# Conduct and Profitability of Gari Production for Increased Food Security in Ondo State, Nigeria

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***Abstract:*** *The study assessed the profitability of Gari production in Ondo State, Nigeria. A multi-stage sampling technique was used to select 216 gari producers from six Local Government Areas of Ondo State. Data collected were analysed using descriptive statistics, profitability analysis and multiple regression model. The results revealed that 86.1% of gari producers were female with 45.4% of the respondents produced white gari. Majority of the respondents (77.8%) fermented their cassava for 4 - 5 days. The profitability analysis revealed that gari production was a profitable enterprise given a gross margin and profit of N24,582.18 and N16,582.18 per gari processing cycle respectively. The results of the multiple regression further showed that access to credit, cost of purchase, producer's experience and price fluctuation were the statistically significant factors that affect the returns to gari production in the study area. The main challenges faced by the producers were inadequate funds (65.3%) and fluctuation of producers' price (61.1%). Therefore, this study recommends that white gari which is more durable and acceptable should be given higher priority in production. Since, credit access and producers' price fluctuation positively influenced returns to gari production; it was also recommended that relevant policies to address access to credit as well as good storage facilities to guide against drastic fall in price should be put in place for the gari producers.*
***Keywords:*** *fermentation, Gari, Multiple Regression, Production*

## I.    Introduction

Nigeria is currently the largest producer of cassava in the world with an annual production of over 34million tones of tuberous roots and the largest cassava market in Africa. Cassava is largely consumed in many processed forms in Nigeria. Its uses in the industry and livestock feed, are well known, but are gradually increasing, especially as important substitution becomes prominent in the industrial sector of the economy. As cash crops, cassava generates cash income for the largest number of households in comparison with other staples [1]. It is produced with relevant purchase inputs as frequently as some staples and in some cases more frequently than other staples. A large proportion of total production, probably larger than that of most staples, is planted annually for safe. As a food crop, cassava has some inherent characteristics which make it attractive, especially to the small holders farmers in Nigeria. First, it is rich in carbohydrates especially starch and consequently has multiplicity of end products. Secondly, it is available all year round, making it preferable to other more seasonal crops such as grains, peas, beans and other crops, for food security. Compared to grains, cassava is more tolerant of low soil fertility and more resistant to draught, pest and diseases. Also, its roots are storable in the ground for months after maturity.

One of the major and most important products of cassava is Gari. Gari is a fermented, gritty and starchy food or free flowing dry granular product of processed cassava roots. It is processed by fermenting, peeled and grated roots followed by dewatering, sieving and toasting or frying. This indeed agreed with [2]. Gari which is a cassava flake or granules is the most popular form in which cassava is consumed in Nigeria [3]. It is consumed principally as a main meal (eba) or taken as a snack when soaked in cold water, sweetened with sugar and consumed with roasted groundnut, coconut and sometimes dry fish [4]. Gari features more frequently up to 2 or 3 times in the daily diet of most households in the producing areas [5].

The processing of cassava into Gari is one of the major cottage industries in the study area. The gari processing centres are located in every nooks and cranny of the towns and villages in the study area. A good number of people particularly the working class and urban dwellers obtain their gari from these centres for immediate consumption and storage at home. The surplus gari produced at these centres are sent to other local market for sale. However, field observations at these gari processing centres revealed a total lack of standardization in the gari production practices employed, leading to different quality of gari being sold to the members of the public. Since the quality of the gari offered for sale or consumed is inextricably tied up with the processing operations and very little information is available on the quality characteristics of gari produced, a comprehensive study on gari production with emphasis on the processing cycle and standardization is highly necessary.

The high carbohydrate content of gari makes it a good source of energy in communities where it is consumed as a staple food. However, the significant variations which existed in the chemical composition of gari samples between processing centres could be attributable to factors such as types of cultivars, method of cultivation and management practices, age of harvesting, type and length of fermentation. Others could also include method of processing, cultural practice, climatic and soil factors [6].

Therefore, the broad objective of the study is to access the profitability and structure of gari production for increased food production in Ondo State, Nigeria. While the specific objectives are to:

i. examine the socio economic characteristics of gari producers in the study area.
ii. examine the conduct of gari production.
iii. determine costs and returns associated with gari production.
iv. determine factors affecting gari production in the study area.

