

## IMPACT OF COOPERATIVE MEMBERS' CONTRACT ARRANGEMENTS ON SUGARCANE FARMING IN KILOMBERO VALLEY

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### Abstract

*Contract farming has been adopted by agribusiness firms and cooperatives to ensure a constant supply of raw materials to the buyers. It is a foreseen approach by cooperatives and other firms for improving farmers' production and marketing risks. Since the 1990s, contract farming has been introduced and farmers were organized through farmer's associations in Kilombero Valley. In 2017 farmers decided to be organized through cooperatives. It's unclear whether the contracts that cooperatives sign with the buyer have improvements that represent a significant change. This study presents an analysis of contract farming arrangements when farmers were organized through associations and after the formation of Agricultural Marketing Cooperative Societies. A quasi-experimental research design was used to collect qualitative and quantitative data. Descriptive statistics and Propensity Score Matching were used for data analysis. According to the findings, the farmers' productivity has increased by 44%, and sugarcane prices increased by 46%. It is concluded that the transition from the farmers' association to the cooperative via contract farming has resulted in positive changes for farmers in terms of productivity and profitability. It is recommended that farmers who are non-Agricultural Marketing Cooperative Societies members should be encouraged to join Agricultural Marketing Cooperative Societies.*

**Keywords:** Smallholder farmers, Sugarcane Farming, Contract Arrangements, Kilombero Valley.

### Introduction

Contract Farming Arrangements (CFAs) have been considered to be among the solutions for addressing marketing failure and improving the productivity, and welfare of smallholder farmers (Mishra *et al.*, 2018; Ragasa *et al.*, 2018). CFAs are concerned with pre-harvest and post-harvest agreements mostly in terms of marketing contracts or production contracts which have been used as a strategy to increase the adoption of advanced agricultural technologies and develop a value chain worldwide (Sulle, 2017). Globally, CFAs have been a major solution for smallholder farmers facing production and marketing problems by providing marketing assurance, transfer of

technology, and guarantee pricing systems (Bellemare, 2018).

Studies by Reardon *et al.* (2019) contended that about 5% of the smallholder farmers in Sub-Saharan Africa have access to CFAs. For instance, in Ghana and Malawi, contracting firms provide farmers with fertilizers, pesticides, and the facilitation of credits to ensure high productivity and to meet the quality requirement standard (Dubbert *et al.*, 2021; Mugwagwa *et al.*, 2020). In African countries, smallholder farmers have been receiving CFAs to facilitate farming activities to improve their well-being (Martiniello, 2021; Mazwi *et al.*, 2020) and they may be simple formal agreements or complex production

contracts. The simple formal agreements are whereby the contracting firms may have little or no intervention in the smallholder farmers' production activities while in complex production contracts smallholder farmers may participate in contract farming (CF) like an employee (Mugwagwa *et al.*, 2020).

Scholars including (Meemken *et al.*, 2020) argue that with CF smallholder farmers collectively are likely to have collective bargaining power, easier communication with the sugarcane buyers, reduce transaction costs and in the end, could enjoy effective market linkages. Smallholder farmers may enter into a contractual agreement by selling directly to the buyer or groups of farmers in collective structures such as trusts, companies, or cooperatives (Maltitz *et al.*, 2019). Any of the options has advantages such as an increase in production and disadvantages such as opportunistic behaviour for both parties depending on the nature of contractual arrangements. It is imperative to analyse option(s) in place to have a broader understanding of how to manage the contractual arrangements. Furthermore, (Chamberlain *et al.*, 2017) prefer collective organizations like Agricultural Marketing Cooperative Societies (AMCOS) and other forms of farmers' associations as a key strategy for reduction of transaction costs.

Having multiple CFAs in place is associated with enforcement and monitoring costs but on the other hand, it enhances the cooperation with smallholder farmers ((Mugwagwa *et al.*, 2019) For example, in Greece, CFAs through AMCOS intended to favour smallholder farmers by ensuring the disposal of farming products and higher revenue to their members due to assured prices of the produces and pre-agreed payments (Dubbert *et al.*, 2021). The pre-arrangements have been framed as a business collaborative model which guaranteed farmers access to farming inputs

and markets for their products (Martiniello, 2021). In this business model, although the agencies (Cooperative, trust, and companies) are intended to help smallholder farmers, however, they may be exposed to production and marketing risks (Anh *et al.*, 2019).

