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Analysis of The Role of Women Within the Oil Palm Value Chain in the Akyemansa District and Birim Central Municipality of the Eastern Region of Ghana

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Abstract

This study presents the findings of the analyses of the role of women in the oil palm value chain. The Akyemansa District and Birim Central Municipality were selected purposively, and primary was data collected from 74 farmers, 109 processors and 47 distributors within the study area. The research set out to identify and map out the actors within the oil palm value chain, describe the key roles performed by women at each stage of the chain, estimate the differences in value added between men and women, as well as identify and rank constraints faced by actors. The results show that women add the most value in the production, processing and distribution nodes of the chain. Women recorded higher ROI values (GH₵0.3, GH₵0.3 and GH₵0.5 – the latter being significantly different from that of the men) and higher gross margins (GH₵0.5, GH₵1.21, GH₵4.65) per unit sale for the production, processing and distribution stages respectively. The most pressing constraints were identified as high transportation and labour costs as well as high interest rates. These results informed policy recommendations, among which include a call to empower women to take up more leadership roles in the oil palm sector, especially in management and resource-control. Government must ensure that access roads are developed and better maintained to ease the transportation of goods. The assembly must encourage the formation and/or activation of associations to give the actors leverage on the capital market and help them manage labour costs, for example through communal labour.

Keywords: oil palm, women, value chain, Ghana

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INTRODUCTION

Over the years, women have played critical roles in agriculture and have constituted the majority of smallholder farmers in some jurisdictions (FAO, 2011). Women in agriculture are mostly found in the lower nodes of the value chain that are characterized by lower gains.

According to IFAD, the greater proportion of the world's poor and vulnerable dwell in developing countries and most of them are women who live in rural areas where the dominant occupation is farming. Many face challenges with transitioning into the upper echelons of the value chain which is characterized by higher returns (FAO, 2012). Although Ghana has made tremendous strides in reducing poverty, a significant number of women still lack decent work opportunities (FAO, 2012). To help eradicate poverty, the government of Ghana realized the need to transform the economy through the modernization, promotion and use of local resources such as oil palm, maize, sorghum and other commercially feasible export and domestic market-focused enterprises.

Palm oil is Ghana's next major export commodity whose full economic exploitation can be spearheaded through small-scale agro-processing of fresh fruit bunches (FFB) into Crude Palm Oil (CPO) for export (Adjei-Nsiah et al., 2012). It has become Ghana's

second most important traded tree crop, by economic importance, coming second only to cocoa (Danyo, 2013).

The palm tree, whose fleshy fruits are extracted for the crude palm oil (CPO), is cultivated in the undisturbed wooded (forest) belt of Ghana where the annual precipitation is above 1200 mm per annum with bimodal distribution (Ofosu-Budu and Sarpong, 2013). The Central, Eastern and Western regions of Ghana present the most conducive areas for cultivation of palm. However, the crop can be cultivated in other areas such as the Ashanti, Bono and Volta regions (Rhebergen et al., 2014).

Palm oil is commercially produced in all the forest zones of the Eastern region made up of districts such as Akyemansa, Birim North and South, Kwaebibirem, Denkyembour, West and East Akyem, Atiwa, and Ayensuano. Due to the longer harvesting season (in comparison to cocoa) and the relatively low risk in the cultivation of oil palm, its production has the potential to become more profitable than cocoa (Danyo, 2013).

Apart from palm oil, there are byproducts such as palm kernel oil and pressed fibre that provide a potentially profitable industry especially for women entrepreneurs.

Ghana's palm oil sector received a boost during the initiation of the out-grower project schemes for the development and expansion of seed nut production to about 5 million seed nuts per year. There was also the cultivation of over 20,000 hectares of small-scale farms (Fold and Whitfield, 2012). The support was intended to cause a surge in the supply of oil palm and hence boost output levels of palm oil annually to take advantage of Ghana's and West Africa's unmet demand of 350,000 MT and 850,000 MT respectively (Angelucci, 2013). Moreover, there is an opportunity for increased palm oil production in Akyemansa and Birim Central Municipality and the region as a whole. This laudable intervention however, needs pragmatic efforts aimed at reducing rural poverty and increasing employment. In light of the role of women in agriculture, it also

has the opportunity to better equip small-holder farmers, especially women, to produce at optimum capacity to increase productivity, profitability and self-sufficiency.

