

Characteristics of Small-Scale Palm Oil Production Enterprise in Anambra State <https://dx.doi.org/10.4314/jae.v22i1.3>

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Abstract

The study examined characteristics of small-scale palm oil production enterprise in Anambra State, Nigeria. All the palm oil producers in Anambra State formed the population of the study. Multi-stage sampling technique was used to select 120 respondents for the study. Data were collected from primary source through validated interview schedule. Data were presented and analyzed using percentage, mean score and factor analysis. Findings show that: mean age was 48.67 years, household size, 7.00 persons and palm oil processing experience, 18.3 years. The majority (93.3%) processed palm fruits as individual or family enterprise, 51.7% pounded cooked palm fruits in large wooden or concrete mortars, 55.8% used hand pressing and 85.0% used NIFOR /Stork hydraulic hand press. The findings further showed the mean annual quantity (174.67 litres), revenue (₦ 163,417), cost (₦ 68,000) and profit (₦ 88,417) of palm oil production, implied that palm oil production in the area was profitable. The major constraints to palm oil production were related to incentive/infrastructure, productivity and socio-economic. The need to improve productivity by encouraging increased use of modern technologies and ensuring good markets for palm oil to encourage more farmers to take up the enterprise was recommended.

Keyword: Palm oil production enterprise; Small-scale processors

Introduction

Palm oil is an edible vegetable oil derived from the mesocarp (reddish pulp) of the fruit of the oil palms, primarily the African oil palm *Elaeis guineensis*, and to a lesser extent from the American oil palm *Elaeis oleifera*. It is naturally reddish in colour because of high beta-carotene content (Poku, 2002). Palm oil is one of the few highly saturated vegetable fats and is semi-solid at room temperature. Like other vegetable oils, palm oil contains no significant amounts of cholesterol, but saturated fat intake can increase

a person's low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol (Harold, 2004; Behrman and Gopalan, 2005). Palm oil is a common cooking ingredient in the tropical belt of Africa, Southeast Asia and parts of Brazil. Its use in the commercial food industry in other parts of the world is widespread because of its lower cost and the high oxidative stability (saturation) of the refined product when used for frying (Matthäus, 2007).

In the 1960s before oil became the dominant income earner for Nigeria, palm oil from the south eastern region of Nigeria was one of the tripods on which the economy of Nigeria stood (Adetola, 2015). With the discovery and dependence of the Nigeria on crude oil, the role of agriculture as a whole and palm oil in particular dwindled. Nigeria not only ceased exporting palm oil, but also became a net importer of palm oil even from Malaysia that took the seedlings from her. The United States Department of Agriculture (USDA) (2017) notes that palm oil production in Nigeria amounts to 537,000 MT in 1964, dwindles and rises to maximum production of 971,000 MT in 2010 and then maintains stagnancy at 970, 000 MT since 2011. According to Adetola (2015), the growth in oil palm has stagnated at 930,000 MT since 2013 while the consumption of palm oil in Nigeria amounts to 2.0 million MT per annum and the shortage in oil palm industry is estimated to be around 1,070,000 MT annually. This poses a very precarious situation not just for the manufacturing sector that uses it as input but even for diet. To this effect, Gupta (2013) noted that various south-eastern states that were part of the old eastern region embarked on activities to revamp palm oil production and processing through establishment of palm development schemes and projects. However, the outcomes of these projects led to an oil palm plantation of 42,658 hectares of land, road development and increased capacity of oil mills as direct effects, yet far below the capacity of the country as former world leader in the oil palm industry.

Various techniques may be used to process palm oil fruits for edible oil, which may be grouped into four categories according to throughput and degree of complexity of the unit operational machinery. These are the traditional methods, small-scale mechanical units, medium-scale mills and large industrial mills. Generally, processing units handling up to 2 tonnes of fresh fruit bunches (FFB) per hour are considered to be small-scale. Installations that process between three and eight tonnes FFB per hour are termed medium-scale, while large-scale refers to mills that process more than ten tonnes per hour (Ataga, Ilechie and Omoti, 1993; FAO, 2004). The oil winning process, in summary, involves the reception of fresh fruit bunches from the plantations, sterilizing and threshing of the bunches to free the palm fruit, mashing the fruit and pressing out the crude palm oil. The crude oil is further treated to purify and dry it for storage and export. Palm oil processors of all sizes go through these unit operational stages. They differ in the level of mechanization of each unit operation and the interconnecting materials transfer mechanisms that make the system batch or continuous. The scale of operations differs at the level of process and product quality control that may be achieved by the method of mechanization adopted (FAO, 2004).

