



Analysis of Financial Efficiency and Constraints of Smallholder Cotton Farmers in the Northern Region of Ghana

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

This study examined the financial efficiency and constraints faced by smallholder cotton farmers in some selected districts in the Northern Region of Ghana. Multistage sampling approach was employed to solicit cross-sectional data from 150 smallholder cotton farmers in three selected districts and six communities spread across the region using a structured questionnaire. The data was collected during the 2009 cotton growing season. Financial efficiency measures were estimated to reveal the financial efficiency levels of cotton farmers. These measures include Asset Turnover Ratio, Operating Expense Ratio, Depreciation Expense Ratio, and Net Farm Income Ratio. These were estimated and compared with benchmarks and valid conclusions drawn. Constraints faced by smallholder cotton farmers were also identified and analyzed using Kendall's Concordance analysis and agreement among the rankings of constraints by cotton farmers tested. The results show inconclusive financial efficiency levels of smallholder cotton farmers. Comparing financial efficiency ratios to the bench mark figures, Asset Turnover Ratio (20.28%), Operating Expense Ratio (74.1%) and Net Farm Income Ratio (19.14%) show that smallholder cotton farmers in the Northern Region are financially inefficient but efficient in terms of Depreciation Expense

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Ratio (3.29%). Several constraints were also identified as hindering the successful cotton production in the Northern Region. Poor pricing of seed cotton appeared as the most limiting constraints followed by untimely supply of farm inputs whilst lack of access to land was ranked as the least constraint. Kendal's Concordance analysis revealed that there was about 87.4% agreement among the rankings of the constraints. The government, NGOs in the cotton sector, private cotton companies and other cotton stakeholders should step up their efforts in building capacities of smallholder cotton farmers in both technical and financial management to enable them handle efficiently the cotton production business. Management of cotton companies as well as government should regularly meet with smallholder cotton farmer associations in the Northern Region to negotiate fair prices for seed cotton. This will inevitably entice the farmers to remain in the cotton production business for improved livelihoods. There is the need for the formation of cotton stakeholder committees with the mandate of carrying out monitoring on timeliness of input supply by cotton companies to cotton farmers.

Keywords: Financial efficiency; constraints; smallholder cotton farmers; Northern Region.

1. INTRODUCTION

Agriculture in Ghana remains the dominant sector in terms of its contribution to income and employment generation. Agriculture is the largest contributor to Ghana's Gross Domestic Product (GDP) with 40.6% share in 2005 compared with 27.1 and 32.3% for services and industry, respectively [1]. The Agricultural sector grew by 5.7% in 2006, an improvement on the 4.1% recorded for 2005. However, this was still lower than the 7.5% growth rate of 2004 and short of the 2006 target of 6.2% [2]. Total cotton production in Ghana was 11,216.07 tonnes in 2005 and 11,147.03 tonnes in 2006 with a corresponding value of US\$ 5,814,810.00 and US\$ 7,614,070.00, respectively [2].

Cotton serves not only as a major source of foreign exchange earnings to many countries but also a good source of income for millions of rural people in in Sub-Saharan African (SSA) through cotton cultivation and employment of labour force as farm hands and ginnery workers. Cotton therefore plays an instrumental role in the fight against rural poverty. According to Goreux [3], cotton production contributes to poverty reduction because it is mostly grown by small family farms especially in areas with the existence of limited opportunity for growing other crops and very low per capita income. Historically, cotton is the world's oldest commercial crop and today's biggest non-food crop and plays an important role in West Africa's development [4]. Between 1 and 2 million households produce cotton in West Africa [5]. However, up to 16 million people are involved in cotton production in West and Central Africa as the world's second largest exporters of cotton

after the United States of America. Cotton, as one of the non-traditional agricultural export commodities in Ghana, was first introduced into the country in the 17th century by the Bassel missionaries [6] and large scale production begun in 1968 with the establishment of Ghana Cotton Development Board (GCDB) [7]. The core mandate of GCDB was to increase cotton production, enhance regular and adequate supply of raw materials to local cotton industries as well as undertake research for the multiplication and supply of improved cotton seed to farmers. Cotton production declined in the 1980s due to low producer price leading to the privatization of the cotton sector and the establishment of Ghana Cotton Company Limited (GCCL). This initiative also failed to boost cotton production due to falling prices of cotton in the world market [7]. Though the cotton industry is still faced with numerous challenges, the government of Ghana is still committed to revamping the cotton sector following the economic importance of the crop especially in reducing poverty and enhancing economic growth of the country.

