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IMPACT OF SUGARCANE CONTRACT FARMING ARRANGEMENTS ON SMALLHOLDER FARMERS' LIVELIHOOD OUTCOMES IN KILOMBERO VALLEY, TANZANIA

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ABSTRACT

Sugarcane Contract Farming (CF) has been mentioned to be an important practice and an engine for improving livelihoods among farmers in Africa. However, in Tanzania there has been limited research on explaining the impact of sugarcane contract farming arrangements on smallholder farmers' livelihood outcomes. The purpose of this paper was to determine the impact of sugarcane CF arrangements on smallholder farmers' livelihood outcomes. The specific objectives of the study (from which this paper is based) were to: (i) identify CF arrangements experienced by smallholder farmers, (ii) measure levels of livelihood outcomes, and (iii) determine the impact of CF arrangements on smallholder farmers' livelihood outcomes. Data were collected from 300 sugarcane outgrowers in February and March 2014 in Kilombero Valley using a structured questionnaire and an interview guide used for interviews with 14 key informants. Data were analysed descriptively and inferentially whereby the multiple (linear) regression model was used to determine the impact of some CF arrangement' variables on farmers' livelihood outcomes. The findings indicated that CF arrangements, variables such as price negotiations made by farmers' association leaders, sugarcane harvesting arrangements, loans or goods by farmers and the payments follow up made by farmers' association leaders for the sugarcane sold; expose smallholder farmers to higher risks of low livelihood outcomes. It is recommended that the Sugar Board of Tanzania and farmers' associations should make sure that the few CF arrangements which negatively affected farmers' livelihood outcomes are addressed timely. It is recommended that contractual supports provided by sugarcane farmers' associations should increase farmers' association leaders' ability to negotiate for better prices of their sugarcane outputs.

Key words: *Livelihood outcomes, smallholder, sugarcane*
Paper type: *Research paper*
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INTRODUCTION

Smallholder agriculture continues to play a key role in East African agriculture. Smallholder farming accounts for about 75% of agricultural production and over 75% of employment (Salami *et al*., 2010). However, contributions of smallholder farming and agriculture in general to the region's growth have remained limited (Salami *et al*., 2010, Waswa *et al*., 2012). Since the mid-1980s, East African countries have implemented macroeconomic, sectoral and institutional reforms aimed at ensuring high and sustainable economic growth, food security and livelihoods of the rural poor through contract farming (Magongo, 2008; Prowse, 2012). In developing countries, contract farming is significant and on the increase. For example, all cotton and tobacco in Mozambique is produced through

contract farming, and almost 12% of Mozambique's rural population is involved in this type of farming. All the paprika, tobacco and cotton in Zambia and 60% of Kenya's tea and sugar are produced under contract farming (Action Aid, 2015). In Tanzania, contract farming arrangements have been employed to boost crop production and marketing of agricultural produce (World Bank, 2007, Mshiu, 2007). Since the 1990s sugarcane Contract Farming (CF) arrangements became highly emphasised in Tanzania (Chongela, 2008; Ngirwa, 2010). Among other things, the introduction of sugarcane CF was essentially to commercialise small scale farming (World Bank, 2007). Through CF, smallholder farmers are expected to build capacity to produce more, produce quality cane at a desired time, and have a reliable and fair market for sugarcane (Barrett, 2011; Oya, 2012).

In view of the above, the Government of Tanzania came up with policy initiatives whose main objective is to improve the livelihood of smallholder sugarcane farmers. At first, in the 1990s, the Government advised sugarcane farmers to organise themselves in formal associations. Then, the government passed Sugar Industry Act (2001), which endorsed the Sugar Board of Tanzania (SBT) and the National Sugar Institute (NSI). The Act ensures that there is an established mechanism for making follow up in order to ensure good quality in the sugar industry as well as to improve sugarcane stakeholders' wellbeing with a focus or responding to their sugar needs (URT, 2002). Through the Act, sugarcane farmers' associations were officially empowered to coordinate farmers' CF arrangements (Ngirwa, 2010). Through the stated initiatives, the sugar industry in Tanzania, up to 2013, managed to provide direct employments to about 30 000 people. While sugarcane outgrowers were about 16 768, secondary employments under the sector involved a total of about 81 360 people. The industry also creates substantial indirect employment in the form of people engaged in the wholesale and retail trade in sugar, providers of transport services and people working in social services in townships near the sugar estates (PASS, 2013, Waized *et al*., 2013).

