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Contribution of Contract Cocoa Production on Improving Livelihood of Smallholder Farmers

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Abstract- This study examined the technical efficiency of cocoa productivity through contract farming in Tanzania for improving livelihoods of smallholder farmers. Probability sampling was used to select 271 respondents (131 respondents from Kilombero and140 from Kyela Districts). A cross-sectional data were collected using structured questionnaire from cocoa smallholder farmers. The data was analyzed by using NLOGIT software version 5. The results show that the mean technical efficiency was 79.7% and 61.6% from Kilombero and Kyela Districts respectively. Smallholder farmers from Kilombero District were more efficient than Kyela District within contractual arrangement. These smallholder farmers were technically efficient in terms of number of hours spent in farms, labour training, experience, distance and Size of labourer. Moreover, results show that smallholder farmers agreed that being in contract had increased access of training (89.3% (n=242)), credits (80.8% (n=219)), production quantity (73.1% (n=198)), production acreage (71.7% (n=194)), timely purchase (92.9% (n=252)) and timely payment (95.2% (n=258)). However, results show that 67.47% of respondents disagreed that contract farming did not provide timely inputs and 74.9% of respondents disagreed that contract farming helped to introduce new technology. Therefore, findings suggest that contract farming contributed a lot on improving smallholder farmers' livelihood within contract farming.

Index Terms- Technical Efficiency, Contract Farming, Livelihoods

I. Introduction

Agricultural sector is the leading sector of the economy of Tanzania and accounts for over half of the GDP and export earnings; and over 80% of the poor are in rural areas and their livelihood depends on agriculture (United Republic of Tanzania (URT), 2001). Apart from providing food, Agriculture sector remains to be the country's main source of income for the rural population, which forms 80 percent of the total population and employs 70 percent of the active labour forces (Ministry of Agriculture and Food Supply (MAFS), 2005). However, most smallholders farmers in Tanzania use hand hoes in farming ranging from 1 to 3 acres, and this is the main type of farming characterizing the agricultural economy in Tanzania. Tanzania has conducive environment for development of agriculture sectors despite its people using poor technology. The agricultural sector in Tanzania is facing a lot of problems like low price, low incentives, low output and unreliable market, poor infrastructure, poor quality, low productivity, poor coordination, inadequate private sectors (Mwakalinga and Massawe, 2007; Delgado, 1995; and URT, 2001). As the result of such problems the agricultural sector has been growing slowly and therefore increasing poverty to smallholder farmers in particular and the nation in general. This is so because most of smallholder farmers in Tanzania do practice independently and lack supports in their production. Smallholder farmers in Tanzania are facing production problems such as inadequate product quality, low labour productivity, insufficient extension, poor market, low price, poor-harvest management, shortage buying posts, late payment, where some market actors violate set standard units of weights and product grades. The Ministry of Industry, Trade and Marketing (MITM, 2008) argues that market constraints of smallholder farming were weak legal and regulatory framework on agricultural marketing; weak institutional set-up dealing with agricultural marketing; inadequate marketing research; inadequate marketing linkage; and inadequate capacities to utilize opportunities emerging in the domestic, regional and international markets and including preferential markets.

Due to these agricultural constraints one would say that contract farming arrangements is a measure of some of these problems in production. The Food and Agricultural Organization (FAO_2 (cited by Ministry of Agriculture Food and Cooperatives (MAFC), 2006) defined contract farming as "an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices. The centralized model of contract farming links the term "Contract Farming" as a vertically coordinated model where the sponsor purchases the crop from farmers and processes or packages and markets the product (Eaton and Shepherd, 2001). Contract farming could be an institutional arrangement that enables farmers to access markets, introduction of higher-value seeds, information, technology, reduction of production risk for farmers, monitoring and labour incentives, timely inputs and production markets, credit and financial intermediation, reduction in the risk of price fluctuations, and increased incomes (Eaton and Shepherd, 2001; Glover and Kusterer, 1990; Key and Runsten, 1999; Holloway et al. 2000; Warning and Key, 2002; Patrick 2004; Birthal et al. 2005a; and Ramaswami et al. 2006).