Women play an integral role in the oil palm value chain but are faced with barriers that tend to limit their active participation (Mutua et al., 2014). Cultural seclusion is one of the major factors that has limited women's access to markets (Farnworth, 2011). With increase in commercial farming and trade, some cultural norms have placed burdens on income-control by women. There is also the challenge of women having limited access to technologies (FAO, 2011). Though women form the majority of agricultural actors, they mostly lack the basic rights to own agricultural land, which situation pushes them into less-paying business ventures (FAO, 2011). The role of women must be efficiently included in the business model so as to better quantify and appreciate their contributions to the oil palm value chain.

Objectives of the Study

The foremost objective of the study is to analyse the role of women in the oil palm value chain and assess their respective roles/contributions along the chain.

The study specifically set out to;

1. Identify and map out the various actors along the oil palm value chain.
2. Identify the major roles and activities performed by women at each stage of the value chain.
3. Estimate the difference in value added between men and women actors.
4. To identify and rank the major constraints that affect actors.

Research Questions

In couching out the objectives of the study, the following research questions were posed.

1. What is the nature of the oil palm value chain?

2. What specific roles do women perform in the value chain of oil palm?

3. What are the differences in value added between men and women along the chain?

4. What are the constraints that affect actors at each level of the chain?

Hypotheses

The following hypotheses underlie the general objective of the study, the partial intent of which is to establish, through assessments of value added, Return on Investment (ROI) and margins, the differences in value addition between men and women at every key stage of the value chain.

H_0: There are no significant differences between the ROI of male and female producers/processors in the oil palm value chain.

This was repeated for other actors in the chain. The t-test was used to test for differences in the means.

For the constraints analysis, the underlying null hypothesis is:

H_0: The Coefficient of Concordance (W) = 0 (i.e. there is no agreement within the rankings)

METHODOLOGY

Research Design

Both quantitative and qualitative data were collected for the study. Prior to the formal survey, a reconnaissance survey and focus group discussions were conducted to gain a general overview of the oil palm sector, as well as palm oil production and marketing arrangements.

Table 1: Research design

Type of Analysis	Data Required	Sources	Method of Collection
Value chain Mapping	**Sources of inputs, output produced, and output channels**	**Producers, processors, distributors**	**Questionnaire interviews**
	Activities undertaken to support various actors in the value chain	MoFA, OPRI, NGOs, Financial institutions	Key informant interviews
Assessment of roles of men and women along the value chain	**Activities of the actors at every stage of the value chain (Initiation, decision-making, ownership, management, control of resources)**	**Producers, processors, distributors**	**Questionnaire interviews**
Estimation of margins and Return on Investment	Quantities, Costs and Prices	Producers, Processors, Distributors	Questionnaire interviews
Constraints analysis	**Scoring using Likert scale**	**Producers, Processors, Distributors**	**Questionnaire interview**

Sample and Sampling Technique

The Akyemansa district and Birim Central Municipality were purposively selected, and 74 farmers selected at random from these areas. Purposive sampling was used to select 109 processors from the various communities in the two districts, and the snowball sampling technique used to select a total of 47 Distributors.

Table 2: Distribution of sample

	Producers	Processors	Distributors
Akyemansa District			
Akokoaso	0	6	0
Ayirebi	8	15	18
Abenase	2	4	0
Ofoase	27	9	8
Otwereso	10	20	3
	47	54	29
Birim Central Municipality			
Asene	8	20	4
Manso	1	14	0
Oda	5	0	20
Oda-Nkwanta	13	21	4
	27	55	28

Mode of Analysis

Identification and Mapping of Actors in the Oil Palm Value Chain

At each operational phase, the major roles that are performed by independent men and women entrepreneurs were identified and the respective number of men and women that carry out these roles ascertained. The roles identified in the value chain were categorised under initiation, decision-making, control over production resources, ownership and managerial.

