

Economics of Soybean Production: Evidence from Saboba and Chereponi Districts of Northern Region of Ghana

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Abstract

The objective of this study was to document soybean production practices, estimate the level of profitability and identify constraints to soybean production in Saboba and Chereponi districts of the Northern Region of Ghana based on gender. Primary data from 140 farmers were subjected to profitability analysis and Kendall's Coefficient of Concordance. Soybean production was found to be unprofitable in Chereponi District for both male and female farmers but profitable for male farmers in Saboba District. Constraints to soybean production include lack of right over land, selling of produce on credit, among others. The level of profitability of soybean production can be improved by addressing constraints such as unfavourable land tenure arrangements, unfavourable market conditions *inter alia*.

Keywords: Chereponi, Kendall's, profitability analysis, production constraints, Saboba, soybean

1. Background

Ghana's Council for Scientific and Industrial Research (CSIR), Ministry of Food and Agriculture (MoFA) as well as its development partners have been promoting soybean production because of its potential to increase income and enhance nutritional status of households (Mbanya, 2011). In northern Ghana, most agricultural interventions such as Youth in Agriculture Program, Northern Rural Growth Program, Savannah Accelerated Development Authority projects, Alliance for a Green Revolution in Africa (AGRA) projects, Danish International Development Authority projects, United States Agency for International Development projects, among others, are also promoting the production and utilization of the soybean crop mainly through value chain enhancements. According to Masuda and Goldsmith (2009), soybeans are not only a valuable source of feed for livestock and fish but also a good source of protein for human diet. El Agroudy, Mokhtar, Zaghlol, and Gebaly (2011) reported that soybeans contain 30 percent cholesterol free oil, 40 percent protein and also contain most essential vitamins required by human beings.

According to D. S. Ugwu and H. C. Ugwu (2010), the benefits of soybean over other grain legume (such as groundnut and cowpea) include lower susceptibility to pests and diseases, better storage quality and larger leaf biomass which translates into soil fertility benefit to subsequent crops. Even though soybean is a relatively new crop in Ghana (Akramov & Malek, 2012), the increasingly important role the crop is playing in the rural economy of farm households in northern Ghana, and especially the eastern corridor of the Northern Region of the country, cannot be overemphasized. Northern region alone contributes about 70 percent of national soybean area and about 77 percent of national production (SRID, 2012). Several soybean demonstrations are established annually in the region by both governmental and non-governmental organizations with the aim of increasing productivity and production. Etwire et al. (2013a) reported that the crop is gaining popularity and acceptance among farmers in Ghana including those of Saboba and Chereponi districts. Even though the crop appears to be vigorously promoted in both districts, there seems to be little or no information about the level of profitability of the crop under farmer management. The study therefore seeks to analyze the level of profitability of soybean production in Saboba and Chereponi districts taking into consideration gender and location effects. The study also documents soybean production practices in the Saboba and Chereponi districts.

Smallholder farmers in Ghana face a number of production constraints. Etwire, Dogbe and Nutsugah (2013b) observed that a major constraint to smallholder agricultural development in the Northern Region of Ghana is farmers' inability to access credit. Al-Hassan, Sarpong and Mensah-Bonsu (2006) reported poor access to guaranteed input and output markets as major problems confronting smallholder farmers. Berchie et al. (2010) reported that the main constraints to Bambara groundnut production in the Upper East Region of Ghana are unpredictable weather, inadequate access to labour and farm inputs. D. S. Ugwu and H. C. Ugwu (2010) posit that pests and diseases are a constraint to soybean production in Nigeria. Constraints to soybean production in Ghana appear not to have been comprehensively documented. This study also sought to identify constraints to soybean production on the basis of gender and location.