Contract farming arrangements are thought to offer transformation from subsistence to commercial agriculture, improve market, reduce income poverty, improve standards of living in the rural areas, supply raw materials and improve farmers' production. However, literature indicates that smallholder farmers have slight gain from CF arrangements in terms of their produce when compared to large farmers and processors/buyers (Magongo, 2008; Waswa *et al*., 2009; 2012; Kweyu, 2013). Criticisms of CF often focus on unequal power relation between a company and farmers, the latter providing a form of cheap labour and the company passing over production risks to small-scale producers. There is great risk for trapping small-scale farmers in cycles of debt. Contracts create dependence by small farmers on technology, credit, inputs and services provided by their contracting companies. Because CF mostly involves the use of intensive technologies in industrial agriculture, farmers may have to risk borrowing money to invest in agricultural production. They then may not earn enough money to cover their debts, a risk that is heightened when the contracting firm is the only buyer (Mapuva, 2013; ActionAid, 2015).

Sugarcane smallholder farmers in Tanzania are faced with many production problems like limited capital, market inaccessibility and information, inadequate infrastructure like roads, limited extension services, lack of resources (e.g. production inputs) and inadequate government support (Matango, 2006; Mshiu, 2007; Ngirwa, 2010; Amrouk *et al*., 2013). In addition to that, the success of the CF arrangements in most of the cases assessed by PADEP (2006) in Tanzania depended on the type of crop (labour/input intensive, tree crop, short term crop, high value crop) and assets of smallholder farmers (technical skills and financial resources and organisation). Where farmers were more organised and financially stable, the report indicates that they had better livelihood outcomes. Knowing better the livelihood outcomes attained by sugarcane smallholder farmers in Kilombero Valley is important to understand the impacts sugarcane CF arrangements to smallholder farmers' household livelihood outcomes. Following authors' debate (Matango, 2006; Mshiu, 2007; Magongo, 2008; Waswa *et al*., 2009; 2012; Ngirwa, 2010; Kweyu, 2013; Amrouk *et al*., 2013; Mapuva, 2013; ActionAid, 2015) on the impact of CF relations between farmers and the sugarcane buyers; the impacts of sugarcane CF arrangements to smallholder farmers' livelihood outcomes are not well known in the study area. Previous studies (Ngirwa, 2010; Mshiu, 2007) gave only a generalised picture on the impact of CF arrangements to all sugarcane farmers and not on the smallholder sugarcane farmers at household level in the Valley.

The valley is the largest sugarcane producer in Tanzania. In 2013, it had more than 8 000 sugarcane outgrowers, more than 5 000 being smallholders, with about 15 000 ha under cane production (Amrouk *et al*., 2013; Sulle *et al*., 2014). The livelihood for smallholder famers in the Valley highly depend on sugarcane CF arrangements and that is why the Government of Tanzania introduced agricultural support/service mechanisms to sugarcane smallholder farmers through SBT, NSI and farmers' associations (URT, 2002). In view of that, it was therefore critical to determine the impact of CF arrangements by smallholder farmers on livelihood outcomes in Kilombero Valley, with the specific objectives to: (i) identify CF arrangements experienced by smallholder farmers and (ii) measure levels of livelihood outcomes, and (iii) determine the impact of CF arrangements on smallholder farmers' livelihood outcomes. In the study, it was hypothesised that sugarcane contract farming arrangements do not have significant impact on the chances of having high livelihood outcomes.

METHODOLOGY

The Study Area

The study was conducted in Kilombero and Kilosa Districts located in Morogoro Region, Tanzania. The two districts were selected for the study because they had smallholder farmers with farm sizes which ranged from 0.9 to 3.0 hectares (URT, 2013). This range is the one which defines smallholder farmers in Tanzania. The districts also had over 5 000 smallholder sugarcane outgrowers in 2013. This was a large population of sugarcane outgrowers in Tanzania (Sulle *et al*., 2014). Kilombero and Kilosa Districts constitute the largest sugar producing area in Tanzania. The area lies East of the Udzungwa Mountains and extends to the North and South of the Great Ruaha River in Kilosa District (Ngirwa, 2010). The research was narrowed to six wards, namely Kidatu, Sanje, Mkula, Ruhembe, Kidodi and Ruaha.