Estimation of Gender Roles Along the Value Chain using Duncan's Index of Dissimilarity

Duncan's Index of Dissimilarity was used to measure gender segmentation for the entire value chain. According to Michael (1986) and Duncan and Duncan (1955), the index measures the uniformity with which two mutually exclusive groups are spread across the geographical entities that make up a larger physical entity.

$$\mathrm{D} = 0.5 * \sum_{i=1}^{N} |fi - mi|$$

$$D = \frac{1}{2} * \left[\left| \left(\frac{f_{prod}}{F} - \frac{m_{prod}}{M} \right) \right| + \left| \left(\frac{f_{trad}}{F} - \frac{m_{trad}}{M} \right) \right| + \left| \left(\frac{f_{proc}}{F} - \frac{m_{proc}}{M} \right) \right| \right]$$

Where D is Diversity or Index of Dissimilarity, F is the total female population in the chain, f_i is the proportion of females in a particular node of the chain, M is the total male population in the chain, mi is the sample male population at a particular chain node, and prod, trad, pro represent production, trading (distribution) and processing levels of the actors in the chain.

The index consists of a range of 0 to 100 or 0 to 1. An index of 0 means a perfect gender integration within the workforce. An index value of 1 or 100% indicates complete gender segregation within the workforce.

Estimation of Value Addition at each Stage of the Oil Palm Value Chain

Value addition was calculated using the following estimations: profit, value added, depreciation, fixed cost, variable cost, total cost, and total revenue. Evaluation of Value Addition was done by estimating the incremental monetary value added to inputs at each stage to generate output for the next level along the value chain (Figure 1).

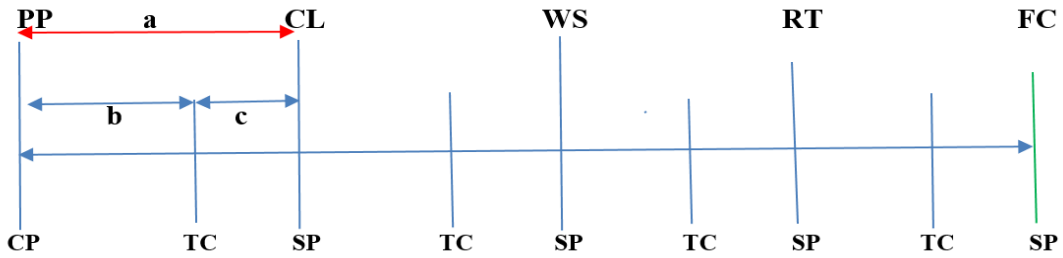

Figure 1: Illustration of value addition along the palm oil value chain and how value accumulates as the chain evolves.
Source: Lamptey, 2016

Where PP = primary producer, CL = collector, WS = wholesaler, RT = retailer, FC = final consumer CP = cost price, and TC = total cost. SP and TC represent the selling price and total cost respectively, a is value addition**,** b is production cost and c is benefit or profit.

Estimations for Value Addition

Value added for distributors and processors was estimated by finding the difference between the price at which a primary input was purchased from a preceding actor and the price at which it was sold as a finished product.

The equation is given by:

$$VA = SP - CP$$

Where, VA = Value added, SP = Selling Price and CP = Cost price of primary input that was purchased from the preceding stage. Value added for crude palm oil (CPO) processors was estimated per month. The production cost and revenue were estimated for gallons of CPO per 2 weeks and used to calculate the value added. Value added for oil palm producers was obtained by calculating their total revenue and subtracting the cost of their production input.

$$VA_i = \frac{TR - (PP * n)}{\text{Number of months}}$$

Where: TR = Total Revenue, PP = Price of Primary input and n = number of primary

inputs. The mean Value Added is estimated as:

$$\text{Mean VA} = \frac{\Sigma_{j=1}^{N} VA_j}{N}$$

Where Mean VA = Mean Value Added and N = number of actors at a given level of the chain.

Gross Margin Estimation

The gross margin per unit output (GM) is expressed as;

$$GM = SP - MC$$
$$= SP - TC/Q$$

Where SP = Selling Price, MC = Marginal cost (=TC/Q), TC = Total cost and Q = Output produced.

Mean gross margin (Mean GM) was estimated as;

$$\sum_{J=1}^{N} \frac{GM}{N}$$

Where N is the number of people in a particular community and j the number of participants in the value chain.