2. Methodology

2.1 Study Area

Saboba and Chereponi districts are located in the eastern parts of the Northern Region of Ghana. They share boundaries with Gushiegu District to the west; Zabzugu-Tatale District to the south; Bunkpurugu-Yunyoo District to the north; Yendi Municipality to the south-west; and Republic of Togo to the east. The districts have a combined land area of about 2810 square kilometers. During the raining season, water normally drains to the Oti River, as well as dams and streams present in both districts. There is however incidences of flooding of roads during peak of the rainy season which impedes transportation of goods and services (Government of Ghana, 2013).

Saboba and Chereponi districts are located in the Guinea Savannah agro ecological zone with grasses interspersed with trees such as shea and baobab. The climate is characterized by alternative wet and dry seasons of equal lengths of six months. Annual rainfall is about 1000mm or less, falling between May and October. Temperature is generally high ranging between 21°C and 41°C. There is considerable soil erosion and degradation in some parts of Saboba and Chereponi districts (Government of Ghana, 2013). This is mainly as a result of bad farming practices and rampant burning of bush. The economy of both districts is largely dependent on agriculture with the sector directly and indirectly engaging between 80-90 percent of the population (SRID, 2012).

2.2 Data and Data Sources

The study relied mainly on cross sectional data collected from soybean farmers in Saboba and Chereponi districts. The observations were collected with the help of a semi-structured questionnaire. The questionnaire captured key data points such as socio-demographic characteristics of soybean farmers, farm characteristics, constraints to production, costs and return to soybean production among others.

A multi-stage sampling technique was adopted for this study. Saboba and Chereponi districts were purposively selected because of their importance in soybean production in the Northern Region and for that matter Ghana. A list of soybean producing communities was generated for Saboba and Chereponi districts in consultation with the district directorates of the Ministry of Food and Agriculture. Through simple random sampling technique, 8 and 6 communities were selected in the Saboba and Chereponi districts respectively. At the community level, a list of soybean producers was generated by sex. Five males and five females were then randomly selected in each community. A total of 140 farmers (70 females) were therefore enumerated for this study.

2.3 Method of Analysis

2.3.1 Profitability Analysis

In order to estimate the level of profitability (P) of soybean production in the Saboba and Chereponi districts for the 2012 season, the total cost of production was deducted from the total revenue realized using Equation 1,

$$P = TR - TC \quad (1)$$

Where TR is the total revenue and is captured as the total market value of soybean produced. TC is the total cost of producing soybean. The total cost of production takes into account both variable and fixed costs. If P is greater than zero, then soybean production is adjudged to be profitable and vice versa. A value of zero is an indication of break even. The analysis was based on a hectare of land through scalar transformation of all individual observations.

2.3.2 Kendall's Coefficient of Concordance

Kendall's coefficient of concordance (W) provides a measure for the level of agreement between rankers on their rankings. The total rank score for each factor is computed and the factor with the least score is said to be the most important factor. Farmers' ranking of their constraints to soybean production in the Saboba and Chereponi districts was subjected to the Kendall's coefficient of concordance following from Tetteh (2011) using Equation 2;

$$W = \frac{12 \left[\sum T^2 - \frac{(\sum T)^2}{n} \right]}{nm^2(n^2 - 1)} \quad (2)$$

Where; T = sum of ranks for constraints being ranked.

m= number of farmers and

n = number of constraints being ranked

The hypothesis tested is as follows:

H₀: Soybean farmers in Saboba and Chereponi districts do not agree on their ranking of production constraints

H₁: Soybean farmers in Saboba and Chereponi districts agree on their ranking of production constraints

The Coefficient of concordance is tested for significance using the F distribution. SPSS software was used for the analysis.

3. Results and Discussion

3.1 Soybean Production

Soybean is mostly grown as a cash crop in the Saboba and Chereponi districts. Other crops grown for cash include cotton and cowpea. Maize, rice and Cassava are mostly grown for consumption. Yam and vegetables are grown for both consumption and sale. Soybeans are an important source of income for both men and women farmers in Saboba and Chereponi districts. The production process and utilization of the crop is discussed below.