The CFAs offered to smallholder farmers from Zimbabwe through their farmers' associations were helping them to increase productivity and mitigate the marketing and production risks (Mugwagwa *et al.*, 2020). Despite the CF covering a wide range of arrangements, the incentives provided to smallholder farmers through associations needed to be clear to help them to survive over time. Yet, Kariuki *et al.* (2016) argue that the incentives depended on the quality, level of control, and trust among partners. Furthermore, Dubb (2016) revealed that different institutional arrangements should be observed during the development of policies to improve CF systems. Conversely, some studies in CF found that farmers through CFAs were facing opportunistic behaviour from buying firms such as late payments and lack of risk-sharing in case of losses (Thi *et al.*, 2016).

CF in Kilombero Valley, the largest sugar-producing area in Tanzania, formerly was operated through farmers' associations whereby up to 2014 there were 17 farmers association operating in Kilombero Valley (Machimu *et al.*, 2019). Smallholder sugarcane contract farmers were receiving CFAs from farmers' associations for instance fertilizers, access to credit, harvest, and transportation arrangements (Martiniello *et al.*, 2019). The CFAs were thought to improve the market and production of the smallholder farmers (Machimu *et al.*, 2019). Despite the efforts, (Akyoo *et al.*, 2018) indicated that operations of the farmers' associations were ineffective and smallholder farmers proved to have low revenues, growing production input costs and the failure of Kilombero

Sugar Company Limited (KSCL) to fulfil their contractual obligations. Yet, scholars (Isager *et al.*, 2018) revealed the challenges faced the smallholder sugarcane farmers such as poor infrastructure, corruption, poor price settings and late payments. Additionally, (Sulle, 2017) argued that the government of Tanzania could take measures to safeguard the out-growers interest by sharing costs and risks among contract partners.

In response to the inefficiencies experienced by sugarcane smallholders in Kilombero Valley, the government of Tanzania took the initiative to help the smallholder farmers by introducing 19 AMCOS in 2017 (TCDC, 2020). The aim was to ensure the weaknesses experienced by farmers through their associations were eliminated and agree on improving the CFAs offered to smallholder farmers. The CF through AMCOS has been seen as an essential pillar of rebalancing power among contract partners, mitigating production costs and marketing risks, transferring agricultural technology, and reduction of opportunistic behaviour (Anh *et al.*, 2019). According to (Alemu *et al.*, 2021) the success or failure of CFAs depends on how AMCOS is managed especially managerial competence and expertise, contents of CFAs contracts, dispute resolution mechanism among contract partners, and how farmers perceived the quality of CFAs. The arguments put forth suggest a null hypothesis, *H<sub>0</sub>: There are no differences between the contribution of contract farming arrangements conducted through associations and those handled by AMCOS on sugarcane farming.* The situation also raises the question of whether the newly implemented CFAs through AMCOS will benefit the smallholder sugarcane farmers in the Kilombero Valley. As a result, the study intends to (i) determine the CFAs offered to smallholder sugarcane contract farmers in Kilombero Valley through AMCOS and (ii) examine the contribution

of CFAs offered to smallholder sugarcane farmers through associations and AMCOS on sugarcane farming.

## 2.2 Theoretical Review

### 2.2.1 Principal Agency Theory

The Principal Agency Theory (PAT) by Rhber (2007) states that a principal hires an agent under a contract for compensation to achieve the desired outcome. The theory assumed that actors under the contract have rational behaviour which makes them focus on their priorities. This study adopted the PAT because AMCOS and KSCL are the main actors facilitating the provision of CFAs to smallholder farmers. The principal gives away some decision-making authority to the agent. For instance the AMCOS in Kilombero Valley were providing contract arrangements such as farming inputs, facilitation of credit, extension services, training, transportation arrangements, harvest arrangements, payments follow-up, price negotiation and settings. AMCOS had the role of making sure that farmers receive the CFAs as per agreements and canes are delivered to KSCL regarding the Cane Delivery Agreements. Sugarcane buyers were supposed to receive sugarcane and make payments as per agreements. Therefore, the success of AMCOS and the KSCL depends on how they manage their roles, behaviour expectations, outcome, resources owned, and control mechanisms. To achieve the desired goal of principal and agent, Machimu (2017) argues that in the principal-agent relationship, the agent is expected to behave following the expectations of the principal. Thus, smallholder farmers perceive CFAs as valuable because they act as a means to manage production risks and marketing through the cooperative effort with a processor (Chambat *et al.*, 2019). The PAT focuses on protecting the principal's investments and ignores the concept of transaction costs incurred during the provision of CFAs. Therefore, the theory

was complemented with the Transaction Cost Theory (TCT).