Research Design, Sampling Procedure and Sample Size

The study adopted a cross-sectional research design, whereby data were collected only once (Bryman and Bell, 2011). The design provided a chance of understanding the impact of the sugarcane CF services in a reasonable time. The sampling unit for this study was a household which cultivated not more than three hectares of sugarcane in 2013 harvesting season. Six wards were purposively selected with the reason that they had smallholder farmers. Then, six farmers' associations which had more smallholder farmers compared to their counterparts during the 2013 harvesting season were purposively selected in order to increase the chance of getting the respondents. Lastly, a total of 375 smallholder contract farming farmers were randomly selected using farmers associations' register books. Smallholder farmers' names were each written on an individual piece of paper, and the pieces were placed in a box (lottery technique) from which picking of names of famers to be interviewed was done. The sample size was determined by employing Yamane's formula as shown below:

$$n = \frac{N}{1 + N\left(e^2\right)} = \frac{5985}{1 + 5985\left(0.05\right)^2} = 375 \text{ (Yamane, 1967 cited by Israel, 2013)}$$

n = the sample size
N = the population size
e = the level of precision

However, 80% of the 375 respondents were interviewed (300), due to difficulty in getting other potential respondents. In addition, 14 key informants were selected based on their positions (Village Executive Officers, Association Chairpersons/representative) for triangulation purpose.

Data Collection

Primary data were the key source of information for this paper and were collected through interview with smallholder sugarcane outgrowers using a structured questionnaire. Both quantitative and qualitative information were collected. The latter type of information was collected through interviews with key informants, who were

people that were considered to have comprehensive knowledge on sugarcane contract farming. They included six leaders of farmers' associations, six Ward Executive Officers (WEOs), one member from the Sugar Board of Tanzania (SBT) and the Kilombero Sugar Company Limited Outgrowers Manager. Quantitative data were collected using a questionnaire. Secondary data were collected from different reports, published and unpublished documents from Ministry of Agriculture, Food and Co-operatives; SBT; Sokoine National Agricultural Library (SNAL); and websites. The information collected included outgrowers yield trends and nature of CF services provision.

Data Analysis

Qualitative and quantitative methods were employed to analyse the collected data. Qualitative data were analysed by being summarised by their themes, and comparing and contrasting arguments given by various interviewees. Quantitative data were analysed using descriptive statistics (frequencies, mean and median) and multiple (linear) regression. Livelihood outcome was measured by developing a Livelihood Outcomes Index (LOI). LOI sought to assess whether smallholder farmers were able to increase sugarcane yield, undertake non-farm activities, use improved technologies, save money from sugarcane sold, gain income from sugarcane, and lastly if farmers had improved their assets. The response weights were yes (1) and no (0). Thereafter, each livelihood outcome was assigned points, and all the points were added up to get the overall scores on livelihood outcomes. The overall scores ranged from 0 to 6. This measure was finally categorised into three categories after computing the mean scores (1.983), median (2.0), minimum (1) and maximum scores (4). In view of that, the categories were high livelihood outcomes (2.1 to 6.0), moderate livelihood outcomes (2.0), and low livelihood outcomes (1.0 to 1.9). It has to be noted that cut-off points were chosen by using the computed median. Therefore, median (2.0) was used as a moderate category.

Since the research sought to find out the impact of CF arrangements on smallholder farmers' livelihood outcomes, the impact of CF arrangements was assessed using a multiple regression model. This model was found appropriate since the dependent variable has a continuous scale value. Accordingly, the model was adopted given the fact that it meets the basic assumptions that all predictor variables must be quantitative or categorical (with two categories), and the outcome variable must be quantitative, continuous and unbounded (Field, 2009).