3.1.1 Land Acquisition

The search for, and securing of a piece of land for soybean production usually occurs between January-April in the Saboba and Chereponi districts. Land can be acquired by either making cash payment or by exchanging with inputs such as chemicals and fertilizers. It is common practice to negotiate and pay in kind with produce after harvest. Permission to use the land is usually granted on an annual basis mostly through oral consent in the presence of at least one witness.

3.1.2 Land Preparation

As a result of the drudgery associated with manual preparation of land, most farmers now engage tractor service providers for plowing and sometimes harrowing. For smooth tractor plowing, there is the need to have a clean farm hence fallowed and virgin fields are usually stumped. The stumps are then heaped at a central location and may or may not be burnt before plowing. Some farmers as part of weed management and control do spray their fields with total weed killer herbicides (glyphosate) a few days before plowing. Plowing with tractor sometimes leaves behind furrows that need to be leveled. Some farmers level their fields manually by relying on farm labour while others also rely on tractor harrowing. Leveling or harrowing is undertaken to improve soil structure, reduce soil erosion as well as increase cropping space.

3.1.3 Planting

Planting mostly commences 3 days after plowing subject to the availability of adequate moisture in the soil. Most farmers sow their seed at random. Row planting is however recommended using garden lines and pegs. Almost all soybean farmers plant their seed without any treatment; inoculation of soybean seed with rhizobium inoculant before planting is however recommended. Treatment of the seed is done by sprinkling water and the inoculant on the seed in a basin. The mixture is stirred gently to ensure even coating. The contents are then air-dried under shade by spreading it uniformly on a sack for about 30 minutes before planting. A planting distance of 60 x 10cm is recommended with 3 seeds per hole, which is later thinned to 2 seeds per hole.

3.1.4 Cultural Practices

Depending on the frequency and intensity of weed infestation, the first weeding is done between 2-3 weeks after planting. The second weeding starts from 4-6 weeks depending on the effectiveness of the first weeding. After the second weeding, some farmers may engage in manual picking of single weeds that sprout. In case the canopy of the soy plant does not close early, then a third weeding may be carried out between 8-10 weeks after planting.

3.1.5 Harvesting

Soybeans are ready for harvesting 3-4 months after planting depending on the variety. Maturity of soybean is determined by yellowing and dropping of the lower leaves first, and then the upper leaves around the third month.

Harvesting is usually done manually. At maturity the soybean are uprooted and gathered into smaller heaps. The heaps are then moved to a tarpaulin spread on the ground. In some instances, farmers do not use a tarpaulin; the heaping is done on the bare floor cleared for that purpose.

The harvest is then threshed by beating the heap with sticks till the pods break open to release the beans. The beans are separated from the chaff by winnowing. The beans are then bagged and transported to storage or sale points on tricycles, motorbikes, bicycles, and donkey carts. The bagged produce is mostly kept in storerooms or barns under cool dry conditions in order to preserve the viability of the seed. Some farmers treat their produce with chemicals to minimize insect pests and diseases.

3.1.6 Marketing

Soybeans are usually stored and sold when prices are favourable except for farmers who have urgent financial needs or who have received credit. Soybean marketing appears to be structured in the Saboba and Chereponi districts. Results of the survey suggest that majority of soybeans produced in the two districts are sold to institutional buyers. Institutional buyers include private processing companies such as Ghana Nuts Company, private marketing companies such as Savannah Farmers Marketing Company, government agencies such as the National Buffer Stock Company and several agricultural projects. Most of these institutional buyers provide some support to farmers during the course of the season with an understanding that farmers will sell their produce to them after harvest at a predetermined price. Support provided is mostly in the form of input credit and technical backstopping. Soybean processors within the two districts also buy few bags of the crop to process soybean products such as dawadawa (a local seasoning used in preparing dishes) and kebabs. Soybean farmers who are not under any obligation to sell their produce may decide to sell directly to an institution or processor or indirectly through an aggregator or assembler. Farmers who sell to an aggregator or assembler are likely to receive a slightly lower price because of the marketing cost and margin incurred by the intermediary.