Cost and returns are very germane in any business enterprise. Returns on any investment are usually determined mainly by the cost associated with such investment. Considering the importance of gari in the daily diet of most households in Nigeria, the processing of cassava into gari as well as gari marketing being major occupation in the study area, this study therefore, is important as it will provide necessary information to both present and intending gari producer as well as relevant policy makers in the study area in particular and the country at large. Hence, the need for the study to examine the various socio economic and other factors determining the viability of gari production enterprise in the study area.

## II.     Methodology

### 2.1 The The Study Area
The Study was carried out in Ondo State, Nigeria. The State has 18 Local Government Areas with its headquarters in Akure. It is located on longitude $4^0 30^1$ and $6^0 00E$ and latitude $4^0 45^1$ and $8^0 15^1$ North. The State has abundant land estimated to be $13.595km^2$. Majority of the people in the State were engaged in small scale farming with major arable crops including maize, cassava, yam, cowpea, sorghum while the tree crops cultivated include cocoa, kolanut, oil palm, cashew, rubber e.t.c. Production is usually for food consumption, market and cash for sustainability.

### 2.2 Sampling Procedure and Sampling Technique
Data were collected from both primary and secondary sources. Multi-stage sampling technique was adopted in selecting data for the study. The sampling frame was the list of selected gari producers from six (6) Local Government Areas across the 3 Senatorial districts of the State. The Local Government Areas were Okitipupa, Odigbio, Ondo-West, Akure-South, Owo and Akoko South-West. The second stage involved purposive selection of 3 towns/villages in each of the six selected Local Government Areas based on their involvement in the business, making 18 towns/villages in all. 13 respondents were randomly selected per town/village making a total of 234 respondents. A total number of 18 questionnaires were discarded due to inconsistency and bias in information supplied. Therefore, 216 copies of questionnaire were valid and used for the study.

### 2.3 Method of Data Analysis
Data collected were analysed using descriptive statistics, profitability and multiple regression analyses. Descriptive statistics such as frequency, percentage and mean were used to ascertain the socio-economic characteristics of the respondents.

Profitability analysis such as gross margin and profit were employed to estimate the costs and returns of gari production in the study area. The Gross Margin formula is represented as:

G.M = G.I - TVC………….……… (I)

Where G.M=Gross margin
    G.I=Gross income
    TVC=Total variable cost

The profitability was also represented symbolically by

$\pi$ =TR - TC……………….………..(II)

Where:  $\pi$ = profit

TR = Total revenue/gross income

TC = Total cost [total fixed cost (TFC) + Total variable cost (TVC)]

Again, multiple regression was used to determine the factors affecting the returns to gari production. The implicit function is presented as follows:-

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, U_i)$…………………. (iii)

Where :

Y = Returns to gari production (naira)

$X_1 =$ Transportation cost

$X_2$ = Access to credit
$X_3$ = Cost of fire wood
$X_4$ = Peeling, sieving & frying
$X_5$ = Cost of purchase of cassava
$X_6$ = Grating & pressing
$X_7$ = Skillet
$X_8$ = Experience
$X_9$ = Sex
$X_{10}$ = Fluctuation in price
$X_{11}$ = Miscellaneous expenses
$U_i$ = error term
The following production functions were fitted to the model:
Linear function:
$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + Ui$
Semi-Log function :
$Y = b_0 + b_1\log X_1 + b_2\log X_2 + b_3\log X_3 + b_4\log X_4 + b_5\log X_5 + b_6\log X_6 + b_7\log X_7 + b_8\log X_8 + b_9\log X_9 + b_{10}\log X_{10} + b_{11}\log X_{11} + Ui$
Double-Log function:
$\log Y = b_0 + b_1\log X_1 + b_2\log X_2 + b_3\log X_3 + b_4\log X_4 + b_5\log X_5 + b_6\log X_6 + b_7\log X_7 + b_8\log X_8 + b_9\log X_9 + b_{10}\log X_{10} + b_{11}\log X_{11} + Ui$
Exponential function:
$\log Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + Ui$
The following criteria are used in choosing lead equation of the regression analysis:
The coefficient of Multiple Determination ($R^2$) which must be between 0-1;
The significance of the coefficient or estimate with respect to their t –value;
The *a priori* expectation of the explanatory variable; and
The measure of the overall significance of the regression model using the F- test.