Fixed Cost Estimation

The components considered as fixed cost for the production of oil palm include the land, tools (earth chisel, cutlasses, lines, watering cans), and labour cost for permanent employees. The fixed cost elements considered for palm oil processors include trucks, milling plants, extractors, bowls/containers, basins, boilers, wheelbarrows, water tanks/reservoirs, and frying pans. Fixed cost components for distributors include cost of store room, trucks, store, business license, tanks and cost of wages. The total fixed cost (TFC) for the actors was obtained from adding the various depreciated fixed cost items of that actor. The items were depreciated using the straight-line method. This is expressed as:

$$TFC_j = \sum_{i=1}^{n} FC_i$$

Where TFC_j = Total depreciated fixed cost for actor j, FC_i = Depreciated fixed cost of the i^{th} item and n = number of fixed items for actor j.

Variable Cost Estimation

The variable cost components for production consisted of the cost of polyethylene bags, pre-germinated seeds, weedicides and pesticides, fertilizers, pruning, harvesting and labour. The variable cost items for processing included cost of water, transportation, milling and extraction, fuelwood, packaging materials. These items were estimated for a gallon of palm oil per fortnight. Cost of transportation, rent, tax, gallons, loading and offloading were among the variable cost items considered for distributors. The total variable cost of each actor was estimated by adding up the product of the unit price and quantity of the variable cost items. The variable cost also includes marketing costs. The equation is expressed as:

$$\mathrm{TVC_j} = \sum_{\mathrm{i=1}}^{\mathrm{n}} \mathrm{r_i x_i}$$

Where TVC_j = Total Variable Cost for actor j, r_i = unit price of variable item, x_i = quantity of variable cost item, n = number of variable cost items for actor j.

$$Mean\ \mathrm{TVC} = \frac{\sum_{\mathrm{i=1}}^{\mathrm{n}} TVC_j}{N}$$

Where N = number of actors at a given level.

Total Cost Estimation

The total cost of an actor is the addition of the fixed cost and total variable cost.

$$TC_j = TFC_j + TVC_j$$

Mean total cost for all actors at a given level of the chain is given by:

Mean TC = mean TFC+ mean TVC

Total Revenue Estimation

Total revenue was estimated by multiplying the number of bunches of fruits or gallons of palm oil sold by the prevailing market price. Prices of bunches were determined by their sizes. The total revenue of a processor is the number of gallons of CPO produced multiplied by the prevailing unit price.

Equity of Benefits Along the Chain

The net income (profit) and the margins of the various actors within a particular chain were estimated and used to calculate their returns on investment (ROI) per month, and the paired sample t-test used to check its significance.

Estimation of Return on Investment (ROI)

The margins created by the various actors were estimated as the difference between the price of the actor's value created and the unit cost incurred in the creation of that output. For the purposes of this study, the ROI was used to measure the efficiency of investments made by the actors of the value chain and compared to see their equity. The ROI is specified as;

$$\mathrm{ROI} = \frac{P_o - C_o}{C_o}$$

Where P_o = Value of one unit of output and C_o = unit cost incurred in producing an output.

Identifying and Ranking the Major Constraints that Actors Face in the Oil Palm Value Chain

Respondents were asked to identify and rank a set of barriers faced them in the oil palm value chain. Kendall's coefficient of concordance was then used to test the agreement among the rankings. The rankings were estimated to determine the respective means of each constraint, which were used to calculate the total rank score for each constraint. The constraint with the least sum score was ranked as the most pressing and the one with the highest sum score ranked as the least pressing constraint. The total rank score was used to calculate the Coefficient of Concordance (W). W is positive and it ranges between 0 and 1. W is 1 when there is complete agreement among the rankings of the actors and 0 when there is complete disagreement in the rankings.

$$W = \frac{12S}{p^2(n^3 - n) - pT}$$

Where T = sum of ranks for each constraint being ranked and n = number of respondents = number of rankings.

Hypothesis:

H_0: W = 0; there is no agreement within the rankings of the constraints.