2. COTTON PRODUCTION IN GHANA

The cotton belt of Ghana is similar in agro-ecology to the cotton growing regions of the 8 major cotton producing countries in West Africa. However Ghana's production, which has experienced steady decline since the 1980's, accounts for less than 1% of the total production in West Africa [8]. Cotton production in Ghana is concentrated in the three Northern Regions; Upper East, Upper West and Northern Regions. Since the evolution of cotton production in 1968, the trend in volumes produced has rather been

erratic and production has never reached 40,000 tonnes. Yield levels have never exceeded 800 kg/ha though Ghana has excellent conditions for cotton growth [8].

The three Northern regions which constitute the cotton belt have the highest incidence of poverty in the country. Currently, the incomes of an estimated 100,000 smallholder farmers whose livelihoods hinge on plots of land often measure less than one hectare. The government of Ghana has a vision of increasing rural households' income in Northern Ghana. This vision will also enable cotton farmers have sustainable sources of income through cotton production and processing of the by product, thereby improving their livelihood. Therefore, the government of Ghana embarked on several initiatives for the realization of its vision.

The initial effort was the introduction of three new companies in Ghana to further the production of cotton. These companies include Olam, Wienco and Armajaro who are committed to boosting cotton production in Ghana. These companies assume pre-financing approach to their operations through the provision of in-kind credit such as seed, fertilizers and insecticides, land preparation which are charged against the final cotton. The volume of the final cotton determines the farmers' ability to offset the credit advanced to them. A farmer is in default if the gross value of the seed cotton purchased from the farmer is inadequate to cover the cost of inputs received from the company.

The Government also rolled out a technical assistance programme aimed at increasing the income generation and employment opportunities in cotton farming communities in Ghana jointly implemented by government of Ghana and UNIDO alongside other developmental partners. Following these revival efforts in the cotton sector, the question that comes to mind is whether or not these have translated to efficient management of smallholder productive and financial resources for improved cotton farming business in the Northern region. However, there is a considerable body of literature on technical efficiency especially on agricultural commodities including cotton [9-12]. However, Adzawla et al. [12] estimated technical efficiency of cotton production in Yendi Municipality in Northern Ghana. This paper however achieved two objectives which include the following:

- To analyze the financial efficiency of smallholder cotton farmers in the Northern Region of Ghana
- To identify and analyze constraints hindering successful cotton production in the Northern region of Ghana.

The rest of this paper is organized as follows; section 3 presents the methodology of the study highlighting the study area, sampling and data collection procedures, theoretical framework and method of data analysis. Section 4 presents and discusses the results of the study including financial efficiency measures of smallholder cotton farmers. Socio-economic features of smallholder cotton farmers and constraints to successful cotton farming have also been discussed in this section. The last section (5) provides conclusions and draws some policy recommendations for the cotton sector in the Northern region.

3. METHODOLOGY

3.1 Geographical Area of Study

The research study was conducted in the Northern Region of Ghana. The Region lies in the north of the country and is bordered in the northwest by the Upper West Region, in the northeast by the Upper East Region, in the southwest by the Brong-Ahafo Region, in the southeast by the Volta Region, in the west by Côte d'Ivoire (the Ivory Coast) and in the east by Togo. The Northern Region is made up of 26 districts. Northern Region is located on latitude 9 degrees, 30 minutes, 0 seconds North (9°24'0N) and longitude 1 degree, 0 minutes, 0 second West (1°0'0W). The region is much drier than southern areas of Ghana, due to its proximity to the Sahel, and the Sahara. The vegetation consists predominantly of grassland, especially savanna with clusters of drought-resistant trees such as baobabs or acacias. Between May and October is the wet season, with an average annual rainfall of 750 to 1050 mm (30 to 40 inches). The dry season is between about November and April. The highest temperatures are reached at the end of the dry season, the lowest in December and January. More than 70% of the economically active population is engaged in agriculture. The small population density is partly caused by emigration due to extreme poverty in the region. Some districts are selected in the Region for the study due to the

fact that cotton production is popular in the Region.

