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An evaluation of factors affecting the feasibility of reviving cotton industry in Kenya, A case of Kitui and Tharaka nithi Counties

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Abstract

Cotton production was introduced in Kenya in 1900 by the British colonial settlers and the industry continued to record impressive performance up to the early 1980s. However, the sub-sector virtually collapsed by the early 1990s and recorded the lowest production performance by 1994 (CODA, 2012). Given the opportunities accorded through the United States of America (USA) "African Growth and Opportunity Act (AGOA) of 18th May 2000" for the promotion of the cotton sub-sector, the Government of Kenya has been making some efforts to revive the cotton industry since the year 2000. The AGOA Act permits the entry of apparel products (mainly clothing/textile products) from eligible African countries into the USA duty free. This study assesses the factors that led to a virtual collapse of the cotton industry in Kenya by 1994 and also evaluates the feasibility of reviving the cotton industry in the country by assessing the drivers of cotton production performance in Tharaka Nithi and Kitui Counties of Kenya as a case study. The study uses multiple linear regression and the gross margin analysis. The regression results reveal that farmer experience in cotton farming, engagement in farmer groups or organizations, distance to ginnery and numbers of extension trainings had significant and positive relationships with the production performance of cotton in Kenya. The results further showed that the age of the household head, the years of formal education for the household head, credit access and land ownership had negative and significant relationships with the production performance of cotton in Kenya. The results of gross margin analysis showed that cotton production was not competitive when compared to production of the main crops grown in the study areas. Cotton was found to have the lowest gross margin and it would therefore not be rational for farmers to put much effort in its production.

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Introduction

In Africa, the major producers of cotton include Cote d'Ivore, Chad, Benin, Togo and Burkina Faso. In eastern Africa, the countries that produce cotton include Tanzania, Uganda, Kenya and Sudan (USDA, 2015). Kenya is a net importer of cotton and the imports come mainly from the neighboring countries, namely Uganda and Tanzania. Since 1991 after market liberalization in Kenya, the cotton-to-garment value chain in the country has lacked the structure and institutional dynamics required to produce the commodity competitively like the global and other larger regional players. Production of cotton in Kenya is far from realizing its true potential (Gitonga *et al*, 2009).

The promulgation of the African Growth and Opportunities Act (AGOA) of the United States of America (USA) in May 2000 created an opportunity for Kenya to diversify her trade basket with the USA. This USA Trade Act basically gave Kenya an opportunity to include textiles and apparel in non-dutiable items that could be exported to the USA and which had suffered from the import ban that the USA had imposed in 1998. The AGOA thus made Kenya to consider how it could engage in measures to revive the cotton industry in the country. In 2006, the Government of Kenya (GoK) established the Cotton Development Authority (CODA) through the Cotton Amendment Act of 2006 to provide for the promotion of the cotton industry and its associated activities in Kenya.

Kenya's Vision 2030 was launched in 2008 and aims at making Kenya a middle income industrialized state by year 2030. The development of the cotton sub-sector in the country is seen as one of the government's key development initiatives that are geared toward the promotion of industrialization in the country.

Despite the government (GoK) intervention in the cotton sub-sector in recent times, the response has not been impressive. Some regions that used to produce cotton during the peak in the 1980s and had ceased to do so after the mid-1990s have resumed cotton farming while some others are yet to resume; the latter group is yet to be convinced that resumption of cotton farming would be good.

More specifically, what emerges from the analysis of the situation on the ground with regard to cotton-production performance in Kenya is that different scenarios are being experienced in different regions of the country, or even within regions in the same agro-ecological zones. For instance, Kitui, Makueni, Tharaka Nithi and Meru counties have common agro-ecological zones that can support cotton production. However, Kitui and Makueni counties provide an example of the areas in which many farmers have resumed cotton production, while Tharaka Nithi and Meru counties provide an example of areas in which the farmers are still sluggish and do not appear to be keen on resuming cotton production. A private ginnery at Kitui has resumed operations, but the ginneries in Tharaka Nithi and Meru are yet to be fully operationalized.

The broad objective of this study was to determine and assess the factors that led to a virtual collapse of the cotton industry in Kenya by 1994, and also evaluate the feasibility of reviving the cotton industry in the country. This was to be done through a synthesis and critical evaluation of past experiences and by assessing the drivers of cotton production performance in Tharaka Nithi and Kitui Counties of Kenya as a case study.