Palm oil production is characterized by low productivity at production level (wild grove) and processor level (traditional processing). The lack of storage and marketing facilities and the numerous intermediaries involved in the value chain could have also

strongly depressed producer prices (Gourichon, 2013). The major constraints of palm oil production according to Olagunju (2008) are the supply of inputs, the inefficiency of processing methods, the low quality of the output, the lack of infrastructure and inefficient distribution. With regards to production, the traditional method is dominant, so yields remain low. Moreover, this method is very tedious and laborious compared to mechanical methods and requires a substantial proportion of labour force. Milling cost of production is high, which results in high prices. The lack of infrastructure such as storage facilities, transportation systems, access roads, communication channels are also sources of inefficiencies in the value chain (Edem, 2012).

However, it has been observed that processing activities are dominated by smallholders located in the rural communities of Anambra State. These smallholders account for the greater percentage of palm oil output in the state but their output cannot even satisfy local demands both quantitatively and qualitatively. It is against this backdrop that this study was carried out to examine characteristics of small-scale palm oil production enterprise in Anambra State, Nigeria.

The specific objectives were to:

- i. describe the socio-economic characteristics of palm oil processors;
- ii. identify palm oil production processes;
- iii. estimate cost and return of palm oil production; and
- iv. identify major constraints to palm oil production in the study area.

Methodology

The study was carried out in Anambra State of Nigeria. The State consists of twenty one (21) Local Government Areas (LGAs), 177 autonomous communities and four (4) agricultural zones namely, Onitsha, Aguata, Awka and Anambra agricultural zones. The State is located between latitude $6^{\circ}45^1$ and $5^{\circ}44^1$ N and longitude $6^{\circ}36^1$ and $7^{\circ}29^1$ E. Anambra State has Abia, Delta, Enugu, Imo and Kogi State as its neighbouring states. It has an estimated population of 4,886,447 in 2011 using the state's growth rate of 2.83% projection of the 1991 census figures as reported by the National Population Commission (NPC) (State Bureau of Statistics, Awka, 2011). It has a total land area of about 4,415.54 square kilometer, 70% which is suitable for agricultural production. The state is located in the humid tropical rain forest zone. Agriculture is the major occupation in the rural areas engaging more than 70% of the rural population. The number of farm families is 338,721 with an average size of 8 persons per farm family or household (Anambra State Economic Empowerment Development Strategy (S.E.E.D.S), 2006). Oil palm fruit is being processed into palm oil in many parts of the state.

Population and Sampling

All the palm oil producers/processors in Anambra State formed the population of the study. Multi-stage sampling technique was used in the selection of 120 respondents for the study. The first stage involved the purposive selection of two agricultural zones (Aguata and Onitsha) that are notable for oil palm production and processing in the state. In the second stage, two extension blocks were randomly selected from each of the selected Agricultural zones. This gave a total of four extension blocks involved in the study and they included Nnewi South and Orumba North in Aguata zone; Ihiala and Ekwusigo in Onitsha zone. The third stage involved the random selection of three

extension circles from each of the selected extension blocks. This gave a total of twelve extension circles and they included Azia, Isseke and Lilu in Ihiala block; Ihembosi, Ozubulu and Ichi in Ekwusigo block; Akwaihedi, Utu and Ezinifite in Nnewi South block; Ajali, Ufuma and Okoh in Orumba North block. From each of these circles, ten palm oil producers were randomly selected. This gave a total of 120 palm oil producers that serve as sample size for the study.

Methods of Data Collection

Data were collected from primary source in which a validated structured interview schedule was used to elicit information from the farmers through the help of agricultural extension agents covering the selected extension circles.

Measurements of Variables

The socio-economic characteristics of the respondents were measured as follows:

Age: Respondents were asked to indicate their actual age in years. This was later grouped as follows: 20-29 years, 30-39 years, 40-49 years, 50-59 years, etc

Sex: The respondents were asked to indicate whether they were male or female.