RESULTS AND DISCUSSIONS

Demographic Characteristics of the Respondents

About 41.9% of the 74 farmers interviewed were women. This percentage engagement of women in oil palm is higher than the 25% found by Ofosu-Budu and Sarpong (2013) for fresh fruit bunch (FFB) producers in the Kwaebibirim District.

Table 3: Educational of respondents

Actors	Characteristics	Gender	
		Male (freq.)	Female (freq.)
Producers		**43 (58.1)**	**31 (41.9)**
	Formal education	30 (66.7)	15 (33.3)
	No formal education	13 (44.8)	16 (55.2)
Processors		**18 (16.5)**	**91 (83.5)**
	Formal education	16 (21.6)	58 (78.4)
	No formal education	2 (5.7)	33 (94.3)
Distributors		**8 (17)**	**39 (83)**
	Formal education	5 (14.2)	30 (85.7)
	No formal education	3 (43)	9 (57)

*Percentages in parentheses

Women constituted 41.9% of producers and at the palm oil processing stage, represented 83.5% as against 16.5% of men. Women also made up 83% of distributors, an indication that an intervention in the oil palm sub-sector would greatly impact the lives of women. This percentage engagement of women in the oil palm value chain is found to be higher than what was reported by Ofosu-Budu and Sarpong (2013) of 25% of producers, 80% of processors and 80% of distributors being female.

Mapping of Key Actors, Functions and Existing Linkages Along the Oil Palm Value Chain

Input Suppliers

The value chain begins with the supply of inputs such as agrochemicals, seedlings, fertilizer, and farm equipment. The agro-inputs used extensively in the study area are mostly obtained from the Oil Palm Research Institute (OPRI) in Kusi, and also from

private agents. About 80% of producers source their seedlings directly from OPRI, 6% from private agents and 4% from their farms and from family and friends.

Producers

Oil palm production in Ghana is dominated by independent small-scale holders who produce about 80% of all CPO in the district. The production activities involve land preparation (bush clearing, felling of trees, etc.), line and pegging and sowing. Labourers are occasionally hired by farmers to carry out some of the farming activities.

Processors

Ghana produces about 2,000,000 MT of FFB annually with the small-scale processors contributing to over 60% of total production (Osei-Amponsah et al., 2012). Oil palm processing in Ghana is divided into five main categories. There are the large industrial plantations with large-scale processing mills linked to a network of smallholder and out-grower farmers who produce to feed the industry. There also are the medium-scale plantations with medium-scale industrial mills linked to a network of out-growers. There are also the small independent farmers cultivating less than 10 hectares (who may double as processors), small-scale processors using semi-mechanised mills with a capacity of about 6 to 10 tonnes per day, and secondary processors who process crude palm oil into refined olein (Danyo, 2013).

Harvested bunches are conveyed to the processing centre where they are split, the fruits removed from the spikelet and packed into boilers and boiled for over an hour. The boiled fruits are then conveyed into the miller which crushes the mesocarp containing the oil. There are three main types of pressing equipment used - the digester screw press, the digester with separate spindle press, and the digester with separate hydraulic press. 6% of respondents used the digester screw press, 20% the digester with separate hydraulic, and 74% the digester with separate hand spindle press. The FFB together

with the loose fruits are conveyed in trucks from the farm gate to the processing mill. The processors estimate the weight of the fresh bunches by counting the number of bunches or by mere visual assessment. The FFB are quartered into spikelets, kept on the floor and covered with polyethylene sheets, palm fronds, or simply left uncovered for a period of 3-5 days. This practice is to aid the loosening process of the fruits. The loosened fruits are then heaped in a metal boiler and boiled for a period of 1 to 4 hours or overnight. The boiled fruits are then carried by the women into the digester which crushes the mesocarp containing the oil. The digester separates the oil, fibre and the nuts into different compartments. The oil is collected at the outlets by the women and then poured into big pots where they are fried under low heat. This frying process, referred to as clarification, is done to remove water from the crude (Osei-Amponsah, 2012).

Distributors

Palm oil assembling, wholesaling and retailing are dominated and controlled by women. Traders of palm oil in the Akyemansa and Birim Central Municipality operate mostly as private entrepreneurs. There are no specific trader associations for palm oil dealers in the districts. There exists a market 'queen' status and function as an expression of traditional hierarchies. Together with her assistants, rules of engagement are established, such as setting of prices and the admission of new entrants, which is binding on all.