Contract farming act as value chain between smallholder farmers and the company, Hellin and Meijer (2006) argues that chain actors who actually transact a particular product as it moves through the value chain include input (e.g. seed suppliers), farmers, traders, processors, transporters, wholesalers, retailers and final consumers. For the success of the organization there must be dependent to each other. The organization provides services to the people and people provide raw materials (sell products) to the organization, this act as a value chain between the two sectors. Contract farming looks as the chain linking the buyer and out-grower because they are supporting each other in the production. The study aimed at assessing contribution of contract cocoa production on improving livelihood of smallholder farmers in Tanzania.

1.1 Conceptual framework

Technical efficiency measures the performance of production in a given available resources. Producers always aimed at maximizing profit and minimizing cost of production in order to produce at efficiency level. Battese and Coelli (1988) define technical efficiency of a firm as the ratio of its mean production (in original units), given the level of inefficiency, to the corresponding mean production if the inefficiency level were zero. But, inefficiency can arise due to other factors which are out of the control of the producers like bad weather (drought, flood, volcanoes), diseases, wild animals, which can lead to the production below the frontier (Aigner et al. 1977; and Meeusen and Broeck, 1977). Efficiency analysis is a common way of evaluating the performance of agricultural production, whereby highly efficient farms are considered to have higher likelihood of survival (Manevska-Tasevska, 2012). However, livelihood is the way smallholder farmers earn income in order to support life. According to Department of International Development, (1999) term *livelihood* comprises the capability, assets and activities requisite for a means of living. The asset is referred to tangible or intangible; tangible assets are such as food store and cash saving, trees, land, livestock and tools and intangible assets are such that access to materials, information, education, health services and employment opportunities. The livelihoods outcomes are seen in human asset, social assets, natural assets, physical assets and financial assets acquired by undertaking a certain activity. Therefore, the livelihood of smallholder farmers within contract farming in cocoa production could be evaluated through assessing some of aforementioned outcomes.

II. Methodology

2.1 Study Area

The study was conducted in Kilombero and Kyela Districts which are among the areas that produce cocoa beans in Tanzania. The primary data for this study were collected on March - April, 2013. The sampling unit of the study was limited only to the areas producing cocoa, predominantly those within contract farming. Smallholder farmers was obtained from two districts (Kilombero and Kyela), four wards and ten villages involved in the study. Probability sampling method was employed to obtain respondents from smallholder farmers producing cocoa. Cross-sectional data was collected using structured questionnaire; the sample size was 140 respondents from Kyela District and 131 respondents from Kilombero District.

3.1 Analytical Model

The Cobb-Douglas production function has been widely used in agricultural studies because of its simplicity and ease of estimation from agricultural data (Derbetin, 1992). The Cobb-Douglas production function, in its stochastic form, was presented in equation 1.

$$Y_i = \beta_1 X_{2i}^{\beta_2} X_{3i}^{\beta_3} X_{4i}^{\beta_4} X_{5i}^{\beta_5} e^{u_i}$$

…………………………………………….......Equation (1)

Where Y= output per acre/year/household, X_2=labour input, X_3= land input, X_4=technology used, X_5=cocoa plants per acre, *u*=stochastic disturbance term, and *e*= base of natural logarithm. From Equation 1 it is clear that the relationship between output and the four inputs is nonlinear. In transformation this model will be as follows:

$$\ln Y_i = \beta_0 + \beta_2 \ln X_{2i} + \ln \beta_3 X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + \varepsilon_i$$

………………Equation (2)

Where; β_0= constant term, ln= natural logarithm, $\beta_2, \beta_3, \beta_4, and\ \beta_5$ is coefficients and other parameter is previous explained.