3.2 Socio Demographic Characteristics of Respondents

A summary of the socio demographic characteristics of the sample disaggregated by sex and district is presented in Table 1. The mean age of the sample ranged between 36 and 44 years. This implies that soybean farmers in Saboba and Chereponi districts may be able to cultivate the crop for another two or three decade. Soybean productions in the two districts have a bright future if these relatively young farmers can be motivated to remain in its cultivation. On the average, farming experience in soybean production ranges from 3 to 7 years. The few years of experience could mean that the crop has not been produced on a wide scale in both districts until recently.

Majority (86.7-95%) of the respondents are married. Marriage is not only a social obligation in most communities in the Saboba and Chereponi districts but also a source of family labour especially for male farmers and a possible avenue for female farmers to increase their chances of having access to farm land. All the male respondents interviewed were natives of their communities; none of them have migrated from a different community to their present community. The proportions of females who have moved from a different community to settle in their present community were 2.5 and 6.7 percent for Saboba and Chereponi district respectively. It appears the rate of inter community migration within the Saboba and Chereponi districts is low except may be in the case of inter community marriage in which case the woman moves to join the husband and family.

A very large proportion (77.5-87.5%) of the sample has never been to school. The respondents opined that their inability to attend school was as a result of their parents' consideration that agriculture and education are mutually exclusive and uncomplimentary hence education was seen as a threat to agriculture, and household food security. Education was also considered to be expensive with little immediate benefits. Further, there were hardly any schools in their communities or nearby communities hence most of the respondents did not have any formal education. They however claim the trend is changing with most of their children either being in school or have ever been in school. About 20-45 percent of the sample reported receiving production credit for the 2012 season. More females received production credit in the Saboba District and vice versa for the Chereponi District. Maize, rice and soybeans are the target crops for most agricultural interventions in northern Ghana including the Agricultural Value Chain Mentorship Project, Soil Health Project, Northern Rural Growth Program, among others. Most of these projects are implementing activities that are aimed at linking farmers to credit. Access to credit by the sample could therefore be as a result of their participation in these projects.

About 20 to 53 percent of the farmers own a bicycle. None of the women interviewed owned a motorbike. However, about 30 percent of the men sampled owned at least one motorbike. Foot, bicycle, motorbike and more

recently tricycle are the main means of transportation of goods and services in order of increasing convenience and cost.

Table 1. Socio-Demographic characteristics of farmers

Variable	District	Female	Male
Age (Years)	Saboba	36	44
	Chereponi	40	43
Experience (Years)	Saboba	4	7
	Chereponi	5	3
Married (Percent)	Saboba	95	90
	Chereponi	86.7	93.3
Settler (Percent)	Saboba	2.5	0
	Chereponi	6.7	0
No education (Percent)	Saboba	87.5	77.5
	Chereponi	86.7	83.3
Access to credit (Percent)	Saboba	45	20
	Chereponi	20	36.7
Ownership of bicycles (Percent)	Saboba	22.5	47.5
	Chereponi	20	53.3
Ownership of motorcycle (Percent)	Saboba	0	30
	Chereponi	0	26.7

3.3 Adoption of Soybean Technologies

A few farmers have adopted the use of inorganic fertilizers on their soybean farms. None of the male farmers sampled in Saboba District reported using any inorganic fertilizer. The proportion of females in the district that report using inorganic fertilizers on their soybean farms is 2.5 percent. The proportion of female and male farmers who have adopted the use of inorganic fertilizers on their soybean farms in Chereponi District is 3.3 and 6.7 percent respectively. No male farmer interviewed reported using any chemical to control insect pests on their soybean farm. The proportion of females in Saboba and Chereponi who reported using insecticides is 2.5 and 6.7 percent respectively.