Traders from Accra, Kumasi, Tamale, Dambai, including countries like Togo, Nigeria and Burkina Faso come to buy crude palm oil both for consumption and industrial purposes. These marketers from the aforementioned countries have local agents who move from one mill to the other to purchase palm oil. These agents in turn resell to these marketers. Some marketers also buy the oil during the peak season and store them until

between November and February when there are hikes in the prices. There are also wholesalers who buy the oil in large quantities directly from the processors and supply to end users in the large towns and cities. There is also the assembler who uses his or her own resources to finance the marketing of palm oil. They sometimes get financial aid from wholesalers who play a pivotal role in the financing of the informal sector of the rural and urban economy.

Retail of palm oil is mostly the preserve of women in the Akyemansa and Birim Central Municipal even though there are few males who ply their trade in this stage of the value chain.

The Role of Women in the Oil Palm Value Chain

From Table 4, about 33.8% of females interviewed were initiators of the production process. Out of the 109 processors interviewed, 82.6% of the initiators were women. This is an indication of the dominance of women in that node of the value chain. Also, at the distribution stage of the chain, 78.7% of the initiators were female. In the ownership role, men dominate in production (60.8%) but the women dominate in the processing and distribution stages of the chain. This is an indication that women take over control of the product right after production/harvest.

In decision-making/taking, the men were seen to dominate the production sector in terms of who takes the decision concerning the use of land. This is due to the fact that very few women own farm lands. However, a lot more women were involved in decision-making in the processing (78.9%) and distribution (87.2%) nodes of the chain. As in earlier discussed roles, the males dominated in the management (70.3%) and resource-control (78.4%) roles in the production phase. More women managed and controlled resources in the distribution stage (81.5% and 82.9 respectively) and the management of processing (81.7%). This corroborates the results of Ofosu-Budu and

Sarpong (2013) which indicate a higher level of decision-making and resource-control by women in the processing and distribution nodes, while men dominate in the production phase. In this study however, the men outnumbered their women counterparts in the control of resources within the processing stage (87.2%).

Table 4: Indicators of the roles of men and women in the palm oil value chain

	Production				**Processing**				**Distribution (Trading)**			
Roles	Male		Female		Male		Female		Male		Female	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Initiation	49	66.2	25	33.8	19	17.4	90	82.6	10	21.3	37	78.7
Ownership	45	60.8	29	39.2	10	9.2	99	90.8	8	17	39	82.9
Decision-making	44	59.5	30	40.5	23	21.1	86	78.9	6	12.8	41	87.2
Management	52	70.3	22	29.7	20	18.3	89	81.7	4	8.5	43	81.5
Control of resources	58	78.4	16	21.6	95	87.2	14	12.8	8	21.7	39	82.9

Source: Authors' computation.

Difference in Value Added Between Men and Women

Gender Segregation Using Duncan's Index of Dissimilarity

Table 5: Gender role and Duncan's Dissimilarity Index.

Actors	Male		Female		Total (Freq.)	Absolute Difference (%)
	Freq.	%	Freq.	%		
Producer	43	58.1	31	41.9	74	16.2
Processor	18	16.5	91	83.5	109	67
Distributor (Trader)	8	17	39	83	47	66
Total						**149.2**

Source: Authors' computation.

Men dominate the production stage (58.1%) while females dominate the processing and distribution stages with 83.5% and 83% respectively (Table 5).

D = ½ * (149.2)

= 74.6%

The percentage of dissimilarity between the roles of men and women in the oil palm value chain is 74.6% - women have an absolute dominance of 74.6% across the entire value chain.

Individual Levels of Dissimilarity Amongst Palm Oil Value Chain Actors

Dp, Dpr, Dd = Production, Processing and Distribution stages respectively.

Dissimilarity at the production stage:

Dp = ½ * D_i%

Dp = ½ * 16.2%

Dp = 8.1%

Therefore, the level of dissimilarity amongst producers is 8.1% and men dominate the production of palm oil by this proportion.