### 2.2.3 Transaction Cost Theory (TCT)

Transaction Cost Theory was found by Williamson (1975). The theory focuses on how to minimize the transaction cost between the buyer and the seller. The theory proposes that conducting the transaction is costly due to its associated costs on contract negotiation, monitoring, and dispute resolution. The theory has been used in this study because the provision of CFAs buying firms ensures the transactions are organized at a lower cost compared to the market and allow stakeholders to provide support to the farmers. The provision of CFAs is influenced by the transaction costs and information costs in the market environment in which production is conducted (Musungu *et al.*, 2017). However, Mugwagwa *et al.* (2019) suggest that CF buying firms were exposed to transaction costs in monitoring the CFAs by searching for smallholder farmers and monitoring the contracts. The situation calls up for CFAs with terms and conditions to protect buyers' investments, reducing uncertainties and hence economizing the transaction costs. In addition, Chamberlain (2017) found that smallholder farmers were funded inputs, training, and interest rate free-loans from off-takers to support their farming activities. Yet, to minimize transaction costs, buying firms were mostly choosing internal extension officers to train farmers. The transacting parties in CF were supposed to choose the governance structure which will conceptualize the CFAs by focusing on transaction cost minimization.

### 3.0 Methodology

This study employed a quasi-experimental research design. The design selects a comparison group with characteristics similar to the treatment group. The quasi-experimental design allowed for the investigation of the causal effects of

AMCOS implementation on CFAs received by smallholder sugarcane farmers. Furthermore, the design allows the selection of existing groups that appear similar, with only one group receiving treatment, and the design was preferable for controlling confounding variables (Saunders *et al.*, 2019). The study was conducted at Kilombero Valley because it is the largest sugar producing area with 5887 registered smallholder sugarcane farmers who practice farming activities under CF which contribute approximately 45% of total sugar production in the country (Massawe *et al.*, 2018). The population of the study constituted smallholder sugarcane contract farmers. The unit of analysis was smallholder sugarcane contract farmers with farms ranging in size from 0.9 to 3.0 hectares (Anderson *et al.*, 2016). Yet, respondents were members of farmers' associations and AMCOS members.

All 19 AMCOS operating in Kilombero Valley were purposely selected in this study. A list of smallholder sugarcane contract farmers was drawn from each AMCOS, and the sample size for each AMCOS was determined using a stratified proportionate sampling procedure because the number of AMCOS members varied from one AMCOS to another. Again, smallholder sugarcane contract farmers were randomly selected from each AMCOS by using the lottery method based on their homogeneous characteristics because all AMCOS members had equal chance to participate in this study. Three key informants were selected purposely from AMCCOS based on their knowledge regarding CFAs.

Due to the small number of smallholder farmers who were members of farmer' associations and are now not members of AMCOS, a 5:1 ratio was used to select farmers who received CFAs through farmers' associations. Alomar and Visscher

(2019) used a similar approach in their comparative study. A snowball sampling technique was used to complement the pre-stated approach to get the respondents. A total of 440 smallholder sugarcane farmers were approached whereby 361 smallholder sugarcane farmers received CFAs through

AMCOS (Treated) and 79 smallholder sugarcane farmers received CFAs through farmers' associations (Control). Smallholder sugarcane contract farmers were sampled from all registered AMCOS as indicated in Table 1.

**Table 1: Sample Size Distribution**

S/No	AMCOS	n
1	Miwa AMCOS	20
2	Bonye AMCOS	27
3	Ruhembe cane Growers AMCOS	40
4	Mkula AMCOS	10
5	Msolwa station Nyange AMCOS	12
6	Mang'ula AMCOS	9
7	Harambee AMCOS	12
8	Hope AMCOS	20
9	Kidatu Ikela AMCOS	17
10	Sanje AMCOS	11
11	Kitete Msindazi AMCOS	10
12	Muongano AMCOS	29
13	Msowero AMCOS	13
14	Kidodi AMCOS	39
15	Miwangani Mtendezi Lukonga AMCOS	9
16	Msindazi AMCOS	39
17	Msolwa Ujamaa AMCOS	7
18	Chauamiho AMCOS	13
19	Kilombero Cane Growers AMCOS	24
	<b>TOTAL</b>	<b>361</b>

The sample size for sugarcane contract farmers (treated) was estimated by using Cochran's (1977) formula for finite populations. This was due to known population of smallholder farmers (5887) in Kilombero valley which made the Cochran formula (1977) for the finite population to be more appropriate for this study.