## III. Results And Discussion

### 3.1 Personal Profile and Socio-economic Characteristics

The Table 1 reveals that the majority of the respondents (52.8%) fell within 41 and 50 years of age, while 72.2% comprise the cumulative percentage of the respondents that were at most 50 years of age. This implies that the respondents are very active to engage in productive economic activities that will generate income for the households. Female (86.1%) dominated the enterprise as shown in Table 1. The probable reason for the large difference is the fact that gari production is seen as a female affair and almost all the processing are done at their homestead therefore keep the females engaged when their husbands go to the farm. Contrary to most of the studies in the literature, it was observed that only 2.8% of the respondents had no formal education while about 60% of the respondents had secondary school education. The high literacy level of the respondents (97.2%) will have an intense effect on adoption of technology and innovations in gari production as well as farming systems towards improving the business. Year of experience in an enterprise will increase one's knowledge and skills therefore; the result showed that about 64% had been producing gari between 11 and 20 years. It is indicated that most of the respondents possessed reasonable experience that could increase the efficiency of the business. The preference of gari produced in terms of colour was made known that the majority (45.4%) of the respondents produced white gari while 21.3% and 33.3% produced yellow and both colours respectively in the study area. This implied that white gari are the most acceptable type of gari produced in the study area because of its durability and fermentation qualities.

The result of the fermentation days revealed that majority of the respondents (77.8%) fermented their grated cassava between 4 and 5 days while 19.4% and 2.8% fermented their grated cassava between 2 – 3 and 6 – 7 days respectively. Majority of the respondents (65.3%) were producing gari between 5 and 6 times per month followed by 29.1% who produce between 3 and 4 times per month in order to get higher returns.

**Table 1: Socio-economic Characteristics of the Respondents**

| Variables | Frequency | Percentage |
|---|---|---|
| **Age (years)** | | |
| ≤ 30 | 9 | 4.1 |
| 31 – 40 | 33 | 15.3 |
| 41 – 50 | 114 | 52.8 |
| > 50 | 60 | 27.8 |
| **Sex** | | |
| Male | 30 | 13.9 |
| Female | 186 | 86.1 |

| | | |
|---|---|---|
| **Level of Education** | | |
| No formal education | 6 | 2.8 |
| Primary education | 48 | 22.2 |
| Secondary education | 150 | 59.4 |
| Tertiary education | 12 | 5.6 |
| **Years of Experience** | | |
| 1 – 10 | 66 | 30.5 |
| 11 - 20 | 138 | 63.9 |
| 21 – 30 | 122 | 5.6 |
| **Type of Gari Produced** | | |
| White | 98 | 45.4 |
| Yellow | 46 | 21.3 |
| Both | 72 | 33.3 |
| **No of Days of Fermentation** | | |
| 2 – 3 | 42 | 19.4 |
| 4 – 5 | 168 | 77.8 |
| 6 – 7 | 6 | 2.8 |
| **No of Production Cycle Per Month** | | |
| 1 – 2 | 6 | 2.8 |
| 3 – 4 | 63 | 29.1 |
| 5 – 6 | 141 | 65.3 |
| 7 – 8 | 6 | 2.8 |
| **Total** | **216** | **100.0** |