The specific objectives were to assess cotton production performance in Kenya since the early 1960s, to determine the factors that influenced the observed cotton production performance in Kenya since the early 1960s with special focus on the factors that led to a virtual collapse of the cotton industry in Kenya by 1995 and to evaluate the technical and economic feasibility of the revival of the cotton industry in Kenya.

Material and methods

The study used cross sectional primary data from household survey. Tharaka Nithi and Kitui Counties in Kenya were purposively selected. This was because the two Counties experience more or less homogeneous agro ecological conditions and also because of their past experience in Cotton farming.

For adequate representation, stratified sampling was used. The sample frame was drawn from the sub counties that cotton is grown. To enhance the chances of getting an adequate sample of cotton farmers, the bowling technique was also used whereby an interviewed farmer would direct the interviewer to the next nearest cotton farmer.

A total of 80 farmers were interviewed. However, only 61 were able to provide data that could be used to determine the drivers of production performance in the cotton industry. This is because 19 out of the sampled 80 farmers were found not to have been active in Cotton production for the past 3 years.

Empirical framework

Both descriptive and inferential statistics were used to characterize cotton production performance in Kenya.

Multiple linear regression models

To assess the factors that are driving cotton production in Kenya, the study used multiple linear regression. It is an econometric method for estimating the relationship between a dependent variable and two or more independent variables.

The multiple linear regression model is generally given by

$Y= \beta_0 +\beta_1X_1 + \beta_2X_2 +...+\varepsilon$

Where β_0 is the intercept (The expected mean value of Y when all X= 0) and β_1, β_2 . . . is coefficient of the variable X_1, X_2 ....

- β_1 is the change in dependent variable (Yi) when the independent variable (X_1) increases by one, keeping other independent variables are constant. etc

For this study:

Y= Quantity of cotton

X_1= Age of household head in Years;

X_2= Number of year since farmer has been producing Cotton;

X_3= Number of years of formal education of the household head;

X_5= Farm size in Acres;

X_6= Frequency (Number) of extension contact a household had in the past 3 years;

X_7= Income in Kenyan shillings earned from off-farm activities per year;

X_8= Income in Kenyan Shillings earned from crops and livestock other than cotton, per year;

X_9= Access to credit 1 if there was access, 0 otherwise;

X_{10}= If involved in any farmer organization. 1 if yes, 0 otherwise

X_{11}= Ownership of land. 1 owned, 0 otherwise

X_{12}= Cotton output Price in Ksh per kg of raw lint plus seed ;

X_{13}= whether the farmer uses pesticides. 1 if yes, 0 otherwise

X_{14}= whether the farmer uses fertilizer. 1 if yes, 0 otherwise

X_{15}= Distance in Kilometer to the nearest ginnery

ε= the random error term

The explanatory variables in the current study are those variables which were predicted to have strategic influence on production performance of cotton based on the theory of production economics. They include, farm and Institutional characteristics, factors affecting market access, land tenure related factors and households. The rationale for the inclusion of these variables was thus apriori expectations of the drivers of agricultural technology adoption.

Results and discussion

A total of 80 farmers were interviewed, but 19 of them were found not to have been active in Cotton production for the past 3 years. Therefore, only the data obtained from 61 farmers were analyzed to determine the drivers of production performance in the cotton industry. The distribution of responses according to gender, age and highest education level achieved is shown in table 4-3. As shown in Table 4-3, both male and female respondents were fairly represented at 57.4% and 42.6% respectively. Female headed households are more likely to take up adoption options since most of the rural farming is done by women because many men are employed in cities and towns, or in urban areas in general. Women tend to have more experience and information on crop management practices than men (Langyintuo *et al.*, 2005). However, women have less education than men in most rural households and are more vulnerable to poverty.

Table 4-3. Social characteristics of respondents in the Cotton Revival study.

Characteristics	Category	Frequency	Percentage
Gender	Male	35	57.4
	Female	26	42.6
Age	Above 60years	13	21.3
	30- 60 years	44	72.1
	Below 30 years	4	6.6
Education	None (No formal Education)	10	16.4
	Primary	29	47.5
	Secondary	16	26.2
	College	6	9.8
Economic Activities	Full time farmers	45	73
	Farming and business/employment	16	27

	Maximum (acres)	Average (acres)	Minimum (acres)
Total Land (both for farming and Homestead)	10	4.8	1
Land Under Cotton alone	4	1.6	0.5

Source: survey data 2016.