3.2 Sampling Procedure and Data Collection

A multi-stage sampling procedure was employed in the execution of this study. Three districts in the Northern Region were purposively selected due to their popularity of cotton production. These districts include Tolon, Karaga and Savelugu Nanton. However, six communities including Tolon, kumbungu, Nyong-nayili, Nyong-gumah, Tampion, and Nagdigu were also purposively sampled for inclusion in the study. Simple random sampling procedure was then used to select smallholder cotton farmers from each of the selected communities for data collection. Using a structured questionnaire, 150 respondents were interviewed during the 2009 growing season to solicit information on variables such as socio-economic characteristics, farm sizes, cost and revenues, constraints of cotton production and marketing and other variables required for the analysis. Data entry and analysis was done using Statistical Package for Social Sciences (SPSS) and Microsoft Excel.

3.3 Data Analysis

3.3.1 Theoretical framework

3.3.1.1 The concept of financial efficiency

Financial efficiency measures the intensity with which a farm business uses its assets to generate value of farm production and the effectiveness of production, purchasing, pricing, financing, and marketing decisions [13]. Financial efficiency is one of the basic categories used to describe status, functioning and development opportunities for various types of enterprises [14]. Financial efficiency ratios are calculated using ratios such as Asset Turnover Ratio, Operating Expense Ratio, Depreciation Expense Ratio, and Net Farm Income Ratio [13].

The Asset Turnover Ratio (ATR) measures how efficiently farm assets are used to generate revenue. The higher the value of the ratio, the more efficient the assets are being used to generate revenue. The value of this ratio will vary by type of farm operation. Operating Expense Ratio measures the proportion of gross revenue that is absorbed by operating expenses. The lower the value of this ratio the lower the

proportion of the gross revenue that is absorbed by operating expenses. Depreciation Expense Ratio is the proportion of total revenue that is absorbed by depreciation. Also, the lower the value of depreciation expense ratio, the better. Net farm Income Ratio on the other hand is the proportion of total revenue that remains as net income after all expenses have been deducted. That is income that remains as unpaid labour compensation and equity capital. The higher the value of this ratio, the higher the proportion of total revenue farmers are able to keep as profits.

3.3.1.2 Measuring financial efficiency

In measuring financial efficiency of smallholder cotton farmers, the operating expense ratio, depreciation expense ratio, net farm income ratio and asset turnover ratio are estimated. The formula for calculating each of financial efficiency measures is as follows:

The Asset Turnover Ratio (ATR) measures how efficiently farm assets are being used to generate revenue. The higher the value of the ratio, the more efficient the assets are being used to generate revenue. The value of this ratio will vary by type of farm operation.

$$\text{Asset Turnover Ratio} = \frac{\text{Gross Revenue}}{\text{Total Farm Assets}}$$

When the value of Asset Turnover Ratio is compared from several farms you can find variation. Part of this variation can arise from the way assets are controlled. If large amounts of farm land are rented rather than owned, this can influence this measure. The owned farm land will be part of the total assets that generate gross income. If the farmland is cash rented, land will not be included in the asset value even though the gross revenues will be the same as when land is owned. For some smallholder farms, this will provide an easy rational why the farm may have a low asset turnover ratio. The five operational ratios reflect the relationship of expense and income categories to value of farm production. The sum of the first three operational ratios equals the total expense ratio. The sum of total expense ratio and net farm income ratio is one [13].

Operating Expense Ratio is the amount of each cedi that is absorbed by operating expenses. In determining the operating expense ratio, we take out depreciation. As a result, this ratio tells us how much of each cedi of gross revenue (value

of total farm production) is paid out in operating expenses other than depreciation. It is estimated using the formular;

Operating expense ratio =

$$\frac{\text{Total Operating Expenses – depreciation}}{\text{Gross revenue}} \times 100$$

The lower the value of this ratio the better since there will be a lower proportion of the gross revenue that will be absorbed by operating expenses.

Depreciation Expense Ratio (DER) indicates the proportion of total revenues absorbed by depreciation. That is how much of each cedi of gross revenue is spent on depreciation. It is computed using the formula;

Depreciation Expense Ratio (DER) =

$$\frac{\text{Depreciation expense}}{\text{Gross revenue}} \times 100$$

Also, the lower the value of depreciation expense ratio, the better since lower proportion of the gross revenue will be absorbed by depreciation expense.

Net Farm Income Ratio (NFIR) measures the proportion of total revenue that remains as net income after all expenses have been paid. It is computed using the formula;

Net Farm Income Ratio =

$$\frac{\text{Net Farm Income from Operations (NFIFO)}}{\text{Gross revenue}} \times 100$$

On the other hand, the higher the value of this ratio, the higher the proportion of total revenue farmers are able to keep as profits.