Dissimilarity at the processing stage:

Dpr = ½ * D_i%

Dpr = ½ * 67%

Dpr = 33.5%

The level of dissimilarity between men and women producers and the proportion of dominance by women is 33.5%.

Dissimilarity at the Distribution stage:

Dd = ½ * %D_i

Dd = ½ * 66%

Dd = 33%

The level of dissimilarity between men and women distributors and the proportion of dominance by women is 33%.

Distribution of Value Addition, Costs and Returns along the Oil Palm Value Chain

Table 6: Value addition, margin, and ROI for men and women actors

Actors	Measures of value addition	Women	Men
Producers			
	VA	3.49	3.44
	Margin	0.5	0.44
	ROI	0.3	0.24
Processors			
	VA	3.3	3.0
	Margin	1.21	1.11
	ROI	0.3	0.2
Distributors			
	VA	6.9	5.04
	Margin	4.65	2.8
	ROI	0.5	0.4

Source: Authors' computation.

Value created when FFB is sold by a female farmer to the processor was GH₵3.49 (GH₵0.05 more than value added by male farmers) out of which GH₵0.5 per every bunch accrued to the farmer as profit (GH₵0.06 more than their male counterparts). This represents 14.3% of the value created. Female processors generated a value of GH₵3.3 (GH₵0.3 more than male processors) per one litre of palm oil produced. GH₵1.21 (37%), which is more than twice what accrues to the female farmer, accrues to the female processor. This is GH₵0.1 more than the margins accruing to male processors. The female distributor generates a value of GH₵6.9 (GH₵1.86 more than that of male distributors) per litre of palm oil sold. An amount of GH₵4.65 (67.4% of

the value created) accrues to the female distributor (GH₵1.85 more than what accrues to the male distributor). Returns on investment for female producers, processors and distributors was GH₵0.3, GH₵0.3 and GH₵0.5 respectively (i.e. for every cedi investment into cultivation, processing and distribution of FFB/palm oil, these amounts are realized).

Table 7: Paired Sample Test for Return on Investment

Actor	Mean (ROI)	Standard deviation	t-Value	Decision rule on hypothesis
Male farmer	0.2	0.0693	0.070	H_0 not rejected*
Female farmer	0.3	0.0704		
Male processor	0.2	0.0144	-4.876	H_0 not rejected*
Female processor	0.3	0.0548		
Male distributor	0.4	0.0516	-3.127	H_0 is rejected**
Female distributor	0.5	0.0578		

*t-critical > t-calculated – There is no statistically significant difference in the means of the ROI of male and female farmers, and male and female processors.

**t-calculated > t-critical – There is a statistically significant difference in the means of the ROI of male and female distributors.

Analysis of Constraints Within the Oil Palm Value Chain

The study set out to analyse the constraints that plague the various phases of the value chain for oil palm. Constraints identified through review and pre-tests were presented to the actors to rank in order of severity, 1 being the most severe and 8 (for distributors) or 9 (for producers and processors) being the least severe. Kendall's Coefficient of Concordance (W) was used to assess the level of agreement within the rankings. The analysis showed that there was concordance of 96.5%, 95.3% and 89.5% for females and 98.1%, 96.7 and 96.5% for males in the rankings by producers, processors and distributors respectively, indicating that these results are statistically significant for the oil palm value chain. Both male and female actors agreed on the order of rankings for each stage of the value chain.

Male and female farmers ranked high cost of labour as the most severe constraint on production. They ascribed increases in cost of production and subsequent reduction in margins to hikes in labour cost. High transportation cost and poor roads were also ranked as severe constraints, forcing farmers to sell their produce in local markets instead of in high value markets. Non-availability of fertilizer and weak contractual agreements were ranked the least constraining (Table 8).

Table 8: Ranking of constraints of production

Constraints	Mean Score [Women]	Mean Score [Men]	Rank
High cost of labour	1.10	1.16	1st
High transportation cost	1.90	1.84	2nd
Poor roads	3.10	3.12	3rd
High cost of inputs	3.98	3.88	4th
Inadequate storage facilities	5.03	5.14	5th
Bush fires	6.12	5.88	6th
Lack of ready market	7.03	7.07	7th
Non-availability of fertilizer	7.95	8.00	8th
Weak contractual agreements	8.78	8.91	9th
Women		Men	
N=30		N=42	
Kendall's (W)=0.965		Kendall's (W)=0.981	
D.F =8		D.F=8	
Significance: P-Value=0.000<0.05		Significance: P-Value=0.000<0.05	

Source: Authors' computation.