Source: Computed from Field Survey Data, 2013

The conduct of gari's production was depicted by the channels at which gari is being produced, marketed and consumed in the study area as shown in Figure 1. The flow chart detailed all stages involved in gari production process in the study area. The gari producers get their raw cassava tubers either from their personal farms or neighbouring farms or local markets. It was observed that most of them buy fresh cassava tubers at farm gate prices which were measured in terms of heaps, stands, pickups, baskets, bags, bowls depending on the agreement between the seller and the buyer. It was also noticed that most of the operations were carried out manually. The Figure revealed that majority of the respondents (98.6%) used manual peeling while only 1.4% of them employed mechanical peeling device. The peeling equipment employed mainly was knives and short cutlasses. The next stage is grating which is 100% mechanical and they used milling machine specifically fabricated for the exercise. After grating is pressing or dewatering in which 92.6% of the respondents employed mechanical methods that is, the use of hydraulic machine to squeeze water from the milled cassava (cassava paste) while 7.4% used manual method (the use of big stones, ropes and planks) to achieve dewatering. Sieving is done to reduce the cassava paste into granules and as well remove the shafts for easy toasting or frying. Almost 98.6% of the respondents used manual sieving while only 1.4% used mechanical sieving in the study area. Toasting or frying is the last stage of gari processing before it will be ready for consumption. The use of skillet which is the manual method is the main frying device used by the respondents (98.6%) while 1.4% of the respondents used mechanical method. The source of energy for the frying is usually charcoals and firewood. None of them has started using electricity as the source of energy in the study area. The Figure also revealed the different distribution channel for gari produced in the study area. It was indicated that majority (79.6%) of the gari produced in the area went directly to the local market, 9.3% went directly to retailer buyers, 7.4% went directly to eateries and 3.7% went directly for family consumption. It was also observed that the retail buyers, eateries and family consumption still visit local markets to purchase gari.

The result of costs and returns for gari production per cycle in the study area as shown in Table 2 reveals that average costs of transportation (5.40%), peeling, sieving & frying (8.99%), firewood (3.82%), fresh cassava (59.71%), grating & pressing (3.77%) and miscellaneous expenses (2.39%) made up of the total variable cost which is 84.08% of the total production cost of gari production while the fixed cost (15.95%) is made up of costs of skillet (15.43%) and frying plate (0.52%). The total cost of production (TFC + TVC) and total revenue were N50,242.82 and N66,825.00 respectively with the gross margin and profit of N24,582.18 and N16,582.18 respectively established the profitability of gari production is in the area. The benefit cost ratio of 1.33 and profitability ratio of 0.33 further confirmed that gari production business is a profitable and viable enterprise which can drive high income generation for the people to earn a living vis-à-vis boast food production and employment opportunity.
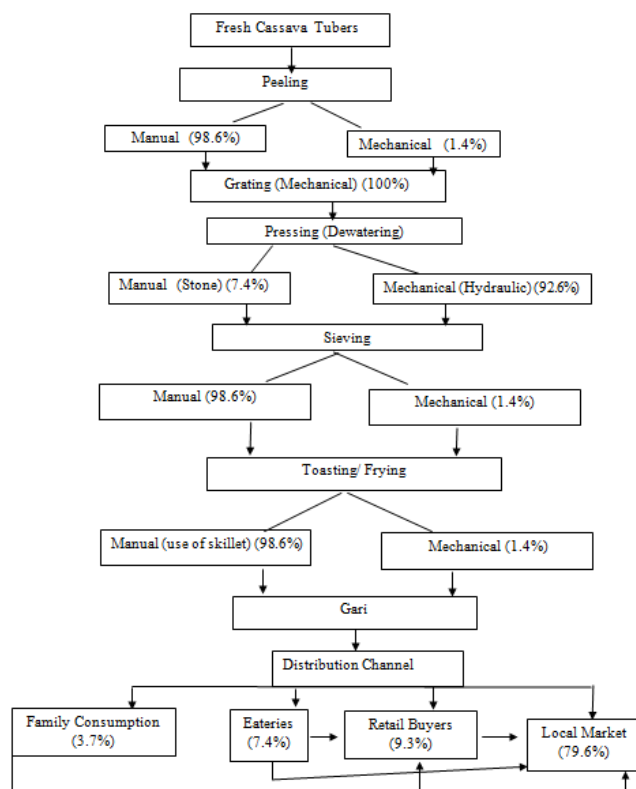
Figure 1: Flow Chart of Gari Production Processes Source: Computed by the Author

Table 2: Costs and Returns Associated with Gari Production.