There appears to be a low level of adoption of improved soybean technologies in the two districts. None of the farmer sampled reported using any rhizobium inoculant. Mbanya (2011) observed that many farmers in the Northern Region of Ghana do not use improved technologies such as row planting, fertilizer application and good management practices. He further opines that smallholder soybean farmers unlike large-scale commercial farmers depend little on inputs such as herbicides and pesticides for increasing their production. Several factors could account for the low level of adoption of improved soybean technologies. Awareness is a necessary condition to adoption. The level of awareness for soybean technologies such as rhizobium inoculant appears to be low hence the reason for the zero adoption of the technology among the sample. Also, soybean is not a traditional staple hence farmers utilization of the crop is limited. Most farmers are therefore not willing to invest in soybean technologies. Majority of farmers may rather prefer to invest in technologies that will improve productivity of staple crops since such crops can easily be utilized or consumed at the household level in the absence of a favourable market. Most farmers are also of the opinion that soybeans do not require soil amendments hence the low use of inorganic fertilizers on soybean farms. Mbanya (2011) noted that technologies such as pesticides are considered to be expensive by smallholder farmers in the Northern Region of Ghana hence the low levels of adoption of such technologies.

3.4 Profitability Analysis

Estimation of profitability of soybean production in Saboba and Chereponi districts was disaggregated by gender as presented in Table 2. The average yield of soybean was found to range between 509 and 642 kg/ha which is far below the national average of 1910 kg/ha (SRID, 2012). Yields were slightly higher in Saboba district relative to Chereponi district. Female farmers on the average out yielded their male counterparts in the Chereponi district; which also translated into revenues received from soybean produce. Analysis of the result indicates that female soybean farmers on the average received slightly higher prices for their produce as compared to their male

counterparts. The higher prices received by females could be due to better bargaining and marketing skills as compared to their male counterparts.

On the average, the opportunity cost of renting a hectare of land or the amount of money paid in terms of cash or harvested produce, was found to be relatively higher for women in both districts. Men in the Saboba and Chereponi districts usually own land hence there is a high tendency for them to rent out land to their friends and colleague males at a relatively low price. The cost of plowing and harrowing was found to be the same for both men and women. The cost of plowing and harrowing in Chereponi District was however slightly higher than Saboba District. It is not uncommon for tractors to move from Yendi and Saboba districts to Chereponi district in order to provide plowing and harrowing services. The extra cost of transportation could probably explain the difference in cost across districts. Women on the average were found to incur more cost for inputs such as seed, depreciation and post-harvest chemicals. No male in Chereponi reported using any post-harvest chemical.

Soybean production in Saboba and Chereponi districts is labour intensive with minimal use of machinery. Farmers usually depend on family, hired and communal labour to undertake activities such as land clearing, planting, weeding, harvesting, threshing, pest and disease control as well as carting of produce. On the average, females were found to incur higher cost for each of these farm activities as compared to males. The total cost of cultivating a hectare of soybean farm was found to range between GH¢ 467.25 and GH¢ 647.55. On the average, it is more expensive to manage a soybean farm in Chereponi District as compared to Saboba District. The cost of production for females on the average is higher than that of males in both districts.

Results of the profitability analysis indicate that on the average, soybean production in Chereponi District is not profitable even though females (-124.35GH¢/Ha) incur less losses as compared to males (-129.15GH¢/Ha). Soybean production is however profitable for male farmers (78.45GH¢/Ha) in Saboba District but not for female farmers (-26.05GH¢/Ha).