The error term (ε_i) has two components u_i and v_i which form equation 3

$$\varepsilon_i = v_i - u_i$$

....Equation (3)

Where; $v_i =$ is a random error associated with random factors which are out of the control of the producers (Aigner et al. 1977; and Meeusen and Broeck, 1977) such as bad weather (drought, flood, volcanoes), diseases, wild animals, which can lead to the production below the frontier. It has a zero mean and variance equal to δ_v^2 such that its distribution is given as $N(0, \delta_v^2)$.

$u_i =$ is a non-negative truncated half normal random variable (at zero) with a distribution given as , $N(0, \delta_u^2)$. However, u_i can also have other distributions such as gamma and exponential. It is associated with farm-specific factors. The mean values of u_i are determined by equation 4.

$$u_i = \omega_i \rho_i$$

....Equation (4)

Where; $\rho_i =$ Represents inefficiency variable for; i=1,2,3 …,n; $\omega_i =$ Parameter estimates; for i=1,2,3…,n; δ_v^2 and δ_u^2 are the variances of v_i and u_i respectively. The inefficiency variable is represented by farm characteristics such as family labour, hired labour, training, distances, access to credit, time (manday hours) and experience.

The maximum likelihood estimation of equation 2 yields parameter estimates; β_i and λ. Given the production frontier and inefficiency effect models represented in equation 5, technical efficiency can be obtained from the conditional expectation of u_i given ε_i as shown in equation 5 (Zaibet and Dharmapala, 1999).

$$E[-u_i|\varepsilon_i] = \frac{\delta_u \delta_v}{\delta}\left[\frac{f^*(\lambda\varepsilon_i/\delta)}{1-F^*(\lambda\,\varepsilon_i/\delta)} - \frac{\varepsilon_i\lambda}{\delta}\right]$$
....Equation (5)

Where; $E[-u_i|\varepsilon_i] =$ A conditional mean of u_i given ε_i; $\delta_v^2 =$ is the variance of v_i; $\delta_u^2 =$ Is the variance of u_i; $\delta^2 = \delta_u^2 + \delta_v^2$ sample variance; $\lambda = \delta_u/\delta_v$ ratio of variance; $f^* =$ value of a standard normal distribution function; and $F^* =$ value of distribution function. Both functions are being evaluated at $\frac{\lambda\varepsilon_i}{\delta}$. Since technical efficiency of a production can be estimated under conditional expectation of u_i given ε_i.

The individual farmer's level of technical inefficiency was calculated from the expected value of equation 4 as re-written in equation 5 and later TE was compared with the return of cocoa output per kilograms per acre per year per household as showed in equation 6.

$$TE_i = \exp\left(E\left[-u_i \ \middle|\varepsilon_i\right]\right)$$
....Equation (6)

Such that $0 \le TE \le 1$. Otherwise $TE_i < 1$ provides a measure of short fall of observed output from maximum feasible output that characterized by a stochastic elements that varies across producers (Kumbhakar and Lovell, 2000).

3.2 The Empirical Model

The model in equation 7 representing stochastic frontier was estimated in two step process. First step; cocoa production through contract farming over one year output (Y) was regressed against the independent variables, including area under production (acres/land), labour (family labour plus hired labour), cocoa plants per acre and cost of technology used in production. The log linear production function is represented by equation 7.

$$LnY = \ln\beta_o + \beta_1 \ln X_{1ij} + \beta_2 \ln X_{2ij} + \beta_3 \ln X_{3ij} + \beta_4 \ln X_{4ij} + v_{ij} - u_{ji} \text{........} Equation.(7)$$

Where; LnY = Output of cocoa products per kgs/acre/years/household; X_1 = Area under cocoa production (land); X_2 = number of cocoa plants per acre; X_3= Labour (man day/acre including family labour plus hired labour); X_4= Cost of technology used in production; v_i = Random errors; u_i = Technical inefficiency effects; and ln= natural logarithms.