Sample size formula

$$n = \frac{no}{1 + \left(\frac{no - 1}{N}\right)} = \frac{384}{1 + \left(\frac{384 - 1}{5887}\right)} = 361$$

Whereby

no = Cochran's sample size recommendation

N = population size

n = new sample size

Qualitative data were collected using a key informant interview guide whereby three (3) interviews with key AMCOS leaders were conducted. Documents such as the Cane Supply Agreement, AMCOS bylaws, policies, and AMCOS and association reports were also reviewed as part of the documentary review to supplement the primary data. Quantitative data on CFAs were collected using an open-ended and closed-ended questionnaire. The questions were elicited for smallholder sugarcane contract farmers do not participate (control) and smallholder sugarcane contract farmers who participate in the AMCOS program (treated).

Content analysis was applied to analyse qualitative data whereby the recorded data were transcribed, categorized, coded, and grouped into themes and concepts. The interviews were transcribed into a word document whereby themes and concepts related to CFAs offered to smallholder sugarcane farmers were identified from the transcriptions. This was done to organize the information into common themes that emerged in response to dealing with specific items. The themes were organized into coherent categories which summarised key results. Data from documentary reviews were analysed manually. Qualitative information was then integrated with findings from quantitative information to provide meaningful conclusions.

The descriptive statistics were used for analysing the socio-demographic characteristics of the smallholder sugarcane contract farming as well as assessment of the CFAs offered through AMCOS to smallholder sugarcane farmers by using frequencies (percentages). The Propensity Score Matching was employed to compare the contribution of CFAs offered to smallholder sugarcane contract farmers through associations and AMCOS. The analytical model was used considering the assumption that there were two groups (control and treated) with similar characteristics, and treatment variables were exogenous. Data were collected from the survey and administrative records for both groups and were collected at the same time frame. The analysis procedures for PSM were referred from (Harianto *et al.*, 2020) following four stages namely propensity score estimation, choosing a matching algorithm, checking overlap/common support, and matching quality/effect estimation..

The binary logit model was used for estimations of propensity scores for CFAs and its relationship to socio-demographic characteristics of smallholder sugarcane farmers, whereby the dummy variable for

small farmers who experience the CFAs through farmers' associations (control) was coded as 0 and those who experienced CFAs through AMCOS (treatment) was coded as 1. The general logit model used was written as;

$$\log\left(\frac{p}{1-p}\right) = \Pr\{D = 1/X\} = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \varepsilon_i \dots (1)$$

Where,

$\Pr\{D = 1/X\}$  was probability for dummy (outcome) variable as 1 for treatment, and 0 for control group, and  $X$  – represent a multidimensional vector of confounder variables ( $X_1$ = Age,  $X_1$ = Gender,  $X_3$  = Education,  $X_4$  = Household size,  $X_5$  = Land size and  $X_6$  = Membership experience),  $\beta_0 - \beta_6$  are coefficients while  $\varepsilon_i$  was error term.

Nevertheless, in the second stage, the Nearest Neighbour Matching algorithm to compute the Average Treatment Effect on the Treated (ATT) was done. The Nearest Neighbour Matching (NNM) allows the one-to-one matching with each smallholder sugarcane contract farmer who accessed CFAs through AMCOS (treated) matched with each smallholder sugarcane contract farmer who accessed CFAs through associations (control). The formula for Average Treatment Effects on the Treated (ATT) estimated by using NNM and RM.

$$ATT = \frac{1}{N^T} \left[ \sum_{i \in T} Y_i^T - \frac{1}{N_i^e} \sum Y_j^e \right] \dots \dots \dots (2)$$

Where,

$N^T$  – Number of cases in the treated group (smallholder sugarcane contract farmers accessed CFAs through AMCOS).

$N_i^e$  – Number of cases in the control group (smallholder farmers accessed CFAs through associations).

$Y_i^T$  –receive the treatment

$Y_j^e$  - did not receive the treatment

The study also employed the Covariate Balance approach to examine the balance of the score and covariates using the Standardized Bias (SB) and Bias Reduction (BR) methods in the last two stages. The difference in sample means in the treated and matched control groups is calculated using the SB method. The difference in sample means in the treated and matched control groups, expressed as a percentage of the square root of the average of sample variances in both groups, is each covariate X. The SB is also used to determine bias for both groups. The formula used was as follows;

$$SB_{matching}(X) = 100 \frac{\bar{X}_t - \bar{X}_c}{\sqrt{\frac{V_t(X) + V_c(X)}{2}}} \dots\dots\dots(3)$$

$$BR = 100 \left[ \frac{1 - B(X)_{After}}{B(X)_{Before}} \right] \dots\dots\dots(4)$$

Whereby;  $\bar{X}_t$  and  $\bar{X}_c$  - Sample means of the covariate for the treatment and control groups.