Table 2. Costs and Return to Soybean Production in the 2012 Season

	Saboba		Chereponi	
	Female	Male	Female	Male
Average yield (Kg/Ha)	563	642	576	509
Price (GH¢/Kg)	0.95	0.85	0.90	0.85
Revenue (GH¢/Ha)	534.85	545.70	518.40	432.65
Land and Capital Cost (GH¢/Ha)				
Renting of land	41.80	34.20	67.30	51.55
Ploughing	83.20	83.20	86.15	86.15
Harrowing/Leveling	44.50	44.50	45.10	45.10
Seed	24.10	22.40	24.50	23.50
Post-harvest chemicals	15.20	12.50	13.25	0.00
Depreciation cost (Hoe, cutlass, sacks)	29.60	32.65	59.50	59.00
Miscellaneous	13.70	10.20	15.90	13.00
Sub-Total (GH¢/Ha)	252.10	239.65	311.70	278.30
Labour Cost (GH¢/Ha)				
Land clearing/Stumping	36.20	22.40	50.20	36.00
Planting	32.60	19.50	35.20	20.70
First weeding	52.30	36.75	49.10	33.70
Second weeding	29.20	20.40	30.00	23.10
Harvesting	53.70	49.00	61.80	61.90
Threshing	48.70	39.90	49.60	49.30
Drying and winnowing	19.30	14.60	23.90	17.90
Application of post-harvest chemicals	7.90	5.20	12.05	0.00
Transport of produce to storage point	10.70	7.40	18.60	18.70
Transport produce to market	18.20	12.45	5.40	17.40
Sub-Total (GH¢/Ha)	308.80	227.60	335.85	278.70
Total cost (GH¢/Ha)	560.90	467.25	647.55	557.00
Profit (GH¢/Ha)	-26.05	78.45	-129.15	-124.35

3.5 Constraints to Soybean Production

Results of the Kendall's coefficient of concordance are presented in Table 3. The results are statistically significant at 1 percent level. The main constraints faced by men and women were found to be similar which includes lack of right over land, difficulty in joining or forming a farmer based organization and selling of produce on credit. The level of agreement between male (31.7%) rankers was however slightly higher than the level of agreement between female (27.2%) rankers. This suggests that the criteria used by males for their ranking were relatively more homogenous as compared to the criteria used by female rankers. The level of agreement between farmers on their ranking for Saboba District (40.8%) is about twice that of Chereponi District (20.2%). Ranking of the constraints to soybean production was however found to be different when the analysis was disaggregated by location, except in the case of the most important constraint. Hence constraints to soybean production appear not to be gender specific but rather location specific.

Lack of right over land was found to be the most important constraint to soybean production in both Saboba and Chereponi districts. Disputes and conflicts over land are common in the Saboba and Chereponi districts. Farmers are therefore constrained in terms of making long term investments aimed at improving soil fertility of soybean farms as well as increasing area under soybean cultivation. Lack of right over land or land insecurity may therefore have negative consequences on both productivity and production improvements.

Difficulty in joining or forming a farmer based organization was found to be the second and third most important constraint faced by soybean farmers in the Saboba and Chereponi districts respectively. A large proportion of the sample interviewed opined that farmer based organization are usually a group of like-minded farmers who have come together to work for their common good. According to MoFA (2009a, b), every FBO must go through the process of forming, storming, norming and performing. After a group has been formed, it is expected to go through some challenges which will result in the setting up of rules and regulation before the group performs to its potential. Most FBOs are either not able to survive the storming stage or abide by the norms that are formulated. Once a FBO has survived and is in the performing stage, they usually do not want to register new farmers for fear of going through the whole process again.

Inadequate access to soybean training and extension services is the third most important constraint facing soybean farmers in the Saboba District. Soybean is not one of the staple crops in the Saboba District hence farmer's indigenous knowledge about the production and utilization of the crop is limited. There are only a few tens of extension workers providing training and extension services to thousands of soybean farmers in the Saboba District. It is therefore not uncommon for soybean farmers to have limited or no access to trainings on either good soybean production practices or utilization of soybean.

Poor storage facilities were ranked as the fourth most important constraint to soybean production in the Saboba District. There are no formal, commercial and large-scale soybean storage facilities in the district. Soybean farmers therefore have to store their produce either in bags in their rooms or barns, which are rudimentary and susceptible to insect attack. Poor storage facilities, which result in high post-harvest losses, are a disincentive to soybean production in the district.

