, 2025

The results in Table 5 revealed that the average total parboiling service cost per month was ₦115,295.15 which comprised of ₦95,566.61 for fuel wood, ₦16,986.5 for water and ₦2,742.04 as amortization cost for fixed equipment. The average total revenue obtained from parboiling service was ₦246,626.56 per month at approximately ₦2,613.4 per bag. When the total parboiling service cost was deducted from this, it gave a gross income of ₦134,073.45 and a net parboiling income of ₦131,331.41, respectively. The ROI is 1.14, indicating that every ₦1 invested in the enterprise has a return of ₦1.14. The BCR of 2.14 and operating ratio of 0.457 show that since the BCR is more than 1 and OR less than 1, the enterprise generates extra revenue as profit after catering for all service expenses. The whole analysis show that the women rice parboiling service is a profitable and viable business and should be encouraged. However, it is noted that cost of fuel alone accounted for about 82.89% of the total service cost. This is as result of the high cost of fuel wood. This could be reduced if the women are introduced to alternative cheaper sources of energy such as solar power or biogas.

The findings of this analysis are at tandem with those of [19] and [18] who reported women participation in rice parboiling service enterprise to be profitable and viable in selected states of northern Nigeria and in Kano, Nigeria, respectively.

3.5 Cost, Revenue and Income of Onion Storage Enterprise Beneficiaries of KSADP/SAA of Kano State

Onion, apart from being an essential vegetable crop, has become an important crop of great commercial and cash value. However, in spite of this commercial and cash value, onion faces a great challenge of perishability due to its high moisture content at harvest. The problem is accentuated by inadequate storage facilities and poor handling practices that contribute to much of post-harvest losses of onion and which negatively impact on the profitability of onion marketing. Therefore, adopting improved storage methods or structures for storing onions can significantly reduce post-harvest losses and enhance its storability, quality and profitability [20].

In Kano State, onion storage offers great potentials for profitability especially with the introduction of modern storage technologies like the Aerated Onion Storage Technology (AOST) which can drastically reduce post-harvest losses and increase the shelf of onions [21].

Table 6 presents the costs and returns associated with onion storage per season.

Table 6. Cost, Revenue and Profitability of Onion Storage Enterprise

Variables	Quantity/Bag	Unit Cost (₦)	Amount (₦)
Purchase Price	86.04	26,615.38	2,289,987.30
Turning			28,200
Sorting			10,419.98
Re-bagging	200		17,208
Transportation Cost	800		68,832
Commission			50,092.49
Rent			45,000
Total Storage Cost			219,752.47
Revenue	81.27	72,615.38	5,901,451.93
Net Income			3,391,712.16
Return on Investment			1.3
Benefit-Cost Ratio (BCR)			2.3
Operating Ratio (OR)			0.037

Source: Field survey, 2025

The cost component of the onion storage business showed that the average total storage cost for 86 bags of onion was ₦219,752.47 which comprised of ₦2,289,987.30 for purchase price, ₦68,832 for transportation, ₦50,092.49 for commission and ₦45,000 for store rent. Others are ₦28,200 for turning the onion bulbs, ₦17,208 for re-bagging and ₦10,419.98 for sorting the onion into sizes.

The total revenue derived from the sale of 81 bags of onion stood at ₦5,901,451.93. When the total storage cost is subtracted from this, ₦3,391,712.16 was realized as net income. The ROI is 1.3, BCR, 2.3 while the OR is 0.037 and a net profit margin of 57.47%. All these show that the onion storage business is viable and profitable.

It could be observed that the initial number of bags of onion purchased was 86 bags but at the end of the storage when the onion was re-bagged, the number shrank to 81 bags, meaning a shrinkage loss of 5 bags which translated to a negligible loss of 5.81%. Similarly, the purchase price per bag was ₦26,615.38, but at the end of

the storage period, each bag was sold for ₦72,615.38, showing a unit net profit of ₦46,000 per bag within a short period. All these go to show that the onion storage business is profitable and viable and should be encouraged by the government. This finding is consistent with those of [20] and [21] who reported that the onion storage enterprise is profitable in Nigeria in general and Kano in particular.

