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# PROFITABILITY OF SOYBEAN PROCESSING IN OGBOMOSO AREA OF OYO STATE, NIGERIA

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**ABSTRACT**

This study investigates the cost and returns to soybean processing in Ogbomoso area of Oyo state. Purposive sampling technique was employed to select a total number of 240 soybean processors (120 soy cheese and 120 soymilk processors). Data were collected with the use of well structured interview schedule.

The result revealed that the mean age for soy cheese producers was 38 years compared with 42 years for soymilk producers. Mean household size was 4.75 for soy cheese producers compared with 5.13 for soymilk producers. Above 88% of soymilk producers received formal education compared with 100% of soy cheese counterparts, while 80% of soy cheese producers compared with 93.3% of soymilk producers were married. Budgetary analysis revealed that soymilk enterprise attracts gross margin of #1,053.00 per processing cycle while soy cheese enterprise attracts gross margin of #350.67 per processing cycle. Soybean processing is found to be profitable with benefit cost ratio of respondents greater than one. Regression analysis revealed that significant variables affecting revenue to soymilk enterprise include purchase cost of soybeans and age (in business) of respondents while for soy cheese enterprise, significant variables include purchase cost of soybeans and cost of other ingredients used in soy cheese production. The result of the analysis shows a positive and significant relationship between processing technique and returns to the enterprise.

The study concluded that soymilk enterprise is more profitable than soy cheese enterprise in the study area.

**Key Words: Profitability, Food processing, Soymilk, Soy cheese**

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## INTRODUCTION

Soybean (*Glycine max*) is a leguminous vegetable of the pea family that grows in tropical and temperate climates. It was domesticated in the 11th century around northeast of China (*Glycine max, 2012*). It is believed that it might have been introduced to Africa in the 19th century by Chinese traders along the east coast of Africa. Soybean was first produced in the mid 1950's in Northern part of Nigeria (IITA, 2001). The importance of food in the development of a country cannot be over emphasized. Soybean has been described as a near-perfect crop for a country like Nigeria, expressing that nutritionally, they carry twice the protein of meat or poultry and contain all eight essential amino acids needed for childhood development (Lukas, 2010; Soybean, 2012). Soybeans are also good for the environment. Since they evolved in Asia, they are far less vulnerable to local insects than African bean crops and require fewer insecticide sprays. They also fix atmospheric nitrogen, which reduces the need for farmers to purchase fertilizer. Soybean is among the major industrial and food crops grown in every continent. The crop can be successfully grown in many states in Nigeria using low agricultural input (Lukas, 2010).

Soybean is usually discussed as a single entity, a particular food which is consumed in various forms. In Africa dry soybeans are used to produce milk substitutes and flour. The bean curd is fried and eaten as a snack or breakfast food. Mature beans are not easily digested and contain toxic compounds, which require soaking and prolonged cooking. Soy cheese is the dry roasted soybean and soymilk is used as substitute for cow milk (Strom, 2001; Hoogenkamp, 2005).

Soybean is one of the most important leguminous crops because of its high nutritive value. Soybean products such as soy cheese and soymilk can take care of protein requirement of people because it is important for growth and maintenance of muscle. It can also be good substitute for animal products because while fermented it contains protein and body's requirements for vitamins A and D. According to IITA (2001), soybean production is economically viable as it is a good diet source. It is lucrative and is a high source of income. It serves as fertilizer and is used for medical purposes. Soybean was discovered to be two to three times more productive under Nigerian condition than in the United States and Asia. However, soybean cannot be consumed unless it undergoes some level of processing (Smith and Circle, 1972; Miniello et al, 2003).

There is therefore the need to investigate the viability of its processing enterprises. The direct human consumption of soybeans is significant in Nigeria, especially among rural low-income groups that cannot afford other alternative protein sources such as meat, fish and eggs. Beginning in the early 1990s, the International Institute of Tropical Agriculture [IITA] promoted the use of protein-rich soybeans in everyday foods to curb malnutrition. Among the recommended uses of soybean, the common soybean-based foods vary from region to region based on the prevailing staple foods available .For example in the Northern part of the country, the common Soybean food include *dadawa* [*nune*], *moinmoin* [*akpupa* or local bread], and *akara* [*akwese*]. Soybean *dadawa* or *nune*, the fermented bean flavoring, is a substitute for locust beans in daily cooking. However, in the Southern part of the country the common ones are Soy milk, Soy-cheese [tofu], Soy- Ogi, Soy- iru. The ones produced at commercial level are soymilk and soy cheese. Virtually, soybean can be added to all the staple foods available for consumption. Science in Africa (2010) remarked that Nigeria has been quick to profit from new technology that has helped farmers overcome a series of complex production problems and that soybean recipe has become an hunger fighter and cash earner for processors in Nigeria. It is on this note

that this study was carried out to investigate the economics of soybean processing in Ogbomoso area of Oyo State.