Marital status: The respondents were asked to indicate whether they are single, married, widowed and separated.

Educational level: The respondents were asked to indicate their level of education such as no formal education, primary school attempted, primary school completed, secondary school attempted, secondary school completed, tertiary education (OND/NCE, HND/First Degree holder and higher degree).

Household size: The respondents were asked to indicate their household size. This was later grouped as follows: 1-5, 6-10, 11-15, 16-20, etc.

Palm oil processing experience: The processors were asked to indicate the actual number of years spent in palm oil processing. Their responses were later grouped into 0-9 years, 10-19 years, 20-29 years, 30-39 years, etc.

Palm oil production processes were measured as follows:

Mode of palm oil processing: The respondents were asked to indicate whether they process by individual (family) or in co-operative (group).

Digestion/ pounding of the cooked fruits: The respondents were asked to indicate whether they use small-scale digester, pounding in large wooden or concrete mortars, foot trampling in canoes or wooden constructed troughs

Pressing (extracting the palm oil): The respondents were asked to indicate whether they use mechanical presses called the 'dry' or 'wet' method, hand pressing, skimming palm oil from the oil/water mixture.

Clarification and drying of oil: The respondents were asked to indicate whether they use clarification to separate the oil from its entrained impurities or drying the recovered oil

Palm oil presses used: The respondents were asked to indicate whether they use manual vertical screw-press, NIFOR /stork hydraulic hand press, motor-jack press, combined screw/hydraulic hand press.

To estimate cost and return of palm oil production, the respondents were asked to estimate the following:

Annual quantity of palm oil produced (litre) such as 1-50, 51-100, 101-150, etc;
Annual revenue from palm oil sale (Naira) such as 1,000-50,000, 51,000-100,000, etc;
Annual cost of production (Naira) (cost of palm fruits, processing, transportation and labour) such as 1,000-50,000, 51,000-100,000, etc; and
Annual profit (Naira) (Revenue - Cost) such as 1,000-50,000, 51,000-100,000, etc.

To identify major constraints to palm oil production in the study area, the respondents were asked to indicate on a 3-point Likert-type scale, how serious each of the various problems militate against palm oil production. Their response categories were: very serious (VS) = 3; serious (S) = 2; and not serious (NS) = 1. These values were added to obtain a value of 6 which was divided by 3 to get a mean score (M) of 2.0. The respondents' mean was obtained on each of the items. Data was subjected to exploratory factor analysis procedure, using the principal factor model with varimax rotation in grouping the constraint variables into major constraint factors. However, only variables with loadings of 0.40 and above (10% overlapping variance) were used in naming the factors. Variables with loading of less than 0.40 were not used while variables that loaded in more than one factor were also discarded.

Method of Data Analysis

The socio-economic characteristics of palm oil processors, palm oil production system, cost and return of palm oil production, were presented using percentage and mean score, while constraints to palm oil production in the study area was analyzed using mean statistic and exploratory factor analysis.

Results and Discussion

Socio-Economic Characteristics of Palm Oil Producers

Table 1 shows that about 43.0% of the respondents were between 50-59 years of age while the mean age was 48.67 years. This implies that palm oil processors were at their middle and productive age hence would be able to carry out tedious operations in palm oil processing. The majority (74.2%) of the respondents were female, while 25.8% were male. This shows that palm oil production in the area under study is dominated by female. The finding is in line with that of Ajani, Onwubuya and Nwalieji (2012) which noted that women in the communities are responsible for the processing and sale of oil palm produce. The majority (76.7%) of the respondents were married which implies that there are more married palm oil processors in the study area.

A greater proportion (37.5%) of the respondents had primary school attempted and about 75.0% were literate who could read and write by having attended formal education. Education plays a significant role in skill acquisition and technology transfer. It enhances technology adoption and the ability of farmers to plan and take risks. Farmers with higher levels of education are likely to be more efficient in the use of inputs than their counterparts with little or no education (Ogundele and Okoruwa, 2006). About 51.0% of the respondents had household sizes of 6-10 persons, while the mean household size was 7.00. This finding implies that palm oil processors had large household sizes. This is in line with the finding of Ajani, Onwubuya and Nwalieji (2012) which reported that the large family size constitutes the family labour which

most of the respondents rely upon in carrying out processing of oil palm produce. Ogundele and Okoruwa (2006) also noted that household size plays a significant role in subsistence farming in Nigeria where farmers rely on household members for the supply of about 80% of the farm labour requirement. Forty percent of the respondents had 10-19 years of palm oil processing experience while the mean palm oil processing experience was 18.25 years. This finding indicate that the producers had very long years of palm oil production experience.