Then in the second step; the error term (u_i) was regressed against selected socio-economic characteristics of the farm as shown in equation 8.

$$u_i = \omega_0 + \omega_1\rho_1 + \omega_2\rho_2 + \omega_3\rho_3 + \omega_4\rho_4 + \omega_5\rho_5 + \omega_6\rho_6 + \omega_7\rho_7$$
..........Equation (8)

Where; $\omega_0, \omega_1, \omega_2 \ldots\ldots \omega_7 =$ parameter estimates; $\rho_1 =$ Distance from home to the field, ρ_2 =Training, ρ_3 =Experience in cocoa production; ρ_4 =Credit; ρ_5 =Family labour, ρ_6 = Hired labour; and ρ_7 =Time used in production (man hours per day).

III. Result and Discussion

4.1 Individual Attributes and Cocoa Output per Acre

Table 1 shows individual attributes and cocoa output per acre per years per household at Kilombero and Kyela Districts. Male producers from Kilombero District obtained 512.79 mean output of cocoa in kilogram under mean acre 1.47 of cultivated land and in Kyela District; male producers obtained 432.60 mean output of cocoa in kilogram under mean acre 1.38 of cultivated land. Female producers in Kilombero District obtained 502.37 mean output of cocoa in kilogram which produced under mean acre 1.37 of cultivated land; and Kyela District female obtained 219.71 mean output of cocoa produced under mean acre 0.73 of cultivated land. Based on the sex of smallholder farmer's data shows that Kilombero District is more productive compared to Kyela District. The group shows that males were very efficient in the production of cocoa than females in both Districts. Logically; males are more productive than females; the results from field support this logic because males were leading in the production of cocoa. There is a need to encourage females to participate fully in the production of cocoa.

Unmarried producers from Kilombero District obtained 174.76 mean output of cocoa in kilogram produced under mean acre of 0.47 of cultivated land; and in Kyela District, unmarried producers 93.01 obtained mean output in kilogram under mean acre 0.31 of cultivated land. The mean of cocoa output in kilogram obtained by married producers from Kilombero District was 779.94 produced under mean acre 2.19; and married producers from Kyela District obtained mean output 502.42 in kilogram per year under mean acre 1.68 of cultivated land. The mean 67.31 in kilogram of cocoa output obtained by divorced producers from Kilombero District which produced under mean acre of 0.21; and Kyela District divorced producers obtain a mean 56.89 of cocoa output in kilogram per year under mean acre 0.12 cultivated. In both districts married producers are leading in cocoa production, Kilombero District being leading in cocoa output produced per acre. Principally; married producers are more productive compared to single producers and divorced producers. The findings showed that married producers were leading in the production of cocoa as principle suggests because married producers had large labour force used in the production.
The mean of cocoa output in kilogram produced by young producer's aged below 45 years from Kilombero District was 523.34 which cultivated under mean acre 1.55; and mean of cocoa output produced by young producers from Kyela District was 148.07 which produced under mean acre 0.53. On the other hand old producers aged 45 years and above from Kilombero District obtained mean 491.82 of cocoa output in kilogram which cultivated on mean acre 1.29; and Kyela District, old producers obtained mean 504.24 of cocoa output produced under mean acre 1.58. Table 1 shows that in Kilombero District the number of young producers were smaller than old producers but young producers are leading in cocoa output; but in Kyela the old producers are leading in the cocoa output than young producers. Logically, young producers are more efficient than old producers in agricultural sector. The young producers in Kilombero District are in line with this logic while in Kyela District the results are inversely to this logic, aged farmers obtained more kilograms of

cocoa output per acre compared to the young who are strong in the production.

The smallholder producers having primary education obtained mean 482.00 of cocoa output which produced under mean acre 1.20 from Kilombero District; and Kyela District obtained 338.34 mean of cocoa output produced under mean acre 1.14. The mean of cocoa output per kilograms obtained by smallholder farmers having secondary education was 318.53 under mean acre 1.00 from Kilombero District; and Kyela District, producers with secondary education obtained 288.34 mean of cocoa output produced under mean acre 0.87. The mean of cocoa output in kilograms per year produced by farmers with higher education from Kilombero District was 214.62 which produced under mean acre 0.64; and from Kyela District, farmers obtained 25.13 mean of cocoa output which produced under mean acre of 0.09. Logically, educated producers are the ones who can produce more compared to uneducated producers. Contrary to this notion, this study showed that smallholder farmers with lower level of education produced more output compared to those with higher levels of education. Thus, there is a need to encourage educated farmers to participate fully in production because they can easily adapt to the change of technology.