| Items | Value (N) | Percent |
|---|---|---|
| **Variable Costs (VC)** | | |
| Transportation | 2,711.62 | 5.40 |
| Peeling, sieving & frying | 4,517.82 | 8.99 |
| Firewood | 1,917.61 | 3.82 |
| Fresh cassava tuber | 30,000.00 | 59.71 |
| Grating & pressing | 1,895.77 | 3.77 |
| Miscellaneous | 1,200.00 | 2.39 |
| **Total Variable Costs** | **42,242.82** | **84.08** |
| **Fixed Cost (FC)** | | |
| Skillet | 7,750.00 | 15.43 |
| Fryer plate | 250.00 | 0.52 |
| **Total Fixed Cost (TFC)** | **8,000.00** | **15.95** |
| **Total production cost (TFC + TVC)** | 50,242.82 | 100.00 |
| **Revenue** | | |
| Average selling price of 50kg bag of gari | 5,500.00 | |
| Average quantity of gari sold per cycle | 12.15 | |
| **Total Revenue** | **66,825.00** | |

Gross Margin (GM) = Total Revenue (TR) – Total Variable Cost (TVC)
  = 66,825.00 - 42,242.82
  = **N24,582.18**
Profit ($\pi$)  = Total Revenue (TR) – Total Cost (TC)
  = 66,825.00 – 50,242.82
  = **N16,582.18**
Benefit Cost Ratio (BCR) = TR / TC = 66,825.00 / 50242.82
  = 1.33
Profitability Ratio  = $\pi$ / TC  = 16,582.18 / 50,242.82
  = 0.33

It was revealed that from all the four functional forms tested, the double log function (Cobb-Douglas) was selected as the lead equation. This was done based on the number of significant variables and the value of coefficient of multiple determinations ($R^2$) and significant F-value.

Table 3 indicates that the coefficient of determinant $R^2$ of 0.831 which implies that 83.1% of the variations in returns of gari (dependent variable) was explained by the explanatory variables while the F-value

of 37.30* (significant at 5% level of probability) means the independent variables were jointly influenced the variations in dependent variable. Six out of ten variables; cost of sieving & frying, cost of labour, cost of purchase of raw cassava, cost of grating & pressing, year of gari production experience and sex of the respondents were statistically significant at least at 5% level of probability. Going by the parameter estimates, a unit increases in any of the variables that have positive coefficient and statistically significant will as well increase the returns to gari production. This could be explained by the fact that whenever there is a change in the prices of gari production inputs, it always reflects in the returns from gari. The gari producers always hid under the change in the price of inputs to increase the amount of selling gari in the market. Years of experience will increase the skills and knowledge of working out efficient and effective production processes therefore, as the year's increase one expects more returns. Cost of labour and sex of the respondents were significant but have negative coefficients. It means that a unit increase in cost of labour will reduce returns from gari production and in the case of sex, it means that females counterpart accrue more returns that the males in the production of gari in the study area.

**Table 3: Summary of Regression Results for Cassava Production in the Study Area**

| Functional forms Variables | Linear Coefficient/ t-value | Semi-log Coefficient/ t-value | Exponential Coefficient/ t-value | Cobb-Dou Coefficien t-value |
|---|---|---|---|---|
| Constant | -8821.59 (-3.60) | -21437.0 (1.68) | 9.11 (16.13) | 7.82 (3.24) |
| Transport | 2350.91 (1.29) | -2132.26 (0.65) | 0.33 (1.96) | -0.05 (0.26) |
| Peeling | 82.83 (0.34) | -79.19 (0.63) | -1.31 (0.88) | 0.09 (0.11) |
| Firewood | 32703.72* (2.45) | 2167.82 (0.76) | 1.52 (1.75) | 0.28 (1.91) |
| Sieving&Frying | 34.57 (1.42) | 601.33 (1.71) | 0.13 (1.27) | 0.04* (2.92) |
| Labour | 75.68* (6.46) | 3072.27 (1.83) | 0.01* (7.27) | -0.67* (3.38) |
| Purchase | -299.71* (2.03) | 612.10 (0.11) | 5.69E-5 (0.06) | 0.72* (2.11) |
| Grating&Pressing | 9.10 (0.48) | 582.69* (7.99) | 3.89E-5 (0.80) | 0.09* (2.14) |
| Skillet | -0.33 (1.67) | 830.28 (0.59) | -5.10E-6 (0.39) | 0.16 (0.77) |
| Experience | 15.14 (0.67) | 379.32 (0.22) | -0.04 (1.55) | 0.22* (3.17) |
| Sex | 322.713* (4.36) | -428.61 (1.27) | 0.07 (1.28) | -0.36* (2.07) |
| $R^2$ | 0.841 | 0.781 | 0.839 | 0.858 |
| Adjusted $R^2$ | 0.824 | 0.757 | 0.817 | 0.831 |
| F-value | 36.03 | 23.93 | 33.94 | 37.30 |