Table 1: Distribution of respondents according to their socio-economic characteristics

Variable	Percentage (%) (n = 120)	Mean
Age		
20-29	6.7	
30-39	15.0	
40-49	21.7	48.67
50-59	43.3	
60-69	13.3	
Sex		
Male	25.8	
Female	74.2	
Marital status		
Single	11.7	
Married	76.7	
Widowed	8.3	
Separated	3.3	
Educational level		
No formal education	25.0	
Primary school attempted	37.5	
Primary school completed	21.7	
Secondary school attempted	4.2	
Secondary school completed	8.3	
Tertiary education	3.3	
Household size (number)		
1-5	37.5	
6-10	50.8	7.00
11-15	11.7	
Palm oil processing experience (years)		
0-9	8.3	
10-19	40.0	
20-29	26.7	18.25
30-39	20.0	
40-49	5.0	

Source: Field survey, 2016

Palm Oil Production Processes

Mode of palm oil processing and processing method

Table 2 shows that the majority (93.3%) of the respondents did their palm oil processing in individual or family basis, while 6.7% operated under cooperatives. This implies that palm oil processing in the area is still a family or an individual enterprise. Table 2 also reveals that greater proportion (55.0%) of the respondents practice traditional methods of palm oil processing while 45.0% engage in small-scale mechanical units. This implies that both traditional methods and small-scale mechanical units of palm oil processing/ extraction are widely used in the study area. According to Ataga, Ilechie & Omoti (1993) and FAO (2004), processing units handling up to 2 tonnes of fresh fruit bunches (FFB) per hour are considered to be small-scale. The traditional method of oil extraction consists of: steeping the pounded fruit mash in hot or cold water; removing fibre and nuts in small baskets and hand squeezing; filtering out residual fibre from the oil/water emulsion in perforated metal colanders or baskets; boiling and skimming palm oil from the oil/water mixture; and drying the recovered oil. Olagunju (2008) noted different techniques used in processing palm oil and these range from modern methods to traditional methods. However, the traditional method of processing according to him is more prevalent among small scale processors and these small scale processors are responsible for the bulk of palm oil processed in Nigeria.

Production process

Table 2 shows that 51.7% of the respondents made use of large wooden or concrete mortars in digestion/ pounding of the cooked fruits, while 10.0% used small-scale digester and 38.3% used foot trampling in canoes or wooden constructed troughs. In pressing (extracting the palm oil) 55.8% of the respondents used hand pressing, while 3.3% made use of mechanical presses called the 'dry' or 'wet' method and 40.8 % skimmed palm oil from the oil/water mixture. In clarification and drying of oil, a majority (95.8%) of the respondents clarified to separate the oil from its entrained impurities, while 55.8% dried the recovered oil. In palm oil presses used, 60.0% of the respondents used manual vertical screw-press, 85.0% used NIFOR /Stork hydraulic hand press, 12.5% use motor-jack press, and 46.7% use combined screw/hydraulic hand press.

The findings are in line with FAO (2004) which noted that the manual vertical screw-press, the stock hydraulic hand press and NIFOR hydraulic hand press enjoyed the highest patronage in Nigeria for a long time, even though oil loss/fibre ratio for these presses range from 18-35 percent. This should be expected as the operation of these presses depends on the strength of the operator. Also the NIFOR mechanical screw-press is the latest used by the small-scale palm oil processing industry in Nigeria. The finding is also in line with Olagunju, (2008) which observed that hydraulic hand press technique was the predominantly used method in processing. Generally, these findings show that palm oil processing in the area is typical traditional and this is in line with a study carried out by Etoamaihe and Ndubueze (2010) which stated that rural women's use of traditional methods for oil palm processing is laborious, time consuming. In support of this, Akangb, Adesiji, Fakayode and Aderibigbe (2011) observed that various activities involved in palm oil extraction *vis a vis* their

corresponding practices were predominantly carried out using traditional practices, except in the case of the digestion activities where digesters were used. The success or failure of a processing depends largely upon how labour and other associated resources are efficiently used. An efficient processing technique increases the quality and quantity of food available for consumption and trade (Etoamaihe and Ndubueze, 2010).