Table 1 Individual Attributes and Cocoa Output per Acre per Year

	Kilombero District			**Kyela District**		
Variables	**Freq (%)**	**Mean of Kgs**	**Mean of Acres**	**Freq (%)**	**Mean of Kgs**	**Mean of Acres**
Sex						
Male	68 (51.9%)	512.79	1.47	89 (63.6%)	432.60	1.38
Females	63 (48.2%)	502.37	1.37	51(36.4%)	219.71	0.73
Marital Status						
Not married	20(15.3%)	174.76	0.47	19(13.6%)	93.01	0.31
Married	101(77.1%)	779.94	2.19	112(80.0%)	502.42	1.68
Divorced	10(7.6%)	67.31	0.21	9(6.4%)	56.89	0.12
Age						
Young <45yrs	64(48.9%)	523.34	1.55	31(22.1%)	148.07	0.53
Old ≥ 45	67(51.1%)	491.82	1.29	109(77.9%)	504.24	1.58
Level of education						
Primary level	63(48.1%)	482.00	1.20	74(52.9%)	338.34	1.14
Secondary level	38(29.0%)	318.53	1.00	60(42.9%)	288.34	0.87
University level	30(22.9)	214.62	0.64	6(4.3%)	25.13	0.09

Source: Field Data Survey, 2013

4.2 Estimation Model

Table 2 presents results of the stochastic frontier production function results estimated using maximum-likelihood method. As it can be seen from the Table 2, the coefficient of amount of plants in Kilombero District and land in Kyela District was positive but not statistically significant. The coefficient of land was 0.08136 in Kilombero District was statistically significant at 1% implies that a unit increases in land could lead to an output rise by 8%. The coefficients of labour (family labour and hired labour) were -0.03180 and 0.14409 from Kilombero and Kyela districts respectively. Where Kilombero District is statistically significant at 1% level and Kyela District is statistically significant at 10% level. The unit increase in labour in production will lead to increase the output by 3% in Kilombero District and 14% in Kyela District ceteris paribus. The coefficient of number of plants per acre was 0.11442 in Kyela which is statistically significant at 5% level. This implies that the unit increases of cocoa plant per acre, the output will increase by 11% after the three to four years as the length of cocoa plant from planting to harvesting.

The coefficients of tools used in production were 0.00122 and 0.02430 from Kilombero and Kyela districts respectively. Where Kilombero District is statistically significant at 1% level and Kyela District is statistically at 5% level. The unit increase in tools of production will lead to increase the output by 0.1% in Kilombero District and 2% in Kyela District ceteris paribus.

Table 2 Production function

		Kilombero District			**Kyela District**		
Parameter	**Proxy variable**	**Coeff**	**Std.Error**	**p-Value**	**Coeff**	**Std.error**	**p-Value**

Constant	β_o	7.53608***	.00672	.0000	5.76388***	.31395	.31395
lnLand	β_1	.08136***	.00087	.0000	.04142	.03659	.2576
lnLabour	β_2	-.03180***	.00150	.0000	.14409*	.08255	.0809
LnPlants	β_3	.00064	.00158	.6841	.11442**	.05675	.0438
lnTools (hand hoe)	β_4	.00122***	.00012	.0000	.02430**	.03659	.0302

Source: Field Data Survey, 2013 **Note** ***,**,* ==>Significance at 1%,5%,10% level

4.3 Input Elasticity from Model Estimation

The elasticity's of output factors of production are return to scale of the Cobb-Douglas stochastic frontier model. Determination of elasticity's is necessary for the estimation of responsiveness of output to factor inputs of production. Most of the inputs on the stochastic frontier were statistically significant at different levels. Summation of all the partial elasticity of production with respect to every input was 0.111 and 0.27 of Kilombero and Kyela districts respectively. For Cobb-Douglas model this figure represents the returns-to-scale coefficient, also called the function coefficient or total output elasticity. When all factors were varied by the same proportion, the function coefficient indicated the percentage by which output increased. In this case, it means if all variables were to be increased by 1%, output would increase by 11% and 27% in Kilombero District and Kyela District respectively which represent increasing return to scale.