Before carrying out the analysis, the researcher executed the following: First, the researcher checked whether all the nine variables that were used in the multiple (linear) regression equation, namely payment follow up, net income from sugarcane, estimated income from other crops, access to extension services, money borrowed or goods by farmers, sugarcane harvesting arrangements, access to farm inputs, price negotiation and estimated income from non-farm sources; were normally distributed. This was done by computing normal distribution curves and checking them visually to see whether they were normally distributed or not. All the variables were found to be normally distributed. Second, all the nine variables listed above were correlated to find out whether any pair of them had a correlation coefficient (r - value) of 0.80 and above, which indicates presence of multicollinearity (Bryman and Cramer, 2005). No pair of the variables had an r – value of greater than 0.79, which means there was no multicollinearity. The two variables on estimated income from non-farm and estimated income from other crops were included to test the contribution of other factors other than sugarcane CF to the livelihood of smallholder farmers' livelihood outcomes. Therefore, the model adopted in this paper took the following form.

$q_{it} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \varepsilon$ (Landau and Everitt, 2004)

Where:

q_{it} = Total livelihood outcomes (scores) attained by a smallholder sugarcane farmer

β_0 = a constant

β_1 to β_9 = Regression coefficients

x_1 to x_9 = predictor/independent variables entered in the model, which were:

x_1= Payment follow up made in cases of payment delay (number of payment follow up communication made by farmers' associations in 2013/14)
x_2 = Net income from sugarcane sold in 2013 measured in TZS
x_3 = Borrowed money or goods in 2013 measured in TZS
x_4 = Access to extension services (number of visits by extension officer)
x_5 = Estimated income from other crop(s) apart from sugarcane measured in TZS
x_6 = Price negotiation made by farmers' association leaders (fairly done 1, 0 unfairly done)
x_7 = Estimated income from non-farm sources measured in TZS
x_8 = Sugarcane harvesting arrangements in 2013 (fairly done 1, 0 unfairly done)
x_9 = Access to farm inputs through farmers' associations in 2013/14 (accessed 1, 0 not accessed)
ε = Error term representing a proportion of the variance in the dependent variable that was unexplained by the regression equation.

During the analysis, multicollinearity effect was also checked by computing variance inflation factors (VIFs) and tolerance levels of all the independent variables. A VIF factor value of not more than 10 and a tolerance level of greater than 0.1 indicated absence of strong relationships between the independent variables (no multicollinearity) (Landau and Everitt, 2004). The interpretation of regression analysis was based on group statistics (means and standard deviation), Pearson's correlations, Beta Coefficients, t-values, adjusted R square values, F statistics and significance (P-values).

FINDINGS AND DISCUSSION

Socio-economic Characteristics of the Respondents

1.1.1 Age and sex

The lowest age of the farmers interviewed was 20 years while the highest was 81 years, with a mean age of 42.9 years. The majority of the respondents were in the age group between 36 and 50 years (43.5%), indicating that most of the household heads were within the productive age, the age at which they were still active to participate in sugarcane farm activities (URT, 2014). The findings also revealed that male headed households were dominant (90.3%), the rest 9.7% being female headed households. This implies that there were few female headed households participating in sugarcane contract farming. Various studies have found existence of male dominance in production of crops which are perceived to be profitable (Amrouk *et al*., 2013; Mende *et al*., 2014).

1.1.2 Farmers' duration in contract farming

The findings showed that the mean experience of years in contract farming was 7.3 years, with the lowest of two (2) years and highest of 30 years. Above average (57.0%) of the household heads had one (1) to five (5) years' experience in growing sugarcane under contract farming. The group with six (6) to 10 years' experience accounted for 24.3%. The proportion of household heads with 11 to 30 years' experience was relatively small, and they accounted for 18.7%. Farmers' duration in contract farming is thought to be an important determinant of levels of livelihood outcomes. With time, farmers are expected to make investment in sugarcane business, and they can probably build capital, knowledge and skills to move out of poverty. Kilombero valley was observed to have few long time cane outgrowers similar to Kakamega County in Kenya where the majority of farmers were between 31 and 60 years and had not been in cane farming for more than five years (Kweyu, 2013).

3.1.3 Sugarcane farm size

The findings showed that the mean farm size was 3.6 acres, with a minimum of one (1) acre and a maximum of 8 acres. More than one-third (34.7%) of the household heads had one (1) to two (2) acres. The group with three (3) to four (4) acres accounted for 32.0%. The proportion of household heads with 5 to 8 acres accounted for 33.3%. The findings imply that still a good number of farmers cultivated small sugarcane farms. Similarly, Mmari (2014) reports that the majority of sugarcane outgrowers in Kilombero and Mtibwa are smallholders, many of them operating on no more than two hectares. These represented 79% and 66% of outgrowers in Kilombero and Mtibwa,

respectively. There were very few large outgrowers at the other extreme, growing sugarcane on 50 or more hectares, with these representing less than 3% of outgrowers.