The study provided answers to the following research questions:

1. What are the socio-economic characteristics of soybean processors?
2. What are the cost and returns to soybean processing?
3. What are the processing activities performed by the respondents?
4. What are the problems associated with soy cheese and soymilk enterprises?

**Objectives of the Study**

The main objective of the study is to investigate the profitability of soybean processing in Ogbomoso area of Oyo state. The specific objectives are to:

1. describe the socio-economic characteristics of soybean processors in the study area,
2. examine the processing activities performed by respondents in the study area,
3. compute the cost and returns to soybean processing activities in the study area, and
4. identify the problems associated with soybean processing enterprises in the study area.

**Hypothesis of the study**

There is no significant relationship between cost of processing and returns to respondents.

## METHODOLOGY

The study was conducted in Ogbomoso area of Oyo State. Ogbomoso is one of the largest towns in the state. It comprises five local government areas namely Surulere, Ogo-Oluwa, Orire, Ogbomoso north and Ogbomoso south. Ogbomoso town is geographically located on latitude $8.1^0$N and longitude $3.29^0$E. The mean annual temperature is $26.2^0$C and highest around March with a mean temperature of $28.7^0$C. Humidity is highest between July and September and lowest in December to February.

Population of the study includes all commercial soy cheese and soymilk processors in the five local government areas. Since there is no complete list of all the potential respondents, purposive sampling technique was employed to select two hundred and forty respondents for the study (120 soy cheese and 120 soymilk processors).

Primary data was employed in this study. The primary data was obtained through the use of well structured interview schedule containing items relating to soymilk and soy cheese production. The interview schedule contained four sections. Section 1 collected the required information about socio economic characteristics of the respondents, the second section focused on processing activities of respondents, the third section collected data on cost and returns to the enterprise while the last section focused the problems facing soybean processors in the study area.

The study involved two major variables in test of hypothesis. These are dependent and independent variables. The dependent variable is the returns to the enterprise while the independent variables include the cost of input used in processing activities.

The data collected were subjected to descriptive and inferential statistical analyses. Budgetary analysis was used to determine profitability of the enterprise. Descriptive statistics included the use of tables, frequency distributions, percentage and means. The multiple

regression analysis was employed to test for relationships that exist between variables. The model was specified as:

$Y = a + b_1X_1\ b_2X_2$+----------$b_9X_9$

Where:

Y = Returns (#)
$X_1$ = Cost of Soybean
$X_2$ = Cost of other ingredients
$X_3$ = Cost of transport
$X_4$ = Cost of labour
$X_5$ = Cost of fuel
$X_6$ = Depreciated Fixed cost (tools and equipments)
$X_7$ = Years in business
$X_8$ = Years of schooling
$X_9$ =Technology

Budgetary Analysis: This was employed to determine profitability of the enterprise. This includes use of the following variables:

a. Gross margin (GM) is the difference between the total revenue earned and the total variable cost incurred GM = TR-TVC.

b. Variable cost (VC) is the cost that varies with changes in output; it is a function of output level. The variable cost includes transport cost, labour cost, fuel, and cost of soybean and other ingredients added.

c. Fixed Cost is the cost that does not vary with respect to output (transactions land rent, tools and equipments).

d. Total cost is the total expenditure on the output i.e. addition of both variable and fixed costs TC= TFC+TVC.

e. Total revenue (TR) is the total income realized on output produced i.e. quantity sold multiplied by price per unit.

f. Net Revenue is the difference between the total revenue and the total cost.

g. Benefit cost ratio (BCR) is the total revenue divided by the total cost BCR=TR/TC. When BCR is greater than 1, the business is profitable.

## Data Analysis and Discussion of Results

### Socio-Economic Characteristics of Respondents (Table 1)

Table 1 revealed that 21.7% of the soy cheese producers were below 30years compared with 16.7% of soymilk producers, 36.7% of soy cheese producers were between ages 31-40 compared with 28.3% of soymilk producers. About 42% of soy cheese producers were of age range 41-50 as against 25% of soymilk producer counterparts. The mean ages (mean age: Soy cheese producers: 37.6 years, Soymilk: 42.2years) for the two groups indicate that there are more aged people in soymilk production than in soy cheese production. The result revealed that 19.2% of the soy cheese producers are male compared with 8.3% in soymilk production. This revealed that there are more male soy cheese producers than in soymilk producers. The result revealed that 20% of the soy cheese producers were single compared with 6.7% in soymilk producers, while 80% of the soy cheese producers were married compared with 93.3% soymilk producer