Table 2: Palm oil production processes

Production process	% (n=120)
Mode of palm oil processing	
Individual (family)	93.3
Co-operative (group)	6.7
Processing method	
Traditional methods	55.0
Small-scale mechanical units	45.0
Production process:	
Digestion/ pounding of the cooked fruits	
Use of small-scale digester	10.0
Pounding in large wooden or concrete mortars	51.7
Foot trampling in canoes or wooden constructed troughs.	38.3
Pressing (Extracting the palm oil)	
Use of mechanical presses called the 'dry' or 'wet' method	3.3
Hand pressing	55.8
Skimming palm oil from the oil/water mixture	40.8
Clarification and drying of oil*	
Clarification to separate the oil from its entrained impurities	95.8
Drying the recovered oil	55.8
Palm oil presses used*	
Manual vertical screw-press	60.0
NIFOR /Stork hydraulic hand press	85.0
Motor-jack press	12.5
Combined screw/hydraulic hand press	46.7

Source: Field survey, 2016; * = Multiple response

Profitability Determination of Palm Oil Production Enterprise

Table 3 shows that greater proportion (38.3%) of the respondents produced within the range of 151-200 litres. The mean annual quantity of palm oil produced was 174.67 litres. This implies that palm oil production in the area under study is still low and small scale production. In estimated annual revenue from palm oil sale, Table 3 reveal that greater proportion (43.3%) of the respondents had annual revenue from palm oil sale between ₦ 151,000- ₦ 200,000, while the mean annual revenue was ₦ 163,417. This implies that palm oil processing enterprise attracts a reasonable income/revenue in the area. Table 3 also show that the majority (68.4%) of the respondents had annual cost of palm oil production between ₦ 51,000- ₦ 100,000, while the mean annual cost of palm oil production was ₦ 68,000. The cost of production included cost of palm fruits, processing charges, transportation and labour. The finding implies that palm oil

processors spent less cost in production of palm oil in the area thereby requires low capital for start-off. Table 3 further shows that the majority (54.2%) of the respondents made annual profit from sale of palm oil between ₦ 51,000- ₦ 100,000, while the mean annual profit from the sale of oil palm was ₦ 88,417. This implies that palm oil production in the area is profitable. The finding is in line with Olagunju, (2008) and Emokaro and Ugbekile (2014) which observed that palm oil processing was profitable.

Table 3: Distribution of respondents according to profitability of palm oil production

Variable	Percentage (n = 120)	Mean
Annual quantity of palm oil produced (litre)		
1-50	3.3	
51-100	10.8	
101-150	18.3	
151-200	38.3	174.67
201-250	15.0	
251-300	9.2	
301 and Above	5.0	
Annual revenue from palm oil sale (Naira)		
1,000-50,000	4.2	
51,000-100,000	8.3	
101,000-150,000	21.7	163,417
151,000-200,000	43.3	
201,000-250,000	18.3	
251,000-300,000	4.2	
Annual cost of production (Naira)		
1,000-50,000	23.3	
51,000-100,000	68.4	68,000
101,000-150,000	8.3	
Annual profit (Naira)		
1,000-50,000	13.3	
51,000-100,000	54.2	88,417
101,000-150,000	25.8	
151,000-200,000	6.7	

Source: Field survey, 2016

Major Constraints to Palm Oil Production

Table 4 shows the results of the rotated factor matrix indicating the extracted factors based on the responses of the respondents on the constraints to palm oil processing. It is evident from the table that three major constraints were extracted based on the responses of the respondents. Factors 1, 2 and 3 were named incentive/infrastructure, productivity and socio-economic constraints, respectively.