1.1.4 Farmers' net income from sugarcane

Farmers were asked about their net income from sugarcane in the 2013 harvesting season. The findings showed that the mean net income was TZS 3 052 782, with a lowest of TZS 1 and a highest of TZS 28 000 000. The findings further indicated that 47.0% of the farmers in the study area had net monetary value of TZS 2 231 000 and above from sugarcane sold by farmers in 2013 harvesting season. The group of farmers who had net monetary value of TZS 831 000 to 2 300 000 from sugarcane accounted for 37.6% while the proportion of households with TZS 1 to 830 000 was relatively small, and they accounted for 15.4%. The findings imply that farmers managed to gain income from sugarcane. Income from sugarcane was also found to be the most important livelihood option in Kilombero valley by many previous researchers (Ngirwa, 2010; Amrouk *et al*., 2013; Waized *et al*., 2013; Sulle *et al*., 2014).

CF Arrangements Experienced by Smallholder Sugarcane Farmers

Table 1 presents the most common CF arrangements experienced by farmers in Kilombero Valley. The findings show that the main CF arrangement experienced by farmers was access to farm inputs through farmers' associations (16%), followed by credit facilitation by farmers' associations (15.8%). However, price negotiation representation by farmers' leaders was noted to be the lowest (10.8%). The findings imply that farmers had doubts on their leaders' bargaining powers on the sugarcane price. A report by Waized *et al*. (2013), which was based on policy evidence for enhancing sugar industry regulatory framework in Tanzania, indicates that the existence of multiple associations is one of the factors that weaken associations' power bargaining for outgrowers' rights. Some farmers' associations are thought by farmers to have sided with the sugarcane buyer instead of fighting for farmers' wellbeing. It is further detailed by Mmari (2014) that outgrower intermediaries (e.g. farmers' associations) have little control over sugarcane prices.

Table 1: Type of CF Arrangements Experienced By Smallholder Sugarcane Farmers (N=300)

Type of CF arrangement	Number of responses*	Percentage	Rank
Price negotiation representation by farmers' leaders	149	10.8	7
Credit facilitation made by farmers' associations	217	15.8	2
Access to farm inputs through farmers' associations in 2013/14	220	16.0	1
Extension services	181	13.2	6
Clear harvesting arrangements (plan and fair implementation)	196	14.3	5
Sugarcane transportation arrangements (engagement of contractors and follow up)	203	14.8	4
Payments follow up in cases of payment delay	209	15.2	3
Total	1375	100.0	

*multiple responses

Levels of Smallholder Sugarcane farmers' Livelihood Outcomes

The mean score on the livelihood outcome index was found to be 1.983 which was at a low level. These findings imply that, generally, smallholder farmers in Kilombero valley were categorised in the low level of livelihood outcomes. A group of farmers who were categorised in the low level of livelihood outcomes composed of 36.0%; while 37.3% were categorised as having moderate livelihood outcomes; and 26.7% had reached a high livelihood outcome in terms of whether smallholder farmers were able to increase sugarcane yield, undertake non-farm

activities, use improved technologies, save money from sugarcane sold, gain income from sugarcane, and lastly if farmers had improved their assets. The findings contradict the contention that contract farming of sugarcane has high possibilities for taking up household famers' livelihood outcomes in Kilombero valley (Kangalawe and Liwenga, 2005; Chongela, 2008; Ngirwa, 2010; Mombo *et al*., 2011). During the interview, one female respondent at Kidodi argued that:

> "...Sugarcane Contract farming is important to our life. However, leaders and managers operate the sugarcane CF unprofessionally. There is a need to employ agricultural, accounting and legal staff so as to improve sugarcane business operations. This will also help us (smallholder farmers) to achieve our goals. Without operating the sugarcane CF services professionally in Kilombero Valley, smallholder farmers are likely to withdraw from sugarcane contract farming..." (Interview, Kidodi, 21 February, 2014).