counterparts. This showed that there are more single persons in soy cheese production than in soymilk production. The study showed that 48.3% soy cheese producers were Muslims compared with 46.7% among soymilk producers while 51.7% of soy cheese producer were Christians compared with 53.3% of soymilk producer counterparts. The result revealed that 21.7% of soy cheese producers compared with 18.3% among soymilk producers had between 3-4 persons within the household. Fifty (50) % of the soy cheese producers had between 5-6 persons within the household compared with 30% in soymilk producing respondents. The mean household size of soy cheese processors was 4.75 while it was 5.13 for soymilk processor counterparts. Data revealed that in soy cheese enterprise, more than half (71.7%) of the respondents received secondary education compared with 46.7% of soymilk processors. It was observed that most of the processors were educated. The study revealed that majority of the soy cheese and soymilk processors were engaged in non- formal sector i.e. 88.3% and 93.3% respectively. The remaining 11.79% of soy cheese processors were engaged in civil service compared with 6.7% among soymilk processors.

**Processing Practices and Experience of Respondents (Table 2)**

The study revealed that more than half of the respondents, 56.6% for soy cheese processors against 68.2% for soymilk counterparts had 1-10years of soybean processing experience while 33.4% of soy cheese group against 31.8% for soymilk group claimed 11-20years of experience. Meanwhile, 10% of soy cheese producers compared with none in soymilk producers claimed 21-30 years of experience. Mean years of experience for soy cheese processors is 9.12 while for soymilk group is 10.85 This finding revealed that there are more newcomers in soymilk enterprise than in soy cheese counterpart.

Table 2 further revealed that 75% of soy cheese processors use less than 8 kg of soybean per processing cycle compared with 65% from soymilk group while 23.3% of soy cheese producers use between 8- 16 kg raw soybean compared with 35% in soymilk production. 1.7% of soy cheese group claimed to use above 16 kg compared with none in soymilk production. Mean quantity of raw soybean processed per cycle by soy cheese group 5.6kg as against 6.48kg for soymilk group. This result revealed that on the average, soy cheese producers use less quantity of soybean than their soymilk counterparts. The data revealed that both groups derive chaff as by-product from soybean processing. The data revealed that 61.7% of soy cheese producers sell the by-product from soybean processing compared with 50% in soymilk, while 5% of soy cheese producers give it out as against 15% of soymilk group. The remaining 33.3% of soy cheese producers compared to 35% in soymilk production claimed to use the by-product from soybean processing within the household. The soybean chaff, according to the respondents, is utilized as livestock feed in the study area.

Soy cheese producers use onion, pepper, groundnut oil, salt and maggi cubes during processing activities as against soymilk counterparts who use only sugar and flavour. The data revealed that tools and equipments utilized by both groups (soy cheese and soymilk processing respondents) include pot, bowl and sieve. In addition to these, processing soybean to cheese involve the use of tray, knife, frying pan and perforated spoon as against the use of cooler, cup and turning stick in soymilk counterpart. The data revealed that 88.3% of soy cheese producers use firewood as their source of fuel as against 86.7% in soymilk, while 8.3% each from both groups use charcoal. Only 3.4% as against 5.0% of soy cheese group and their soymilk counterparts respectively claimed to make use of kerosene stove. This implies that most of the processors in both groups depend on firewood as source of fuel.

**Cost and Returns Analysis per Processing Round**

The result below revealed that soymilk enterprise is more profitable than soy cheese enterprise with profit of #1040.45 compared to # 338.14 profit from soy cheese. Soybean processing was found to be profitable with benefit cost ratio of greater than one for the respondents.

| **Soy cheese** | **Soymilk** |
|---|---|
| Total Revenue (TR) = #1211.00 | TR = #2118.67 |
| Total Variable Cost (TVC) = #860.33 | TVC = #1065.67 |
| Depreciated Fixed Cost (DFC) = #12.53 | DFC = #12.55 |
| Gross margin = TR – TVC | GM = TR - TVC |
| GM = #1211.00 - #860.33 | GM= #2118.67– 1065.67 |
| GM= #350.67 | GM = #1053.00 |

Profit ($\pi$) = Gross margin - Depreciated fixed cost

| **Soy cheese** | **Soymilk** |
|---|---|
| = #350.67 - #12.53 | 1053- 12.5520 |
| = #338.14 | = #1040.45 |
| BCR= 1.39 | BCR= 1.97 |

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**Problems Associated with Soymilk and Soy cheese Processing (Table 3)**

Data analysis revealed that the major problem associated with soy cheese and soymilk enterprises is rapid deterioration in quality as well as storage in soymilk enterprise.