The ranking by processors identified high transportation cost as the most pressing constraint. This is a major debilitating factor against agricultural growth in the region as it increases operational costs, thereby reducing profit margins and discouraging entry into the value oil palm value chain (Nidhi et al., 2017). High cost of labour, poor roads and lack of ready market were also labelled as inimical to the success of economic activity. Adulteration of product and irregular supply of raw materials were ranked as the least severe among the constraints on processing (Table 9).

Table 9: Ranking of constraints of processing

Constraints	Mean Score [Women]	Mean Score [Men]	Rank
High transportation cost	1.16	1.22	1st
High cost of labour	1.88	1.78	2nd
Poor roads	3.07	3.25	3rd
Lack of ready market	3.97	3.86	4th
Inadequate storage facilities	5.17	5.04	5th
Lack of government support	5.99	5.86	6th
Weak contractual agreement	7.13	7.14	7th
Adulteration of product	7.87	7.97	8th
Irregular supply of raw materials	8.78	8.83	9th
Women		Men	
N=91		N=18	
Kendall's (W)=0.953		Kendall's (W)=0.967	
D.F =8		D.F=8	
Significance: P-Value=0.000<0.05		Significance: P-Value=0.000<0.05	

Source: Authors' computation.

Like the processors, distributors ranked high transportation cost as the most severe constraint. Coupled with poor roads (ranked as the fourth most constraining), the problem of high transportation cost delimits the profitability of the sector. Second to this constraint was high interest rates on loans which discourage actors from borrowing to expand their business. Distributors also face serious problems associated with adulteration of palm oil. Weak contracts and lack of quality standards were ranked as the least pressing (Table 10).

Table 10: Ranking of constraints of distribution

Constraints	Mean Score [Women]	Mean Score [Men]	Rank
High transportation cost	1.22	1.13	1st
High interest rates	2.12	2.00	2nd
Adulteration of product	3.05	2.88	3rd
Poor roads	4.00	4.13	4th

Inadequate storage facilities	5.17	5.25	5th
Lack of government support	5.85	5.63	6th
Weak contractual agreements	6.68	7.13	7th
Lack of quality standards	7.92	7.88	8th
Women		Men	
N=39		N=8	
Kendall's (W)=0.895		Kendall's (W)=0.965	
D.F =7		D.F=7	
Significance: P-Value=0.000<0.05		Significance: P-Value=0.000<0.05	

Source: Authors' computation.

Since W > 0 for each of the stages, the null hypothesis is rejected for the alternate hypothesis - there is statistically significant congruence in the rankings.

CONCLUSIONS AND RECOMMENDATIONS

Women in Akyemansa district and Birim Central Municipality play important roles in the production, processing and distribution of oil palm products. They dominate in enterprise initiation, ownership, decision-making, management and control of resources in the processing and distribution sections of the value chain. They perform slightly better than their male counterparts in terms of value addition, margins and return on investment. There are however factors that are constraining on the economic activities of both male and female actors, the most severe of which include high transportation and labour costs as well as high interest rates.

The study brings to the fore the performance of women in the oil palm sector and how pivotal their roles are towards agricultural and economic stability. Women must be empowered to take up a lot more roles in the chain, especially in the ownership and/or management of farmlands. Government, through the relevant ministries, must prioritize the construction and development of access roads in the Akyemansa and Birim areas as well as across oil palm-producing areas of the region. Municipal and district assemblies in these areas should help form active associations of actors,

especially in areas where they are absent, to encourage the use of bargaining power and the leveraging of high labour costs through communal labour. These associations could also serve as thrift groups to help the actors leverage the capital market for better interest rates.

There is a dire need for standardization of oil palm. The study recommends that Ghana's Food and Drugs Authority should institute a measure of standard for locally produced palm oil to nip product-adulteration in the bud.

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