The statement reveals a worry that CF operations were not properly managed in the Valley. However, smallholder farmers still see potentials from sugarcane contract farming if professionally managed. Another observation from the statement is a possibility of smallholder farmers to dropout sugarcane farming. The results on livelihood outcomes being low among smallholder farmers confirm what were observed by previous studies (Magongo, 2008; Casaburi *et al*., 2012; Waswa *et al*., 2012) that livelihood outcomes were low among smallholders. However, the situation was noted to be relatively different to big farmers. They were likely to benefit from CF relations when compared to smallholder farmers (Casaburi *et al*., 2012; Waswa *et al*., 2012). Big farmers had more chances to influence access to the sugarcane CF services from the associations.

Impact of CF Arrangements on Smallholder Farmers' Livelihood Outcomes

To determine the impact of contract farming arrangements on smallholder farmers' livelihood outcomes, multiple (linear) regression was employed whereby standardized regression coefficients known as Beta-weights (β) (denoted by positive or negative signs) were computed to obtain the directions of the predictor variables' impacts (Bryman and Cramer, 1993), as indicated in Table 2. The dependent variable was regressed on nine independent variables. The predictor variables' impacts of six variables among the nine variables were observed to be statistically significant, signifying that the variables strongly impacted on livelihood outcomes. The regression model provided a best fit ($p = 0.000$). The correlation coefficient between the dependent variable and all the independent variables together, R, was 0.710, which was high, implying that the independent variables collectively were highly related to the independent variable. The adjusted coefficient of determination (R^2) that was 0.642 means that the independent variables entered in the model explained 64.2% of variance in the respondents' livelihood outcomes; the rest of the variation was due to other variables not included in the regression and inherent errors in the model. The tolerance and VIF values of collinearity, which were greater than 0.1 and not more than 10 respectively, show that there was no multicollinearity (Table 2).

The findings in Table 2 show that only six of the independent variables had statistically significant influence on farmers' livelihood outcomes. These are: net income from sugarcane sold in 2013 harvesting season ($p \leq 0.001$), average income from other crop(s) apart from sugarcane ($p \leq 0.001$), access to extension services ($p \leq 0.01$), borrowed money or goods in 2013 ($p \leq 0.05$), sugarcane harvesting arrangements in 2013 ($p \leq 0.001$), and access to farm inputs through famers' associations ($p \leq 0.05$). Among the six variables, four of them had positive influence on farmers' livelihood outcomes. These variables include: income from other crop(s), which was the strongest predictor, followed by net income from sugarcane, access to extension services, and lastly access to farm inputs through famers' associations. Income from other crop(s) being the strongest positive predictor may be explained on the basis that there is a notable withdraw of farmers from sugarcane in the study area caused by fall of sugarcane prices and little processing capacities of mills/factories (Mmari, 2014). The price of sugarcane in Kilombero valley dropped from TZS 65 000 per tonne in 2011/13 to TZS 55 000 in 2013/14. A study by Waized *et al*. (2013) reported that sugarcane remained in the outgrowers' possession due to little processing capacity afforded by the factories. In cases farmers' harvest was left to rot on the farms while they had already incurred the production costs and had nowhere else to sell. In view of the situation, farmers in the study area were likely to

have more concentration on other farm activities like, maize rice and cassava which grow faster than sugarcane and with multiple buyers' choice (Amrouk *et al*., 2013; Ngirwa, 2010).

It was further revealed that income from sugarcane sold in 2013 had positive statistical significant effect on the dependent variable (β= 0.267, p=0.002). This is partly caused by the fact that a good number (47.0%) of smallholder farmers in the study area had net monetary value of TZS 2 231 000 and above from sugarcane sold by smallholder farmers in 2013 harvesting season. This finding contradicts the findings of Waswa *et al*. (2012); Kweyu, (2013) who found that smallholder farmers to a large extent earn very little amount of money from sugarcane sales. Another interesting finding was on the access to extension services (β= 0.150, p=0.006). The predictor impacted positively the dependent variable. The finding implies that any increase in the magnitude of the independent variable would result in higher possibilities for the farmers to have high livelihood outcomes. This finding was different from what was observed by Amrouk *et al*. (2013) that extension services were poorly provided in the study area and likely affected farmers' sugarcane production. It was similarly noted by one male respondent at Msolwa village that:

> "...We have two retired extension officers, who used to work with Kilombero Company Limited (KSCL), who now help us on private terms……even the officers responsible for sugarcane farms in our farmers' association are also former employees of the KSCL….we need more extension workers in our farmers' association but it appears the association cannot employ them because of limited fund…" (Interview, Msolwa, 18 February 2014).