With regard to respondents' age, majority (72%) were between the ages of 30-60years old. This could be a suggestion that the study area has an active working age group. The maximum and the minimum age of the respondent were 81 and 23 years respectively with the mean age of 49 years.

This indicates that most of the respondents were in the age bracket that may have experience on when cotton production was high, when the production drastically dipped and when the government of Kenya started trying to revive the sector. Their opinion in the sector was therefore very useful. Based on the highest education level achieved, close to half of the respondents have at least achieved formal primary education. This suggests that they have higher probability of making informed decisions on whether to engage in cotton farming or not.

On economic activities, the findings indicate that about 73% of the respondents are full time farmers. The rest are farming and engaging in other activities like businesses and formal employment. The maximum number of acres that the respondents were found to be holding was 10 acres and the minimum was 1 acre. The average total acreage was 4.8 inclusive of the homestead area. The maximum and minimum area of land under cotton production was found to be 4 and 0.5 acres respectively. The average area of land under cotton production was found to be 1.6 acres.

Factors affecting the feasibility of reviving cotton industry

The following were hypothesized to be the predictor variables for cotton production:

- Age of the house hold head
- Number of years the household has been growing cotton
- Number of years of formal education
- Total farm size in acres
- Contact with extension officer
- Access to credit
- Ownership of the farm
- Price of cotton
- Average household farm income per year
- Average household off farm income per year
- Distance to the ginnery
- Membership of farmer organization
- Use of irrigation by household
- Pesticide and fertilizer use

Multiple linear regression was used to determine the factors that influence cotton production. The number of years a farmer had engaged in cotton farming, distance to ginnery, amount of land under cotton and number of times a farmer was given extension training were found to be statistically significant in explaining cotton production. Table 4-5 gives the results of the regression model estimate.

Table 4-5. Regression results of factors affecting the feasibility of reviving cotton industry.

Variable	B coefficient	Significant level
Age of the household head	-11.672	0.112
Number of years engaged in cotton*	11.554	0.080
Highest education level of HH head	-126.040	0.196
If HH uses pesticides	111.762	0.389
Farm size of the household in acres	30.202	0.574
Number of acres owned	-6.390	0.901
Land on cotton	162.558	0.095
Price of cotton	3.205	0.876
Distance to the ginnery**	-11.227	0.038
If Member of farmer organization**	48.402	0.043
Access to credit	-145.162	0.310
Number of Times trained by extension personnel***	164.114	0.000
Earnings from off farm per year	-2.415	0.972

Note: *** indicates significant at 1%, ** significant at 5%, * significant at 10%.

Source: Authors work, 2016.

The number of years a farmer was involved in farming was found to be statistically significant at 10% and had a positive relationship with cotton production whereby a unit increase in years of farming increased production by a factor of 0.32. Experienced farmers would be expected to know mitigation measures on challenges facing the sector.

The age of the household head had been hypothesized to have a positive relationship with cotton production. The study findings, however, show that the coefficient was not significant. This could be attributed to the fact that the older farmers have become skeptical about investing in cotton production following the losses that were encountered in the early 1990's.

Access to credit was found to be insignificant in influencing the production of cotton. This result is consistent with the findings from a study done by Mberengwa (2012). This result could be due to the fact that those who are likely to access credit are more likely to be in business rather than in farming or they could have been producing crops other than cotton

A positive relationship was observed between contact with extension personnel and production performance, and was significant at 1%. This could be due to the fact that cotton faces a lot of pests and disease incidences and hence a lot of training on how to manage the situation is handy in improving production. The results showed that a unit increase in the number of extension training contacts increases production of cotton by 0.51.

Education of the household head was found to be insignificant in explaining cotton production performance even though the expectation was that education would enlighten people on better farming practices. However, the contrary result could be explained by the fact that those who are educated are more likely to be keen on evaluating gross margins and are thus likely not to be attracted by the low gross margins observed in cotton farming as compared to other crops. Distance to the ginnery was found to have a negative relationship with production performance at a significance level of 5%. The results thus show that a unit increase in the distance of the ginnery from the farmer reduces production by 0.32. This is because the cost of transportation to the ginnery, if high, would erode the farm gross margin and thus weaken the efforts the farmers put into cotton production.