$V_t$  and  $V_c$  - Sample variance of the covariate for the treatment and control group.

The variables in this study were classified into three categories included outcome, treatment, and confounders variables. These variables of interest were described and measured in Table 2.

**Table 2: Measurements variables**

Variable	Measurement	Description
CFA	Continuous	Computed as scores of contract farming arrangements
Treatment	Categorical	Dummy variable as 1 = Treated and 0 = Control
Age	Continuous	Measured in years of the respondent
Gender	Categorical	Categorized as 1 = Male and 0 = Female
Education level	Continuous	Measured in years of schooling
Household size	Continuous	Number of people living in the same household
Land size	Continuous	Measured in hectares
Membership	Continuous	Years of experience as an AMCOS member/association member

*Note: Outcome: Contract Farming Arrangements (CFA), Treatment; Treatment and Confounders; Age, Gender, Education level, Household size, Land size, and membership.*

**4.0 Findings and Discussions**

**4.1 Characteristics of the Smallholder Sugarcane Farmers**

This study's respondents were smallholder sugarcane contract farmers who received CFAs through associations (control) and AMCOS (treated). Variables (Table 3) such as age, gender, household size,

membership, land size, and education level were established to understand the respondents' responses and link them to the CFAs offered to smallholder sugarcane contract farmers through associations and AMCOS.

**Table 3: Characteristics of Smallholder Sugarcane Contract Farmers**

Variables	Treated (AMCOS members)		Control (association members)	
	N (%)	Median/Mean $\pm$ STD	N (%)	Mean $\pm$ STD
Sex				
Male	245 (68)		60 (76)	
Female	116 (32)		19 (24)	
Education level				
No formal education	8 (2)		1 (1)	
Primary education	246 (69)		59 (75)	
Secondary education	82 (23)		19 (24)	
Tertiary education	18 (5)		0(0)	
Age (Years)		45.84 $\pm$ 12.26		39.06 $\pm$ 9.86
Household size		4		3
Land Size cultivated(hectares)		3.66 $\pm$ 1.49		2.63 $\pm$ 0.91
Membership		3.1		9.2

According to the findings in Table 3, most of the smallholder sugarcane contract farmers have an average age of about 45.8 (STD = 12.26) and 39.06 (STD=9.86) for both the treated and control groups, respectively. The findings implied that the older farmers were accessing CFAs through AMCOS or associations because they had more resources for farming activities such as land compared to young farmers. Also, in terms of land size usage for sugarcane cultivation, the smallholder farmers have owned the mean land size of 3.66 hectares (STD = 1.9) and 2.63 (STD 0.91) for both groups. The results implied that the smallholder farmers had a land size between 0.9-3 and land ownership was one of the criteria for accessing CFAs either through AMCOS or associations. Smallholder sugarcane contract farmers, on the other hand, had a minimum of three years of AMCOS membership, while control group members had nearly nine years during the farmers' association's operation. The results implied that for the farmers to access CFAs they were supposed to be either member of farmers' association or members of AMCOS.

Similarly, the household had an average of four (4) and three (3) members for both groups. This implies that smallholder farmers accessed CFAs for farming

activities and they used more family members than hired labour to minimise farming expenses. Thus, approximately 68% and 76% of the treated and control groups were male, while 32% and 24% of the treated and control groups were female. This implies that males were participating in farming activities so their access to CFAs was much higher compared to females because female farmers had more household responsibilities. The findings also revealed that 69% and 59% of smallholder sugarcane contract farmers, respectively, attended primary school. Similarly, 23% and 24% had a secondary education level, about 5% had tertiary education for the treated group only, and 2% and 1% had informal education in both groups. The findings implied that education level contributed to farming activities and the majority of the farmers at least attended primary school and they accessed CFAs.