**Regression Analysis Result Showing Relationship between Costs of Processing and Total Revenue Generated by Respondents (Tables 4&5).**

The multiple regression analysis was employed to establish relationship between cost and revenue generated by respondents. Data on tables 4 and 5 revealed the adjusted $R^2$ for soymilk producers as 0.608 compared with 0.818 of soy cheese counterpart. This implies that 60.8% compared with 81.8% of variations in total revenue generated by soymilk producers and soy cheese producers respectively are explained by the estimated independent variables. The F-values for the two groups are15.523 and 27.590 respectively, both significant at 1%.

For soymilk producers, cost of soybean and years in business of respondents were significant variables affecting total revenue of respondents. For soy cheese producers, cost of soybean and cost of other ingredients (maggi cubes, salt, onion, pepper, and groundnut oil) are significant variables affecting total revenue of respondents.

Purchase cost of soybean is significant for the two groups and has positive coefficient i.e. for the two groups, as cost of soybean increases total revenue of respondent increases respectively and when respondents invest more on good quality soybean the result will bring about good quality soymilk and soy cheese and will be able to make better quality sales. For soy cheese, the cost of other ingredient is significant and have positive coefficient on the total revenue indicating that as respondents invest more on good quality ingredients it has an effect on the soy cheese for sale making it more pleasing to buy with good taste. There is an inverse relationship between the years in business and total revenue of soymilk processors, indicating that as the soymilk processors gets older, there is a decrease in total revenue. This could be

attributed to the fact that as the respondent's productivity decreases with increase in years due to less agility, it has effect on the total revenue. Older people also tend to use traditional technique in processing. The result of the analysis shows a positive and significant relationship between processing technique and returns. Specifically, processors who make use of firewood and charcoal as source of fuel got their product tinted with smoke and laced with charcoal particles. This in turn reduces acceptability of such product by the consumers.

**Conclusion and Recommendation**

The study revealed that soybean processing is profitable. The result of the analysis shows a positive and significant relationship between processing technique and returns. It is therefore recommended that local people should be encouraged to invest in the venture with the hope of enhancing the economic empowerment of low income earners. Effort should also be made by the processors to improve their processing technique.

**Table 1: Socio-economic Characteristics Distribution of Respondents (n =120 for each group of processors)**

| Variable | Soy cheese Frequency | Soy cheese Percentage | Soymilk Frequency | Soymilk Percentage |
|---|---|---|---|---|
| **Age** | | | | |
| ≤ 30 | 26 | 21.7 | 20 | 16.7 |
| 31-40 | 44 | 36.7 | 34 | 28.3 |
| 41-50 | 50 | 41.6 | 30 | 25 |
| 51-60 | - | - | 30 | 25 |
| Above 60 | - | - | 6 | 5 |
| **Sex** | | | | |
| Male | 23 | 19.2 | 10 | 8.3 |
| Female | 97 | 80.8 | 110 | 91.7 |
| **Marital status** | | | | |
| Single | 24 | 20 | 8 | 6.7 |
| Married | 96 | 80 | 112 | 93.3 |
| **Religion** | | | | |
| Islam | 58 | 48.3 | 56 | 46.7 |
| Christianity | 62 | 51.7 | 64 | 53.3 |
| **Household Size** | | | | |
| 1-2 | 26 | 21.6 | 24 | 20 |
| 3-4 | 26 | 21.7 | 22 | 18.3 |
| 5-6 | 60 | 50.0 | 36 | 30.0 |
| 7-8 | 6 | 5.0 | 38 | 31.7 |
| 9-10 | 2 | 1.7 | - | - |
| **Educational Level** | | | | |
| No formal Education | - | - | 14 | 11.7 |
| Adult Literacy | 10 | 8.3 | 30 | 25.0 |
| Primary six | 22 | 18.3 | 8 | 6.7 |
| Secondary school | 86 | 71.7 | 56 | 46.6 |
| Higher institution | 2 | 1.7 | 12 | 10 |
| **Primary Occupation** | | | | |
| Self employed | 12 | 10 | 26 | 21.7 |
| Crop farming | 62 | 51.7 | 70 | 58.3 |
| Livestock farming | 12 | 10 | 12 | 10 |

| | | | | |
|---|---|---|---|---|
| Mixed farming | 20 | 16.7 | 4 | 3.3 |
| Civil services | 14 | 11.7 | 8 | 6.7 |