Table 3 Input Elasticity

District	**Kilombero**	**Kyela**
Variable inputs	**Elasticity**	**Elasticity**
Land	0.08	
Labour	0.03	0.14
Plants		0.11
Tools used (Hand hoes)	0.001	0.02

Source: Field Data Survey, 2013

4.4 Marginal Value Product and Factor Inputs

In order to assess the condition of a producer's profit level between Kilombero and Kyela districts a number of variable such as Marginal Physical Product (MPP)[1], Marginal value Product (MVP)[2] and input prices were also estimated.

[1] MPP= APP*input elasticity
[2] MVP=MPP*output price

Table 4 Marginal Value Product and Factor inputs

Variable	APP	Elasticity	MPP	MVP Tshs	Unit Price Tshs
Kilombero district					
Land	357.45	0.08	17.87	1,608,300	90,000
Labour	185.59	0.03	5.56	222,400	40,000
Tools used	0.212	0.001	0.0002	1.4	7,000
Kyela district					
Labour	146.26	0.14	20.48	819,200	40,000
Plants	2.853	0.11	0.313	633.74	2024.72
Tools used	0.077	0.02	0.0015	10.5	7000

Source: Field Data Survey, 2013

The condition requirement for profit maximization is that the Marginal Variable Product (MVP) must be equal to the average unit price of inputs. When the unit use of labour and land in production per acre is greater than the average unit of price this implies that the unit increase in the variables cocoa farm will lead to negative return in production. Therefore, the MVP of tools of production (technology used/ hand hoes) was lower than the average unit price in both districts. From this result the smallholder farmers would benefit by increasing the tools of production especially hand hoes in the production of cocoa rather than increasing labour and land. Furthermore, Kyela had opportunity of increasing the cocoa plants in the available plots in order to increase production.

4.5 Distribution of Technical Efficiency

Table 5 shows the range of technical efficiency. About 11.45% (n=15) and 28.57% (n=40) from Kilombero and Kyela respectively of smallholder farmers had a mean below 50% smallholder farmers who were technically inefficiency in the production of cocoa. Furthermore, 88.55% (n=116) and 71.43% (n=100) from Kilombero and Kyela respectively of smallholder farmers within contract farming were technically efficient above 50%. The mean technical efficiency was 79.7% and 61.6% from Kilombero and Kyela respectively.

Table 5 Percentage Technical Efficiency

District	Kilombero		Kyela	
Efficiency scores	**Sample**	**%**	**Sample**	**%**
<30	5	3.82	11	7.85
30-39	6	4.58	9	6.43
40-49	4	3.05	20	14.29
50-59	9	6.87	21	15.00
60-69	18	13.74	30	21.43
70-79	17	12.98	27	19.29
80-89	21	16.03	19	13.57
□ □–99	51	38.93	3	2.14
Total	131	100	140	100

Source: Field Data Survey, 2013

Table 6 shows the results of socio-economic factors that influenced technical efficiency or inefficiency. Negative sign on a variable efficiency means that the variable increases technical efficiency, while a positive sign reduces technical efficiency. The coefficients parameters on technical efficiency should not be directly interpreted (Battese and Coelli, 1992).

Smallholder farmers within contract farming had access of training which can facilitate the increase of cocoa output. The coefficient of training was 0.08015 (p=0.0000) and 0.00114 (p=0.0220) from Kilombero District and Kyela District respectively. The parameter was statistically significant at 1% and 5% from Kilombero District and Kyela District respectively. Smallholder farmers who underwent training are in good position of increasing production than non trainee's producers. The results agree with Kibirige's (2008) who found that farmers who received training increased their productivity. Equally, Galawat and Yabe (2011) found that farmers who attended training were profit efficient, while farmers who did not have any training were inefficient and had low profit efficiency. Also, the result is consistent with finding of Nikaido (2004) who found that the participation of the small scale producers in trainings increased efficiency for small scale industry in India. Different finding in world shows that farmers who had access of training are technically efficient in their production.