#### 4.2 CFAs Offered to Smallholder Sugarcane Farmers through AMCOS

The study sought to investigate CFAs made available to smallholder sugarcane contract farmers in Kilombero Valley by AMCOS following its transformation from farmers' associations that facilitated farming activities. Farming inputs, credit facilitation, extension services, training supports, transportation arrangements,



harvest arrangements, market information sharing, payment follow-up, price setting, and negotiation were among the CFAs found in the study area. As per Table 4, AMCOS smallholder sugarcane contract farmers received farming inputs (10.9 %) as part of the CF agreements. According to the findings, AMCOS members had an equal chance of receiving farming inputs such as fertilizers, pesticides, and seeds to help them with farming activities. The goal was

to improve the productivity, and profitability of canes. As a result, transaction costs have been reduced; for example, fertilizer was sold at TZS 55,000 to TZS 60,000 per bag with no transportation costs. The findings were in line with the study by (Mazwi *et al.*, 2020) which found that smallholder sugarcane farmers were receiving farming inputs such as pesticides, seeds, technology, fertilizers as part of the agreeable CFAs.

**Table 4: CFAs through AMCOS**

Variable	Counts	Percent	Rank
Farm inputs	264	10.9	6
Credit facilitation	253	10.5	8
Extension services	272	11.4	3
Training	272	11.4	4
Sugarcane Transportation arrangements	263	10.9	7
Sugarcane Harvest arrangements	265	11.2	5
Market information sharing	288	11.99	1
Sugarcane Payment follow up	287	11.95	2
Sugarcane Price negotiation and settings	237	9.9	9
<b>Total</b>	<b>2401</b>	<b>100</b>	

\*Multiple responses

AMCOS improved credit accessibility (10.5%) for smallholder sugarcane contract farmers. AMCOS leaders facilitated their members in securing loans from financial institutions, with members receiving an average of TZS 1,500,000 in a single farming season. The findings revealed that all AMCOS members were entitled to financial support from financial institutions at the agreed-upon interest rate. The loan was repaid in manageable instalments. The findings were in line with Maltitz *et al.* (2019) who found that farmers were linked to financial institutions to get loans for establishing irrigation infrastructure, especially for irrigated sugarcane farming. This implied that farmers' access to credit services was helping them to cover farming expenses.

In essence, the study revealed that AMCOS extension services were provided by qualified extension officers who were compensated by KSCL. Extension services included farm preparation, advising and verification of pesticides, fertilizers, and seeds to be used by the farmers. Farmers were also registered, and any challenges they encountered were reported to, AMCOS, KSCL and the district cooperative officer. As a result of the AMCOS deployment, extension services in the study area improved and may have a positive impact on farming activities. The findings were supported by Alem *et al.* (2021) that to increase malt production buyers were assigning farming expertise to work with cooperatives to help farmers to produce quality products due to the market competition.

The training (11.4%) was initiated by the Kilombero Growers department which is among the departments in KSCL in collaboration with AMCOS, SBT, Tanzania Agriculture Research Institute (TARI), and TCDC. Smallholder sugarcane farmers were ready to be trained whenever the sessions were initiated whereby education, training, and information being among the cooperative principles were observed by AMCOS. The training costs were covered by AMCOS, KSCL, and other sugar stakeholders. Yet, some training was given by suppliers of farming inputs who were invited by AMCOS. The findings implied that training provided by professionals to smallholder sugarcane contract farmers, especially through AMCOS was more appropriate and provided on time. This helped farmers to increase their skills and knowledge of sugarcane farming. One of the key informants inform that: *“in the last farming season we attended training on diseases, symptoms, and pest control on diseases which were observed on the farms of our fellows* (KI 1, Sanje 23rd February 2021).

As part of the CFAs, smallholder sugarcane farmers received sugarcane transportation arrangements services. The AMCOS leaders were looking for transportation service providers (contractors) who could transport sugarcane at reasonable rates. Payments for transportation services were made after receiving payment from the sugarcane buyer at a reasonable price per ton given the distance. According to the findings, transportation services were agreed upon by all AMCOS members by following their guiding policies. Farmers with farms within 10 kilometres (km) were charged TZS 6,500 per ton, farms within 20 kilometres (km) were charged TZS 8,500 per ton, and farms located 30 kilometres or more were charged TZS 10,000 per ton as transportation charges. This was observed to be a best practice in providing fair charges to AMCOS members.

Nonetheless, AMCOS provided farmers with sugarcane harvesting arrangements. According to the study, AMCOS members agreed on the sugarcane harvesting plan at the start of the farming season. The findings implied that AMCOS was owned by its members and that democratic member control was practised following the cooperative principles because members had the right to make decisions on their matters. Furthermore, sugarcane harvesting was done following the delivery schedules agreed with the KSCL as specified in the Cane Supply Agreement, and canes were delivered within five days of being harvested. This was supported by key informants ...” *every AMCOS is allocated the number of sugarcane tons to be supplied to the mills as per agreements for each sugarcane harvesting season. Therefore, the harvesting plan for each AMCOS must consider the allocated capacity to avoid interruption*” (KI 2, KSCL 25<sup>th</sup> February 2021).