Selling of produce on credit is the second and fifth most important constraint to soybean production in the Chereponi and Saboba districts respectively. As a result of the absence of a ready market, poor storage facilities and limited knowledge on utilization of soybean, farmers are usually left with no other option than to sell their produce on credit and are therefore at the mercy of traders. The amount received by farmers, and timeliness of payment, is dependent on the amount received by the trader, marketing margin and time used to secure a buyer. There are usually no written contractual arrangements. Verbal agreement also appears not to be very binding. A farmer may therefore not be paid anything if the trader losses or claims to have lost the produce in storage. Poor marketing which encompasses poor road network, low prices, price instability, among others, was ranked as the fifth most important constraint to soybean production in the Chereponi District.

Low yield was ranked as the fourth most important constraint to soybean production in Chereponi District. Several factors could account for the low levels of productivity of soybean farmers including poor soil health, pest and diseases, unfavourable weather conditions, inadequate and untimely access to agro inputs, equipments and labour.

Table 3. Constraints to Soybean Production

Constraint	Female	Male	Saboba	Chereponi
Lack of right over land	2.55	2.95	2.72	2.78
Difficult to join or form a group	5.70	4.83	4.01	7.13
Credit sales	7.38	7.59	7.75	7.10
Inadequate access to training	7.43	7.20	5.60	9.87
Poor storage facilities	7.46	8.20	7.13	8.87
Poor marketing	9.44	10.30	10.64	8.72
Low yield	9.45	8.01	8.94	8.43
Poor pest and disease control	9.82	11.19	10.64	10.29
Poor quality of land	9.85	8.99	8.27	11.13
Bad weather	10.33	12.84	11.49	11.70
Low quality of produce	10.40	7.94	8.99	9.45
Low prices due to poor quality	10.58	9.27	10.18	9.58
Poor access to agro-input	10.71	11.02	12.12	8.99
Inadequate labour	10.85	10.46	10.60	10.74
Low produce price	11.22	11.63	11.42	11.43
Price instability	11.74	11.88	11.89	11.69
Inadequate production credit	12.81	13.23	14.72	10.49
High cost of production	13.28	13.47	13.88	12.62
N	70	70	80	60
Kendall's coefficient of concordance	0.272	0.317	0.408	0.202
Chi-Square	300.39	345.09	534.03	178.17
Degrees of freedom	17	17	17	17
Asymptotic Significance	0.000***	0.000***	0.000***	0.000***

*** implies statistical significance at 1 percent level.

4. Conclusions and Recommendations

Soybean is an important cash crop for farmers in the Saboba and Chereponi districts of the Northern Region of Ghana. Preparation for the cultivation of the crop begins before the end of April with the acquisition of land. Land preparation is usually done in May and this is followed by planting subject to the availability of adequate moisture in the soil. After undertaking routine cultural practices, the crop is harvested 3-4 months after planting. The produce is then threshed, winnowed and either stored or sold depending on the availability of a ready market or predetermined arrangement. Analysis of the data suggests a low level of adoption of improved soybean technologies among farmers.

Results of the profitability analysis indicate that on the average, soybean production in Chereponi District is not profitable even though female farmers are relatively better-off than male farmers. Soybean production is however profitable for male farmers in Saboba District but not female farmers.

Constraints to soybean production include lack of right over land, difficulty in joining or forming a farmer based organization, selling of produce on credit, inadequate access to soybean training and extension, poor storage facilities and low yield. Analysis of the result indicates that constraints to soybean production may not be gender specific but rather location specific.

There is the need to improve promotion and dissemination of improved soybean technologies such as fertilizers, pesticides and inoculants. Both governmental and non-governmental organizations could increase farmers' awareness of these technologies through the use of radio, drama, video, announcements from public vans among others.

Agricultural extension and development workers should encourage farmers to improve their management practices and marketing skills, as well as reduce their cost of production. This could be achieved by reducing or eliminating inefficiencies and marketing and purchasing of farm inputs in bulk in order to take advantage of

economies of scale. Agricultural interventions should target farmers in Chereponi District as well as female farmers in Saboba District for maximum impact.

There is also the need for government to lead the way in finding solutions to pertinent issues such as land tenure arrangements, agricultural extension staffing, motivation and training, storage facilities among others. These constraints could be addressed in collaboration with the private sector.

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