Total farm size also had a positive relationship with production performance. The results showed that a unit increase in the size of land increases cotton production by 12%. This could be due to the fact that those with small pieces of land are likely to concentrate on food crops and neglect cotton. On the other hand, land ownership was found to have a negative relationship with production performance. This is contrary to expectation because land title deed could be used as collateral in credit access. The findings of the study therefore could be attributed to the fact that access to credit was not found to be statistically significant in influencing cotton production.

The study had also assumed that lagged cotton prices would have a positive relationship with cotton production performance, but the results were not found to be statistically significant. This could be attributed to the constant prices over a long period of time. The study had hypothesized that membership to farmers' group would influence cotton production performance. The study found that at 5% significance level, being a member of farmer organization had a positive relationship with production performance, with a Beta coefficient of 0.49. This result can be explained by the fact that those in farmer groups are likely to be more informed on farming matters and hence are able to improve their production of cotton.

Economic feasibility of reviving Cotton sector

To assess whether it is economically feasible to revive cotton the cotton sector in Kenya, gross margins of cotton and other main crops produced in the cotton growing zones in the Country were calculated. The main crops grown in the study area include: Green grams, cow peas, cotton, pigeon peas, millet, Sorghum, maize and beans. Out of the 61 households interviewed, 78% were found to be growing green grams as their major crop. The findings of the study show that the average gross margin for green grams is Ksh. 16,000 per acre per season. The gross margins for the other crops were found to be as presented thereafter. The maximum gross margin per acre for cow pea grains was calculated to be Ksh. 12,000 and the minimum amount was Ksh. 6,000. The average gross margin for cowpeas grains was Ksh. 9,300 per acre per season. It was also found that the cow pea leaves are a cherished vegetable within the study area and also in Kenya as a whole.

The gross margin for sorghum was found to be ranging between Ksh. 13,000 and 17,900 per acre per season, with the mean gross margin being Ksh. 15,500 per acre per season. Gross margin for millet was found to be slightly higher than that for sorghum at Ksh. 17,200 per acre per season.

Table 4-6. Gross Margins per acre per season.

Crop	Total variable cost (Ksh)	Yield (Kg)	Average price (Ksh)	Average revenue (Ksh)	Gross margin (Ksh)
Pigeon Peas	6,700	400	80	32,000	25,300
Millet	4,500	800	27	21,600	17,100
Sorghum	6,100	1100	20	22,000	15,500
Green grams	5,100	300	80	24,000	16,000
Cow peas	4,200	500	27	13,500	9,300
Cotton	12,550	400	42	16,800	4,250

Source: Authors work, 2016.

About 84% of the respondents were found to be growing pigeon peas. However, the findings showed that pigeon peas is mainly intercropped and is planted in strips 6 meters apart with other crops in between. Gross margin per acre for pigeon peas was found to be Ksh. 25,000 per acre per season. Among all the major crops grown, cotton had the least gross margin, with an average of Ksh. 4,250 per acre per season. The lowest gross margin calculated was Ksh. 850, with the Highest being Ksh. 8,000. Evidently, cotton had the highest cost of production, with the bulk of the cost being in spraying and harvesting. Cotton spraying is done up to 12 times annually. The main crop found to be intercropped with cotton was cow peas. This is because cow peas do not grow tall and thus do not increase competition for sunlight with cotton. Based on the forgoing results from gross margin analyses, the revival of the cotton sector in Kenya is not economically feasible at the current level of production costs and prices structure.

Conclusion

The results from regression analysis basically give an overview of the key drivers of the cotton production performance. The factors with positive and significant influence would be expected to promote the revival of cotton production while those with negative and significant influence would be expected to inhibit the revival.

Therefore, based on the results of the study, farmer experience in cotton farming, engagement in farmer groups or organizations, distance to ginnery and numbers of extension trainings would be expected to positively the revival of the cotton production in Kenya. However, the low economic competitiveness of cotton production, based on its low gross margin, would appears to make the older and more educated farmers who own land and have access to credit to shun cotton production. Such farmers are more likely to go for more economically attractive farm enterprises. This inference appears to be the plausible as an explanation of why the age of the household head, the years of formal education for the household head, credit access and land ownership were found to have a negative and significant relationship with the production performance of cotton in Kenya.

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