Incentive/infrastructural constraints included poor market networks (0.617), lack of storage facilities (0.550), insufficient fund for buying of processing machine (0.445) and poor incentives to processors (0.584). The findings imply that good market for the sale of palm oil produce had not been adequately established in the area by either the

government or private bodies. Also, the processors had poor access to processing and storage facilities to increase production due to lack of fund. All these were attributed to poor infrastructure/ incentives to the palm oil producers which hinder their productivity. This is in line with Edem (2012) who noted that the absence of infrastructure such as storage facilities, transportation systems, access roads, communication channels are sources of inefficiencies in the value chain. As a result, smallholders prefer to farm in cottage or cooperative mills or sell crops via middlemen to avoid evacuation, storage and transport (UNIDO, 2010).

Productivity constraints included poor quality of palm oil produce (0.613) and presence of numerous actors and intermediaries involved in the value chain palm oil processing and marketing (0.755) as indicated in Table 4. Poor qualities of palm oil produce system/techniques in the area. The findings agrees with that of Gourichon (2013) which stated that one of the challenges for the sector is to achieve a better internal coordination in production.

Price fluctuation (0.515), scarcity of labour/ shortage of labour (0.603) and lack of policy support to develop the production of quality palm oil (0.755), as indicated in Table 4.6, were the socio-economic constraints. Price of palm produce is not stable due to many reasons such as unstable production cost, demand, middlemen and price fixing by market associations, etc. According to Nwauwa and Onyeka (2011) retail can take place in road sides, local/periodic market centers and stands as well as wholesale and each retail point is characterized by activities of trading associations, consequently the retail market is restricted as it does not allow free entry into the business. Indeed, distributors have to be registered by paying a large amount of money to the associations and the members fix the price of palm oil. The traditional nature of palm oil production in the study area is much labour intensive which are scarce in supply thereby slowing down productivity. Also, policy to encourage small scale producers to increase production is yet to be realized in the area. Akangbe, Adesiji, Fakayode and Aderibigbe (2011) also identified non-contact with extension, poor and inadequate transportation, water scarcity, crude and poor palm oil extraction technology, as well as inadequate labour supply as constraints to palm oil extraction activities.

Table 4: Constraints to palm oil production

Constraints	Factor 1 Incentive constraint	Factor 2 productivity Constraints	Factor 3 socio- economic
Inefficiency of processing methods	0.389	0.154	-0.016
High cost of milling machine/ processing facilities	0.133	0.170	0.276
High cost of hired labour	0.015	0.290	0.011
Use of poor variety of oil palm	-0.501	-0.579	-0.050
Price fluctuation	0.017	-0.142	-0.515
Poor market networks	0.617	0.218	0.034
Lack of storage facilities	0.550	-0.051	0.181
Scarcity of labour/ Shortage of labour	-0.191	0.135	0.603
Poor quality of palm oil produce	-0.104	0.613	0.115
Poor extension services	0.040	-0.004	0.320
Insufficient fund for buying of processing machine	-0.445	0.157	0.293
Poor access to good road network for easy transportation	0.515	-0.500	0.336
low productivity at production level and processor level	0.305	0.091	-0.150
Poor incentives to processors	-0.584	0.266	-0.048
Lack of policy support to develop the production of quality palm oil	-0.003	0.134	-0.755
Presence of numerous actors and intermediaries involved in the value chain palm oil processing and marketing	-0.137	-0.693	-0.159

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.

Conclusion and Recommendations

Palm oil production in the area is dominated by female who use traditional method of palm oil processing. Although, palm oil processing enterprise is still in small scale production, it attracts a reasonable income/revenue, requires low capital for start-off, and is profitable. The major constraints to palm oil processing were issues related to incentive/infrastructure, productivity and socio-economic constraints.

There is need to improve productivity by encouraging increased use of modern technologies and ensuring good markets for the palm oil produce to encourage more processors to take up the enterprise. This could be achieved by governments or NGOs by intensification of adequate or comprehensive training of farmers on palm oil processing technologies through extension and equally provide them with suitable and necessary incentives and palm oil infrastructural facilities.

There should be provision of modern processing machinery to alleviate the drudgery of processors. It is therefore important to mechanize the key drudgery-alleviation equipment that can be easily handled by the processors especially women. This could be achieved through acquisition of grants from government, donor agencies or pooling of resources through cooperative formation.

Efforts are needed by the extension agents in providing and disseminating information on improved palm oil processing techniques for adoption by the processors. Also, adequate training on the modern palm oil processing technologies should be given to the processors. This will improve the quality and quantity of palm oil product as well as enhance increased revenue/income among rural dwellers.

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