Smallholder farmers who are close to their farm are expected to be efficient in the production than those who are far away from the field. The coefficient of distance 0.0021(p=0.0126) in Kilombero which is statistically significant at 5% level. The findings conclude that the smallholder farmers who are close to their farm are in position of increasing production. This finding is related with the findings of Kebede (2001) who found that the closer the farm the less the distance used and the greater the efficiency.

Technical efficiency in the production is also associated with hours used in the production; the standard hours used in agriculture is six hours per day. Table 6 shows the coefficient of man hours per day (time) was 0.20898 (p=0.0000) which is statistically significant at 1% level and 0.17512 (p=0.0471) statistically significant at 5% level from Kilombero District and Kyela District respectively. Smallholder farmers within contract farming will increase productivity if they use standard hours in production.

The results on Table 6 show Kilombero District and Kyela District on utilization of family labour are statistically significant at 1% level. The smallholder farmers who use family labour are technically efficiency in the study areas. The results is in line with Kibirige (2008) who reported that increasing number of labour in maize made farmers become technically efficient. Also Kebede (2001) found that the increase of labour in production the output of rice was increased too. In addition, the findings of Kibaara (2005) suggested that the increase of labour possibly led to increase of maize yield.

Regarding to the use of hired labour in the production of cocoa it is technically efficiency at Kilombero District than in Kyela District. The coefficient hired labour was 0.0002 (p=0.0000) which is statistically significant at 1% level. Smallholder farmers in Kilombero District are in good position of using hired labour in the production of cocoa within contract farming.

The smallholder farmers in Kyela District are more experienced in the production of cocoa, the coefficient of experience was 0.00114 (p=0.0221) which is statistically significant at 5% level. The experienced producers are expected to be technically efficiency than newer producers. The result was consistent with the findings of Oleke (2008) who found that the experienced egg producers were the one who where technically efficient. Furthermore, Sesabo (2007) showed that fishermen who had many years of experience in fishing increased their productivity.

The coefficient for credit was -0.00013 (p=0.0000) which signify that the unit increase in credit leads to slight change in cocoa output at Kilombero District. This factor is statistically significant at 1% level. The access of credit within contract farming in production of cocoa in Kilombero District facilitated farmers to increase the output. The result agrees with Onoja (2009) who found that the farmers used credit their yield increased by 7.3%. Likewise, Kibaara (2005) found that alleviating credit constraints enables producers to buy hybrid seeds, and thus reduce technical inefficiency.

Table 6 Determinant of Technical Efficiency

District		**Kilombero**			**Kyela**		
Parameter	**Proxy variable**	**Coeff**	**Std.Error**	**p-Value**	**Coeff**	**std.Error**	**p-Value**
Constant	ω_0	6.91957***	.00498	.0000	6.29639***	.21018	.0000
Training (# days per year)	ρ_1	.08015***	.00200	.0000	.00114**	.00050	.0220
Distance (home to field)	ρ_2	.00021**	.8295	.0126	.00347	.01121	.7568
Time (man hour per day)	ρ_3	.20898***	.00076	.0000	.17512**	.08819	.0471
Family labour (man days)	ρ_4	.07092***	.00111	.0000	.29507***	.09638	.0022
Hired labour (man days)	ρ_5	.00021***	.5229	.0000	.00277	.09011	.9755
Experience (in cocoa prod)	ρ_6	.59692	.00014	.6688	.00114**	.00050	.0221
Credit	ρ_7	-.00013***	.7309	.0000	-.00253	.00919	.7833
Log likelihood function		-185.23011			-106.85501		
Wald Chi-square		73.650	N=131		1.647	N=140	
Mean technical efficiency		79.7%			61.6%		