Findings revealed that Market information sharing (11.99%) among smallholder sugarcane contract farmers was based on sugarcane prices, prices of fertilizers and pesticides offered by suppliers, and other farming inputs provided by AMCOS. These CFAs ranked first among the CFAs through AMCOS because all important information was shared at the beginning of the farming season. The AMCOS leaders were looking for suppliers of farming inputs such as fertilizers and pesticides, negotiating the prices, and then sharing the information with their members. This implied that farmers were getting the right market information of suppliers of inputs and getting services at an agreeable price either in cash or on credit. According to Principal Agency Theory, AMCOS was acting as an agent to share accurate information with its members.

AMCOS was also following up on sugarcane payments (11.95%) to

smallholder sugarcane farmers. According to the findings in Table 4 AMCOS leaders followed up on sugarcane payments, and payments were made within 15 days of sugarcane delivery as agreed. The findings implied that smallholder farmers did not experience late payments and AMCOS leaders were responsible for ensuring that their members were paid an agreeable amount and on time. The study is consistent with Mugwagwa *et al.* (2020) that, payment terms were agreeable with smallholder farmers were informal or formal contracts and payments were done accordingly. Yet, the contract between KSCL and the AMCOS on behalf of their members requires all parties to adhere to the obligations for example buyer must pay on time the agreed amount.

The findings revealed that the sugarcane prices negotiation and setting were ranked the lowest (9.9%) among the CFAs offered through AMCOS. The smallholder farmers were not directly involved in the negotiation team which comprised AMCOS leaders, SBT, TCDC and KSCL so they assumed that, if they could get a chance of directly negotiating sugarcane prices with the buyer they could get better prices compared to what they are getting. According to Poku *et al.* (2018) a good pricing system being among CFAs helped the smallholder farmers against uncertainties and volatile spot market prices. One of the key informants inform that “*sugarcane prices were determined based on sucrose content and the global*

*market, and sugarcane farming expenses were ignored*” (KI 3, Mang’ula 24<sup>th</sup> February 2021). In addition, (Alemu *et al.*, 2021) argued that market prices were determined considering the quality of the produces.

#### 4.2 CFAs Offered to Smallholder Sugarcane Farmers through Associations and that of AMCOS

The respondents were asked to respond to the contribution of CFAs received from associations (control) and CFAs received from AMCOS (treated). Smallholder sugarcane farmers shared their perspectives on what they were promised in terms of CFAs from AMCOS, which were compared to CFAs from farmers' associations. The results from logit regression in Table 5 shows that variables such as age, gender, and AMCOS membership in years were found significant. The smallholder sugarcane contract farmers' age has statistically significant at  $p < 0.1$  and has a negative impact on the access to CFAs through AMCOS. Furthermore, the coefficients of female smallholder sugarcane farmers were significant at  $p < 0.05$  and influenced positively to the accessibility to CFAs through AMCOS than male sugarcane farmers. The years of AMCOS membership were found to be significant at  $p < 0.01$  and had a positive impact on the access of CFAs through AMCOS. This implied that most of the farmers had a minimum of three years of AMCOS membership and they were able to access CFAs.

**Table 5: Logit Regression Results**

Variable	Coef	Std. Err	z	p-value
Constant	3.174	0.798	3.44	0.001
Age	-0.014	0.012	-1.83	0.052
Gender	0.411	0.172	-2.99	0.017
Education	0.087	0.116	1.55	0.522
Household size	0.030	0.030	0.97	0.330
Land size	-0.281	0.095	-1.38	0.291

Farming experience	0.273	0.018	2.44	0.000
Pseudo R	0.0612			
LR chi <sup>2</sup>	28.155			
Prob > chi <sup>2</sup>	0.000			

Results from Nearest Neighbour Matching in Table 6 show the Average Treatment Effects on the Treated (ATT) on CFAs of smallholder sugarcane farmers was 1.487 (t = 9.68), and it was significant at p<0.05. This implied that CFAs offered to farmers

through AMCOS have increased compared to those offered through associations. However, results from Nearest Neighbor matching indicate that AMCOS had a positive significant impact on smallholder sugarcane farmers' accessibility to CFAs.