3.3.2 Constraints of smallholder cotton farmers

Smallholder cotton farmers are faced with numerous constraints. These constraints were identified, harmonized and included in the questionnaire for ranking by cotton farmers under study. The ranking of the constraints was done in order of importance. However, Kendall's concordance analysis was employed to test for the agreement among the rankings by the smallholder cotton farmers. Kendall's coefficient of concordance (W) is a measure of the

agreement among several (p) judges (smallholder cotton farmers) who are assessing a given set of n objects (constraints) [15]. W is an index that measures the ratio of the observed variance of the sum of ranks to the maximum possible variance of the ranks. The idea behind this index is to find the sum of the ranks for each constraint being ranked. If the rankings are in perfect agreement, the variability among these sums will be a maximum [16]. According to Legendre [15], the Kendall's concordance coefficient (W) given by the relation:

$$W = 12S/p^2 (n^3 - n) - pT$$

where W denotes the Kendall's Concordance Coefficient, P denotes number of respondents (smallholder cotton farmers) ranking the constraints, n denotes the number of constraints, T denotes correction factor for tied ranks and S denotes sum of square statistic over the row sums of ranks (R_i). The sum of square statistic (S) is given as:

$$S = \sum_{i=1}^n (R_i - R)^2$$

where:

R_i = row sums of ranks

R = the mean of R_i

The correction factor for tied ranks (T) is also given as:

$$T = \sum_{k=1}^m (t_k^3 - t_k)$$

Where:

t_k = the number of ranks in each (k) of m groups of ties.

The hypothesis to be tested is stated as follows, where H_0 and H_1 denote null and alternate hypothesis respectively.

H_0 : There is no agreement among the rankings of the constraints

H_1 : There is an agreement among the rankings of the constraints

The test of significance of the Kendall's concordance was done using the chi-square (X^2) statistic which is computed using the formula;

$$X^2 = p (n-1) W$$

where

- n = number of constraints
- p = number of respondents (smallholder cotton farmers)
- W = Kendall's coefficient of concordance

The decision rule is that if the calculated chi-square is greater than chi-square critical, then the null hypothesis is rejected in favour of the alternate hypothesis that there is agreement among the rankings of the constraints by the smallholder cotton farmers.

4. RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of Smallholder Cotton Farmers in Northern Region

4.1.1 Gender, age, level of education and marital status

The data in Table 1 presents the socio economic characteristics of cotton farmers in terms of gender, age, level of education and marital status. The study revealed that men are mostly engaged in smallholder cotton farming in the Northern Region. Majority (86.7%) of the respondents are male whilst 13.7% are female. This suggests that women in the rural

communities are mostly engaged in the production of food crops such as cereals, tubers and vegetables to supplement their household upkeep to the neglect of non-food crop production. About 29.3 percent of the respondents are aged between 21-30 whilst 40.7 percent are between the ages of 31 and 40. Only 4.0 percent were 51 years and above and 26.0 percent were aged between 41 and 50 years. This clearly indicates that most of the smallholder cotton farmers are matured and still in their active ages to be able to effectively embark on cotton production. Majority of the respondents (99.3%) are married, about 0.7 percent are single while none is divorced. For educational attainment, about 77.3 percent of the respondents are illiterates, 16.7 percent had primary (middle/JHS) education while 5.3 percent had secondary/technical education. Only 0.7 percent has level of education higher than secondary/technical school. This is a clear demonstration of the high illiteracy rate in the Northern Region of Ghana.

4.1.2 Summary statistics of variables used for analysis

Table 2 presents the summary statistics of selected variables used for the analysis in the present study. Smallholder cotton farmers cultivate an average area of 1.23 hectares which in some cases are scattered in the farming community. Smallholder cotton farmer with this average area under cultivation also applies

Table 1. Gender, age and level of education and marital status

Characteristic	Frequency	Percentage
Gender:		
Male	130.00	86.70
Female	20.00	13.70
Age:		
21-30	44.00	29.30
31-40	61.00	40.70
41-50	39.00	26.00
51and above	6.00	4.00
Level of Education:		
Primary(Middle/JHS)	25.00	16.70
Secondary/Technical	8.00	5.30
Above Secondary/Technical	1.00	0.70
None	116.00	77.30
Marital Status:		
Single	1.00	0.70
Married	149.00	99.30
Divorced	0.00	0.00