The observation demonstrates that smallholders had access to extension services. However, the services were limited and privately arranged by individual farmers. The need to improve extension services in their farmers' association is necessary otherwise some farmers who cannot afford to pay extension workers were likely to be excluded from this important service. Literature on extension services indicate that farmer groups and/or associations can provide a better atmosphere in which new or improved technical information can be introduced and evaluated; have a multiplier effect in cases where farmer motivators or extensions are used; share of information and experiences, and with group support, help members to make better and more informed decisions (Rutatora and Mattee, 2001). However, from experience, farmers' associations are reported to be financially constrained to support extension services. They lack competent or qualified staff; they have poor coordination mechanisms between groups and conflict of interest among members dominates (Sulle *et al*., 2014; Mmari, 2014). In view of this, it seems information and communication technologies (e-mail, internet, phone, radio, TV, print) are as yet tools that are underutilized in extension strategies by farmers associations in the study area.

In addition, the results in Table 2 imply that access to farm inputs through farmers' associations (β = 0.175, p = 0.012) had positively influenced the independent variable. The study findings also indicated that the majority (73.3%) of the household heads had their inputs from farmers' association. However, 73.3% of the household heads indicated that prices of the inputs were high. They took inputs through the associations because the inputs were offered at credit. Equally, it was reported by one female respondent at Ruaha town that:

> "...This year (2014) fertilizers got delayed at the association's offices but I requested to be guaranteed by my farmers' association to get fertilizer at a private shop, they agreed, though, I found the price of a fertilizer bag lower than the price charged by my association..." (Interview, Ruaha 19 February, 2014).

The farmer's observation reveals that farmers in the study area had access to farm inputs but the costs were higher when compared to that offered by the private business shops. At the same time the finding indicates that farm inputs supply were generally delayed. However, literature reveals that the rate of sugarcane farming returns is determined by the timeliness of input application on the farm inputs, and this may lead to good yields (Amrouk *et al*., 2013; Ngirwa, 2010). Morogoro region, in particular sugarcane growing areas, was reported by AGENDA (2006) to have mostly traded and used pesticides for control of weeds, pest and diseases in the sugarcane farms. Similarly, one male respondent at Msolwa village said:

> "I received inputs from our farmers' association on a loan basis and the amount of money was deducted by the association at the source during the time of payment…this helped me to control weeds and pests easily in my sugarcane farms in the past two years….to be honest we do access inputs from our association but they are sold at high prices" (Interview, Msolwa, 18 February 2014).

That quotation demonstrates that farmers had opportunities to get inputs through their associations, and that probably increased the inputs use among smallholders. However, low prices affected farmers' to attain high livelihood outcomes. The mean cost of pesticides incurred by a farmer in the study area was TZS 51 081, which was low compared to TZS 132 071 incurred on fertilizers.

On the other hand, borrowed money or goods by smallholder farmers in 2013 and sugarcane harvesting arrangements in 2013 had statistically significant negative coefficients (β) of -0.109, and -0.176 respectively, implying that those independent variables had negative impacts on farmers' livelihood outcomes. Sugarcane harvesting arrangements undertaken by the farmers' associations in 2013 harvesting season (β = -0.176, p = 0.002) had more statistically significant negative impact to farmers' livelihood outcomes when compared to all the independent variables entered in the regression model. This was somewhat caused by inefficient associations' leadership (Mmari, 2014) and slight processing capacity afforded by the factories Waized *et al*. (2013).