Source: Field Data Survey, 2013 Note***,**,* ==>Significance at 1%,5%,10% level

4.6 Contribution of Contract Farming on Improving Smallholder Farmers livelihoods

The investigation of production quantity among the smallholder farmers within contract farming shows that 73.1% (n=198) of respondents agreed that contract farming led to increased productivity and other denied. Also result shows that 95.2% (n=258) of smallholder producers on contract farming said that contract helped them to sell their products on time while others disagreed. Findings showed that 92.9% (n=252) of smallholder farmers agreed that contract farming enabled timely purchase of their produces. Furthermore, result shows that 89.3% (n=242) agreed that contract farming provides access of training to smallholder farmers. Moreover, the results of production acreage shows that 71.7% (n=194) of smallholder farmers increased the area of production being in contract farming and others disagreed. Eighty one percent (80.8% (n=219)) agreed that contract farming had made them access of obtaining credits. Whereas result indicates that 67.47% of respondents disagree that contract farming helped in obtaining input on time and 74.9% of respondents said contract farming did not increase access of using new technology within contractual arrangement (See table 7). These results prove that smallholder farmers being in contract had improved their livelihoods considering livelihoods outcomes such that Skills and knowledge acquired in contract production, timely purchases, timely payment, increased output and acreage of production, formalised group and relation, increased access to credit and increased employment opportunities.

Table 7 Opportunities within Contract Farming

Variable	% of Agree	% of Disagree
Production quantity	73.1 (n=198)	26.9% (n=73)
Timely purchase	95.2% (n=258	4.8% (n=13)
Timely payment	92.9 (n=252)	7.1% (N=19)
Timely inputs	32.53% (n=88)	67.47% (n=183)
Access of training	89.3% (n=242)	10.7% (n=29)
Production acreage	71.7% (n=194)	28.3% (n=77)
Availability of technology	25.1% (n=68)	74.9% (n=203)
Access of credit	80.8% (n=219)	19.2% (n=52)

Source: Field Data Survey, 2013

4.7 Discussion of Opportunities Available within Contract Farming

Essentially, contract farming stipulates that within contract, smallholder farmers had access of training, credits, increased production quantity, increased production acreage, timely purchase, timely payment, timely inputs, better price and introduction of appropriate technology. This study found that many smallholder farmers benefited from contract farming although there were few challenges encountered on timely inputs, new technology and price fluctuation, within contractual arrangement. Other challenges encountered by smallholder farmers out of contractual arrangement include occurrence of diseases, attack of crops by wild animals, climatic change (drought) and theft cases. It is essential that contract farming provide inputs to smallholder farmers so as they can prevent pests which frequently attack crops in the study areas.

IV. Conclusion and Policy Implication

Contract farming contributes much to the improvement of livelihood of smallholder farmers within contractual arrangement especially on access of credits, timely purchase of their products, timely payment, and increase in production quantity, and labour training. The result shows that smallholder farmers from Kilombero District are technically efficiency than smallholder farmers from Kyela District. This calls for smallholder farmers from Kyela to increase effort in the production and introduce new cocoa plants like farmers from Kilombero Districts.
Rambling

The low performance of cocoa production in Kilombero and Kyela Districts are resulted from factors which are out of control of smallholder farmers such as drought and wild animal (like monkey) who consume fruits. There is a need for the contract companies to introduce irrigation system within contract farming which will facilitate the harvesting of cocoa beans throughout the year. Furthermore, the government of Tanzania through its ministry of natural resource and tourism should take measures on how wild animals can be controlled in cocoa farms.

Furthermore, smallholder farmers in the production of cocoa are faced with various diseases which attack cocoa plants and fruits in general which lead to reduction on output. Also, cocoa plants faced various diseases yet smallholder farmer said there is no pesticides to control diseases, hence they are not allowed to use industrial chemical for fumigation in steady they use locally made pesticides to control pests in cocoa farms. This call for government and contract companies to find solution on how smallholder farmers can control diseases and fortunately the productivity will be increase.

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