**Source: Field survey, 2012**

**Table 2: Processing Practices and Experience of Respondents (n =120 for each group of processors)**

| | Soy cheese | | Soymilk | |
|---|---|---|---|---|
| **Variable** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Experience (Years)** | | | | |
| 1-10 | 68 | 56.6 | 82 | 68.2 |
| 11-20 | 40 | 33.4 | 38 | 31.8 |
| 21-30 | 12 | 10 | - | - |
| **Soybean (kg)** | | | | |
| <8 | 90 | 75 | 78 | 65 |
| 8-16 | 28 | 23.3 | 42 | 35 |
| >16 | 2 | 1.7 | - | - |
| **By- Product Disposal** | | | | |
| Sell | 74 | 61.7 | 60 | 50 |
| Give it out | 6 | 5 | 18 | 15 |
| Household Used | 40 | 33.3 | 42 | 35 |
| **Processing Ingredients** | | | | |
| Onion | 120 | 100 | - | - |
| Pepper | 120 | 100 | - | - |
| Groundnut oil | 120 | 100 | - | - |
| Salt | 120 | 100 | - | - |
| Maggi | 120 | 100 | - | - |
| Sugar | - | - | 120 | 100 |
| Flavour | - | - | 120 | 100 |
| **Tools/Equipments** | | | | |
| Pot | 118 | 98.3 | 120 | 100 |
| Bowl | 70 | 58.3 | 118 | 98.3 |
| Sieve | 118 | 98.3 | 120 | 100 |
| Tray | 96 | 80 | - | - |
| Knife | 114 | 95 | - | - |
| Frying pan | 120 | 100 | - | - |
| Perforated spoon | 92 | 76.7 | - | - |
| Cooler | - | - | 114 | 95 |
| Cup | - | - | 42 | 35 |
| Turning stick | - | - | 80 | 66.7 |
| **Source of fuel** | | | | |
| Firewood | 106 | 88.3 | 104 | 86.7 |
| Charcoal | 10 | 8.3 | 10 | 8.3 |
| Kerosene stove | 04 | 3.4 | 06 | 5.0 |

| | | | | |
|---|---|---|---|---|
| **Total** | **120** | **100** | **120** | **100** |

**Source: Field survey, 2012**

**Table 3: Distribution of respondents by the problems associated with soymilk and soy cheese enterprises.**

| | Soy cheese | | Soymilk | |
|---|---|---|---|---|
| **Problems** | **Frequency** | **%** | **Frequency** | **%** |
| Finance | 20 | 16.7 | 2 | 1.7 |
| Storage | - | - | 120 | 100 |
| Rapid deterioration | 120 | 100 | 120 | 100 |
| Marketing outlet | 20 | 16.7 | 16 | 13.3 |
| High cost of input | 12 | 10 | - | - |

**Source: Field survey, 2012**

**Table 4: Regression Analysis for Soymilk Processors**

| | **Co-efficient** | **t-value** | **Significance level** |
|---|---|---|---|
| Constant | 7.972 | 16.455 | |
| Cost of soybeans | 0.02 | 3.823 | 1% |
| Cost of other ingredients | -0.01 | -0.990 | NS |
| Transport cost | 0.000 | 0.056 | NS |
| Labour cost | -0.001 | -0.524 | NS |
| Fuel cost | -0.02 | -1.433 | NS |
| Dep. fixed cost | 0.000 | -0.788 | NS |
| Years in Business | -0.22 | -2.505 | 1% |
| Years of schooling | -0.21 | -1.410 | NS |
| Technology | 0.022 | 2.506 | 5% |

$R^2 = 0.699$

Adjusted $R^2 = 0.608$

F. value = 15.523 significant at 1%

**Source: Field survey, 2012**

**Table 5: Regression Analysis for Soy cheese Processors**

| | Co-efficient | t-value | Significance level |
|---|---|---|---|
| Constant | 5.775 | 20.244 | |
| Cost of Soybean | 0.002 | 4.719 | 1% |
| Cost of other ingredients | 0.002 | 2.300 | 5% |
| Labour cost | 0.011 | 0.609 | NS |
| Fuel cost | 0.001 | -0.280 | NS |
| Transport cost | 0.001 | -0.143 | NS |
| Dep. fixed cost | 0.001 | -1.366 | NS |
| Years of schooling | -0.008 | -0.835 | NS |
| Technology | 0.006 | 2.971 | 1% |
| Years in Business | 0.002 | 0.116 | NS |
| $R^2 = 0.849$ | | | |
| Adjusted $R^2 = 0.818$ | | | |
| F. value = 27.590 significant at 1% | | | |

**Source: Field survey, 2012**

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