Source: Author's computation, 2009

Table 2. Summary statistics of selected variables used for regression

Variable	Mean	Standard deviation
Cotton output (kg/ha)	615.48	176.28
Cotton revenue (GHC)	453.55	529.59
Quantity of fertilizer (kg/ha)	366.33	272.36
Quantity of seeds (kg/ha)	64.17	49.53
Volume of chemicals (L/ha)	12.14	8.89
Age (years)	36.54	8.34
Area under cultivation (ha)	1.23	0.89
Family size (number)	8.46	2.68

Source: Authors computation, 2009

averagely 366.33 kilogram per hectare of fertilizer (NPK and Sulphate of Ammonia), 12.14 liters per hectare of chemicals (pesticides and herbicides) and sows an average of 64.17 kilogram of seeds per hectare resulting in an average of 615.48 kilogram cotton output per hectare and GHC 453.55 cotton revenue per hectare.

4.2 Estimation of Smallholder Cotton Farmers' Profits

Estimation of profits was done to enable the computation of the financial efficiency measures of smallholder cotton farmers. Table 3 presents the estimation of fixed and variable costs incurred by an average smallholder cotton farmer. Hired labour cost forms the highest variable cost element with an amount of GH¢ 90.00 per hectare representing 25.58% of the total cost. These include cost of weeding, sowing, fertilizer application, chemical spraying and harvesting. This is followed by the cost of fertilizer (sulphate of ammonia) with an amount of GH¢ 62.00 representing 17.62% of the total cost. Miscellaneous expenses which include cost of sharpening a cutlass, inflating a bicycle tire and so on form the least variable cost element with an amount of GH¢ 15.87 representing 4.51%. Transportation which represents 8.53% of the variable cost has a value of GH¢ 30.00 and represents the cost incurred in conveying harvested seed cotton from the farm to the house. The average total variable cost per hectare in a production season is GH¢ 351.87.

Smallholder cotton farmers in the Northern Region use simple tools such as hoes and cutlasses with bicycle assisting their movement to their various farms. None of the respondents uses tractor. Cotton Companies plough for the

farmers whose cost is deducted from the revenue after harvest. The fixed cost elements have been depreciated using the straight line depreciation method. It was revealed that bicycle forms the highest depreciated cost among the fixed cost elements with a value of GH¢ 5.91 representing 39.64%. An average cotton farmer possesses at least three hoes and three cutlasses with depreciated cost of GH¢ 4.50 each representing 30.18 percent. The average total fixed cost per hectare in a production season is GH¢ 14.91.

Table 4 presents the estimation of results for smallholder cotton farmers' profits and its parameters. The estimation of the profits has enabled the computation of financial efficiencies of the smallholder cotton farmers. The fixed and variable cost estimation is for an average smallholder cotton farmer in a production season. The total cost which is GH¢ 55,015.82, is estimated by summing the total fixed cost and the total variable cost for all the respondents which was further divided by the total number of respondents (sample size) to obtain the mean total cost of GH¢ of 366.77 and standardized on per hectare basis. Total revenue is also estimated as GH¢ 68,033.75 while the total net revenue was estimated to be GH¢ 13,271.90. The study therefore revealed that an average smallholder cotton farmer makes net revenue (profit) of GH¢ 86.79 per hectare. Smallholder cotton farmers will therefore depend on this profit till the next farming season.

4.3 Financial Efficiency of Smallholder Cotton Farmers

Table 5 presents the variables used for the estimation of the financial efficiency of smallholder cotton farmers in the Northern region of Ghana.

Table 3. Fixed and variable costs for average smallholder cotton farmer in a production season

Variable costs per hectare				
Variable cost item		Cost (GH¢)	Percentage of cost (%)	
Hired labour		90.00	25.58	
NPK (15:15:15)-4 bags		54.00	15.34	
Sulphate of Ammonia(SO ₄ (NH ₃) ₂)-2 bags		62.00	17.62	
Chemicals		50.00	14.21	
Ploughing		50.00	14.21	
Transportation		30.00	8.53	
Miscellaneous		15.87	4.51	
Total variable cost per hectare		351.87	100.00	
Fixed costs per hectare				
Fixed cost item	Quantity(number)	Cost (GH¢)	Depreciation	Percentage (%)
Hoe	3	12.00	4.50	30.18
Cutlass	3	12.00	4.50	30.18
Bicycle	1	60.00	5.91	39.64
Total		84.00	14.91	100.00