Table 2: Impact of CF Arrangements Variables on Farmers' Livelihood Outcomes

Independent variables	**Unstandardised Coefficients**		**Standardised Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
	B	**Std. Error**	**Beta**			**Tolerance**	**VIF**
(Constant)	3.072	0.361		8.519	0.000		
Payment follow up made in cases of payment delay	-0.049	0.057	-0.060	-0.855	0.393	0.585	1.708
Net income from sugarcane sold in 2013	1.294	0.000	0.267***	3.402	0.002	0.468	2.137
Borrowed money or goods in 2013	-0.409	0.204	-0.109*	-2.003	0.046	0.981	1.019
Access to extension services	0.581	0.212	0.150**	2.748	0.006	0.969	1.032
Estimated income from other crop(s)	1.904	0.000	0.169***	3.073	0.001	0.951	1.052
Price negotiation made by farmers' association leaders	-0.259	0.178	-0.079	-1.455	0.147	0.973	1.028
Estimated income from non-farm sources in 2013	0.077	0.062	0.082	1.234	0.218	0.653	1.532
Sugarcane harvesting arrangements in 2013	-0.882	0.280	-0.176***	-3.151	0.002	0.923	1.084
Access to farm inputs through farmers' associations	1.133	0.000	0.175*	2.534	0.012	0.605	1.653

R=0.710, R^2=0.668, Adjusted R^2=0.642, Std. Error of the Estimate= 1.47597, T=8.519 (p=0.000).
The dependent variable: Total livelihood outcomes attained by farmers.
Note: *, ** and *** represent statistical significant levels at $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$ respectively.

A similar situation was reported by one male respondent at Kidatu village who said:

> "Our farmers' association has limited number of tonnes to deliver daily at K1 mill which are very few compared to our sugarcane produce….I do not think if can harvest this year; otherwise I have to give something to our association harvest planning officer…." (Interview, Kidatu, 20 February 2014).

The finding implies that chances for farmers' to harvest their sugarcane produce were minimal as a result of farmers' associations being limited by the sugarcane buyer to deliver sugarcane consignments. The situation attracted corruption in the whole process of sugarcane harvesting arrangement. Smallholder farmers in the study area were likely to be excluded in the harvesting exercise due to corruption. Likewise, borrowed money or goods by smallholder farmers in 2013 (β = -0.109, p = 0.046) negatively influenced the dependent variable. This was partly caused by the fact that majority (65%) of the farmers interviewed borrowed money in 2013 and struggled greatly to repay their debts (52%). The findings confirm the contention that farmers who borrow money to invest in farming are at risk since they may not earn enough money to cover their debts (ActionAid, 2015; Mapuva, 2013).

1.2 Theoretical results-SLA

Based on the findings from the study (Table 2) which show that farmers' income from other crop(s), net income from sugarcane sold in 2013 harvesting season, access to extension services, access to farm inputs and estimated income from non-farm sources in 2013 with positive Beta-weights (β) statistics of 0.169, 0.267, 0.150, 0.175 and 0.082 respectively; the null hypothesis that stated in the introduction section that sugarcane contract farming arrangements do not have significant impact on farmers' livelihood outcomes; is rejected. The fact is that many of the sugarcane contract farming arrangement variables contribute substantially to improving farmers' livelihood outcomes. Similarly, the theoretical claim that achievements/livelihood outcomes depend on livelihood assets use shaped by prevailing social organizations and processes (Serrat, 2010; DFID, 2001) as drawn from SLA holds true. The findings shown on Table 2 indicate that six among nine of the independent variables had statistically significant influence on farmers' livelihood outcomes. This means that contractual arrangements/supports (livelihood assets) had significant impact on the levels of livelihood outcomes attained by smallholder farmers in the study area.

CONCLUSIONS AND RECOMMENDATIONS

On the CF arrangements experienced by farmers it is concluded that the ability of farmers' association leaders to negotiate for sugarcane price was limited. It is therefore recommended that sugarcane farmers' associations should increase farmers' association leaders' ability to negotiate for better prices of their sugarcane outputs. It is further concluded that CF arrangements have vital contribution to sugarcane smallholder farmers' livelihood outcomes. It is recommended that farmers' associations, local government authorities wards and district levels, and other stakeholders such as Sugar Board of Tanzania should collectively make efforts to encourage farmers participate in sugarcane contract farming and if possible encourage transformation of farmers' associations into cooperatives whereby all farmers will have power to oversee and make decisions on the business; it will therefore assist them to improve their livelihood outcomes collectively. It is also recommended that the Sugar Board of Tanzania and farmers' associations should make sure that the few CF arrangements (such as sugarcane harvesting arrangements) which negatively affected farmers' livelihood outcomes are addressed timely.

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