Source: Field Survey data, 2012. Note *, significant at least 5% level of probability

The challenges in this context mean problems encountering by the gari producers in order to be more effective and efficient in producing gari and as well make substantial returns. Therefore, a list of major problems encountering by the producers gathered from the literature were posed to them and they were allowed to tick as applicable to them. It was revealed from the Table 4 that no access to credit or loan posed the greatest challenge to the gari producers as ranked first on the list. Most of them complained that they were incapacitated as a result of lack of funds. The micro finance and agricultural banks are not accessible and commercial banks are not affordable as a result of their interest rate and inability to provide their requirement such as collateral. Fluctuation in producer prices and non availability of storage facilities were ranked second and third challenges on the list respectively. The respondents said that gari prices in the market do not stable. Most of them were uncertain of the expected returns and the prices always drop drastically during the on-season as a result of flood in the market. The lack of storage facilities was not helping the matter; therefore the producers will be forced to sell their products at ridiculous prices. High cost of transportation (4th) was said to be experiencing since the removal of fuel subsidies in January, 2012. The pickup and van used for the conveying of the fresh cassava from the farm to the home or market consume more fuel and couple with the bad road network, make it more challenging. Shortage in labour (5th) was complained to be a problem and the probable reason was as a result of releasing their workforce to western education. Most of their children that they do use as labours are now engaged in school activities and those that have graduated are in the cities looking for white collar jobs.

**Table 4: Distribution of respondents by major constraints/problems facing the Respondents**

| Major Constraints/Problems | Frequency | Percentage | Rank |
|---|---|---|---|
| No access to credit/loan | 141 | 65.3 | 1st |
| Lack of storage facilities | 117 | 54.2 | 3rd |
| Shortage of labour | 86 | 39.8 | 5th |
| High transportation cost | 108 | 50.0 | 4th |
| Fluctuation of producer prices | 132 | 61.1 | 2nd |

**Source:** Field survey: 2013     Note: Multiple Response

## IV.    Conclusion and Recommendations

The study concluded that the majority of gari producers are still young and productive, and dominated by female households. Their level of education and years of experience must have assisted the respondents to accrue more income as well as adopt innovations that could make them remain in the enterprise. White type of gari commanded preference to other types in the area while the average days of fermentation was between 4 and 5 days. Many of them produced gari between 5 to 6 times per month despite the fact that most of them processed gari manually. It was also concluded that gari production was profitable and viable in the area given the values of gross margin and profit as N24,582.18 and N16,582.18 respectively. The viability was also confirmed with the values of BCR and profitability ratio of 1.33 and 0.33 respectively. The findings revealed that cost of sieving & frying, cost of labour, cost of purchase of raw materials, cost of grating & processing, years of gari production experience and gender of the respondents were statistically significant in addressing returns of gari production in the study area. Despite the huge opportunities in gari production, it is not but with some challenges that are limiting the expectations of the producers. The lack of access to credit/loan, price instability/flunctuation and lack of storage facilities were the main concerns in the production of gari in the study area.

Based on the facts emanating from this study, the following recommendations are made for both present and intending gari producers and policy makers.

Gari producers should be encouraged to form cooperative societies that can be used as a drive for acquiring loans for members at affordable interest rates. Such loans could also be used by the cooperative body to purchase some mechanical instruments such as peeling machines, grating machines, pressing and frying machines. These machines could be used by members for their gari processing at the payment of token amount lesser than the cost of manual labour that are currently used. This will also make gari processing to be faster and allow more processing cycle to be covered and consequently more profit accruable from gari processing.

Gari producers should be enlightened on the importance or implication of allowing grated cassava to ferment for an average of 5 - 6 days as against 2 – 5 days being currently practiced.

Gari producers should be enlightened and encouraged to fry or toast their gari to a reasonable dryness so as to maintain its quality and durability during long period of storage. This will help the producers to overcome the risk associated with price fluctuation.

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