Source: Author's computation, 2009

Table 4. Smallholder cotton farmers' profits

Cost element	Amount (GH¢) per hectare
(A) Total fixed cost	2,235.82
(B) Mean total fixed cost (A/n)	14.91
(C) Total variable cost	52,780.00
(D) Mean total variable cost (C/n)	351.87
(E) Total cost (A+C)	55,015.82
(F) Mean total cost (E/n)	366.77
Revenue element	Amount (GH¢) per hectare
(G) Total revenue	68,033.75
(H) Mean total revenue (G/n)	453.55
(J) Total net revenue (G-E)	13,017.93
(K) Mean total net revenue (J/n)	86.79

Source: Survey data, 2009; Sample size (n) = 150

Table 5. Estimation of financial efficiency variables of smallholder cotton farmers

Variable	Amount(GH¢) per hectare
Depreciation expense	14.91
Total operating expense	351.87
Gross revenue	453.55
Net farm income from operations	86.79
Total farm assets	2,235.82

Source: Author's computation, 2009

Estimates of financial efficiency of smallholder cotton farmers are presented in Table 6. An estimated Asset Turnover Ratio of 20.28%

indicates that an average smallholder cotton farmer is 20.28% efficient in using his or her assets to generate revenue. Langemeier [17] stated that the higher the Asset Turnover Ratio in a farm business, the more efficiently assets are being used to generate revenue. However, comparing the estimated Asset Turnover Ratio (ATR) of 20.28% to the benchmark in Table 7, smallholder cotton farmers are financially inefficient in using their assets to generate gross revenue since it is far below average of 35 percent.

Table 6. Estimation of financial efficiency measures of smallholder cotton farmers

Financial efficiency measure	Ratio (%)
Asset turnover ratio	20.28
Operating expense ratio	74.10
Depreciation expense ratio	3.29
Net farm income ratio	19.14

Source: Author's computation, 2009

Table 7 presents the financial efficiency scores highlighting the benchmarks of the various measures used for the present.

The Operating Expense Ratio of a smallholder cotton farmer is 74.10 percent. This implies that 74.10 percent of the gross revenue generated by smallholder cotton farmers is absorbed by operating expenses. This is extremely higher and therefore depicts smallholder cotton farmers' financial inefficiency in terms of the proportion of their revenue that is absorbed by operating expenses. However, The Depreciation Expense Ratio of 3.29 percent implies that 3.29 percent of

the gross revenue generated by an average cotton farmer is absorbed by depreciation. This also implies that the proportion of each cedi of gross revenue that is spent on depreciation. Comparing this ratio to that on Table 7, smallholder cotton farmers are said to be financially efficient in terms of the proportion of their gross revenue that is absorbed by depreciation expense. Net Farm Income Ratio estimated shows that a smallholder cotton farmer has 19.14 percent of the gross revenue remaining as net income after all expenses have been paid. This clearly indicates that the smallholder cotton farmers are not financially efficient though closer to the average profit benchmark (20%) indicated on Table 7.

Table 7. Financial efficiency scores

Financial efficiency measure	Benchmark	
	Average profit (%)	High profit (%)
Asset turnover ratio	35	43
Operating expense ratio	63	52
Depreciation expense ratio	8	7
Net farm income ratio	20	37

Source: Center for food and Agricultural Business, Perdue University, 2002.

4.4 Constraints of Smallholder Cotton Farmers in the Northern Region

The second objective of this paper was to identify and rank constraints of smallholder cotton farmers in the Northern Region. This was achieved by first seeking the views of the cotton farmers regarding the constraints they face as per their cotton farming businesses. Various constraints were enumerated amongst which are pest and diseases, poor pricing of seed cotton, untimely input supply by cotton companies, difficulty in acquiring labour, bad weather conditions, lack of access to land, competition of weeds on cotton plants, lack of access to cash credit, inadequate access to tractor services among others. Table 8 presents the rankings of the constraints of the cotton farmers.

The results show that poor pricing of seed cotton has the highest rank and therefore the most limiting constraint to smallholder cotton farmers in the Northern Region. One kilogram of seed cotton is priced at GH 30p which has remained so for the past seven years despite a continuous

increase in the cost of production inputs. This apparently reduces the profit margins of the smallholder cotton farmers and therefore discourages some of the farmers from sustaining themselves in the cotton farming business.