3.6 Cost, Revenue and Profitability of Rice Milling among Beneficiaries of KSADP/SAA of Kano State

Milling is the removal of the husk and bran layers from harvested, dried paddy rice to produce white rice which has greater market value than the paddy rice. Kano is one of the major rice producing and processing states in Nigeria with a lot of milling activities taking place from the small scale millers along the Kura rice corridor to large scale millers within the metropolis [22].

The costs and returns associated with small scale rice milling among beneficiaries of the project are presented in Table 7.

Table 7. Cost, Revenue and Profitability of Rice Milling among Beneficiaries of KSADP of Kano State

Variable	Qty/Bag/ltr	Unit Cost (₦)	Amount (₦)
Fuel	111	1,179.83	130,961.13
Engine oil	2	3,230.44	6,260.88
Machine maintenance			11,164.76
Machine operators			38,582.61
Total operational cost			186,969.38
Amortization cost			29,868.64
Total milling cost			216,838.02
Revenue			
Milling charges	180.35	2,195.65	353,565.2
Rice bran	62.22	1,259.21	78,348.05
Total Revenue			431,913.25
Gross Income			244,943.87
Net Income			215,075.23
Return on investment (ROI)			0.99
Benefit-cost ratio (BCR)			1.99
Operating ratio (OR)			0.43

Source: Field survey, 2025

The average total operational milling cost for 180 bags of paddy rice was ₦186,969.38. This comprised of ₦130,961.13 for fuel, followed by ₦38,582.61 for wages of machine operators. Others are ₦11,164.74 for machine maintenance and ₦6,260.88 for engine oil. This shows that among the operational costs, cost of fuel takes the highest share, representing 70.04% of the operational cost. The amortization cost of fixed equipment was ₦29,868.64 which when added to the operational cost raised the total milling cost to ₦216,838.02 for 180 bags of paddy rice.

The total revenue realized was ₦431,913.25 comprising of ₦353,565.2 from milling charges and ₦78,348.05 from sales of rice bran. When the total operational and milling costs are deducted from the total revenue, it

gives a gross income of ₦244,943.87 and net income of ₦215,075.23. The ROI is 0.99 meaning that every naira invested in the rice milling business, gives a return of ₦0.99. The BCR is 1.99 while the operating ratio is 0.43, indicating that the business generates more revenue than expenses and therefore profitable and viable.

It could be noted that fuel alone accounted for over 70% of the total operational cost, especially with its current high cost and therefore affects the overall gross income. The cost of fuel could be reduced if the millers are introduced to alternative cheaper sources of energy such as solar power or biogas.

In summary, the rice milling business is profitable and lucrative and beneficiaries should therefore be supported and encouraged by the government. All these finding are in accord with those of [22] and [23] who found rice milling enterprise profitable in Kano and Bauchi States, respectively.

4 Conclusion and Recommendations

Based on the findings of this study it can be inferred that the agribusiness enterprises established under KSADP/SAA are economically viable. All enterprises recorded profitability, with youth spray services provision and agro-input dealerships being more lucrative ventures. Overall, the program has contributed significantly to youth and women empowerment by creating employment, improving income levels, and promoting inclusive participation in the agribusiness value chain in Kano State. It is recommended that Government and Development partners should continue to support youth and women participation in agribusiness through training, access to credit, and provision of modern technologies. Efforts should also focus on promoting renewable energy solutions such as solar and biogas to reduce production costs, particularly for energy-intensive enterprises like milling and parboiling. Furthermore, strengthening market linkages and enhancing the capacity of beneficiaries in record keeping, financial literacy, and business management will ensure sustainability and scalability of the KSADP/SAA agribusiness initiatives across Kano State and beyond.

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