Table 8. Rankings of constraints of smallholder cotton farmers in the Northern Region

Constraints	Mean rank	Rank
Pest and diseases	4.00	4
Poor pricing of seed cotton	1.14	1
Untimely input supply	2.13	2
Difficulty in acquiring labour	3.51	3
Bad weather conditions	6.11	6
Lack of access to land	8.75	9
Competition of weeds on cotton plant	6.72	7
Lack of access to cash credit	4.85	5
Inadequate access to tractor services	7.79	8

Source: Survey data, 2009
 Sample size (N) = 150, Kendall's W = 0.874, chi-square = 1049.11, df = 8, asymptotic sig. = 0.000

Untimely supply of inputs by Ghana Cotton Company Limited (GCCL) was noted as the next important constraint hindering cotton production. The cotton farmers sometimes do not receive the inputs such as fertilizers, chemicals (weedicides and pesticides), cotton seeds on timely basis. Untimely application of these inputs on cotton farms reduces cotton yield.

The third most limiting constraint faced by smallholder cotton farmers in the Northern Region is difficulty in acquiring labour especially for land preparation, sowing, fertilizer application, chemical spraying, weeding and harvesting. Although the smallholder cotton farmers make use of family labour, they also employ external hands to suffice their labour needs since cotton production is noted to be labour intensive. However, they find it difficult coming by these labourers in the peak season when the demand for labour by farmers outweighs the available labour in the communities. Demand for labour is therefore high in the various communities and this undoubtedly leads to an increase in the cost involved in employing labour. Obviously, this also goes to reduce the profit margins of smallholder cotton farmers.

The fourth most limiting constraint to successful production of cotton is the prevalence of pest and diseases on cotton farms. These pests and diseases attack and destroy the cotton plants thus bringing about drop in output levels as well as poor quality of seed cotton.

Another constraint noted by smallholder cotton farmers in the Northern Region as the fifth most limiting constraint to cotton production is the lack of access to cash credit. Ghana Cotton Company Limited (GCCL) advance in-kind credit to smallholder cotton farmers in the form of inputs after which the cotton produce are bought by the company. The company deducts the input credit before payment is done to the cotton farmers. However, smallholder cotton farmers need cash credit to take care of labour cost since this forms the highest cost among the operational cost elements. The other constraints of smallholder cotton farmers include bad weather conditions, competition of weeds on cotton plants, inadequate access to tractor services and lack of access to land.

4.4.1 Validation of hypothesis

Kendall's Coefficient of Concordance (W) was used to test for the level of agreements among the rankings of the constraints by the smallholder cotton farmers. The Kendall's Coefficient of Concordance (W) was found as 0.874, chi-square statistic was estimated as 1049.11 with 8 degrees of freedom and asymptotic significance of 0.000. Chi-square critical obtained from the chi-square table is 124.34 at 5% level of significance. Since the computed chi-square is greater than the chi-square critical, the null hypothesis is rejected in favour of the alternate hypothesis that there is agreement among the rankings of the constraints by the smallholder cotton farmers in the Northern Region. The Kendall's Coefficient of Concordance (W) estimated as 0.874 indicates that there is 87.4 percent agreement among the Rankings of the constraints.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Based on the survey results, it can be concluded that cotton farming business in the Northern Region is profitable. Also smallholder cotton farmers in the Northern Region of Ghana are financially inefficient in terms of measures such as Asset Turnover Ratio, Operating expense

ratio and Net Farm Income ratio but financially efficient using Depreciation Expense Ratio parameter. Several constraints hinder successful cotton farming business in the region. Relatively lower prices of seed cotton, untimely supply of farm inputs and lack of access to farm lands emerged as the most limiting, second most limiting and the least constraints respectively, faced by smallholder cotton farmers. In view of the above conclusions, the following recommendations are suggested for policy implications:

- The government, NGOs in the cotton sector, private cotton companies and other cotton stakeholders should step up their efforts in building capacities of smallholder cotton farmers in both technical and financial management to enable them handle efficiently the cotton production business.
- Management of cotton companies as well as government should regularly meet with smallholder cotton farmer associations in the Northern Region to negotiate fair prices for seed cotton. This will inevitably entice the farmers to remain in the cotton production business for improved livelihoods.
- There is the need for the formation of cotton stakeholder committees with the mandate of carrying out monitoring on timeliness of input supply by cotton companies to cotton farmers. This will enable the timely execution of cultural practices on their farms for increased productivity and profitability.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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