**Table 6: PSM Estimation of ATT from Nearest Neighbor Matching.**

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
CFAA score	Unmatched	7.592	6.105	1.487	0.514	2.88
	ATT	7.937	5.477	2.460	0.254	9.68**

Significant level: \*\*\* at 0.01, \*\* at 0.05, \* at 0.1

The findings revealed that AMCOS leaders were helping the smallholder sugarcane farmers to access credit from different financial institutions at a favourable interest rate. Smallholder farmers indicated some of the conditions for getting loans from the financial institutions such as farm size, loan amount, age of the smallholder farmer, and guarantee ship. The situation was different during farmers' association operations (control) whereby farmers were not confident to borrow money from financial institutions thinking they could lack money to repay their debts. The findings implied that CFAs offered through AMCOS improved and gives room for each member to access to credit and loan processing costs were favourable. The findings are in line with Mazwi *et al.* (2020) who reported that access to credit was among CFAs and 92.3% of the smallholder farmers managed to repay their loans as agreed. Implies that the majority of smallholder farmers couldn't manage farming expenses so the accessibility of loans helped farmers to cover farming expenses.

Similarly, farming inputs such as fertilizers and pesticides accessed through AMCOS were at favourable prices because AMCOS leaders had the power to negotiate with the suppliers for stance prices of fertilizer ranging from TZS 55,000 to TZS 65,000 per bag unlike through farmers' association whereby the price was up to TZS 132, 071 TZS per bag. The findings are supported by (Parwez, 2017) that a combination of CF and AMCOS smallholder farmers accessed farming inputs which increase the productivity and value of the produces. Again, through farmers' associations, it was proved by (Machimu *et al.*, 2019) that farmers were accessing farm inputs at the higher price compared to prices offered by the private agro-dealers. Findings are also supported by Transaction Cost Theory that sugarcane cultivations expenses were reduced by ensuring several inputs were available at the favourable prices.

Furthermore, the findings revealed that farmers were receiving high-quality extension services from professional extension officers, which increased farmers' productivity from 25 to 45 tons per

hectare. At the start of each farming season, the zonal extension officers provided advice on land preparation, plantation, and seed cane quality. The close supervision provided by the extension officers, 90% of the supplied cane was deemed to be of the required quality. The extension officers were paid by KSCL rather than farmers' associations, where farmers were responsible for paying for extension services, resulting in very few farmers using them. The findings are in line with (Martin *et al.*, 2016) who contended that about 75% of the smallholder farmers under CF were accessing extension services through AMCOS.

Also, training services were noted to increase through AMCOS and the findings revealed that AMCOS, KSCL, TCDC, and TARI were facilitating training to AMCOS members and paying for training costs. It was noted that at least 3 training were conducted early at the beginning of the farming season including weed control techniques, pest and disease control, and fertilizer application (plant nutrition). During farmers' associations, farmers were responsible for paying for the training initiated by the association leaders. According to (Machimu *et al.*, 2019) farmers who have no money to pay for the training they could not get the services which led to very few farmers accessing training services. Low productivity was experienced, and poor cane cultivation led to rejection at the mills' gate. Based on the arguments it was noted that training for farmers was necessary as it was aimed at creating awareness of the issues regarding sugarcane farming.

In addition, through AMCOS it was noted that in the cane supply agreement AMCOS was supposed to supply a total of 60% of the cane needed for sugar production per season and the remained 40% was supplied by sugar processing mills. Unlikely during farmers' association operations where the

cane supply was 45% supplied by farmers' associations and 55% supplied by sugar processing mills. The findings implied that the changes in the cane supply amount were among the AMCOS achievements. Every AMCOS was given Cane Supply Agreements (CSA) whereby the AMCOS leaders and AMCOS employees made arrangements and scheduled the harvest timetable to meet the requirements. The AMCOS members were entitled to approve the sugarcane harvesting plan in the general or regular meeting before the implementation.

During delivery of the canes AMCOS leaders appointed representatives to observe the measurements at the mill's laboratories and weighbridges whereby during farmers' association operations there were no such practices. The findings by (Machimu *et al.*, 2019) revealed that farmers' associations were given a required amount of sugarcane to be delivered to sugar buyers which gave a room for corruption because association leaders had influenced the allocation of quotas and manipulated the process to favour richer farmers. As a results the contract between AMCOS and KSCL has introduced the anti-bribery and anti-corruption provisions whereby ant-corruption training were provided to members of AMCOS at the company's cost to create awareness and take appropriate action in case of corruption incidences.

The findings revealed that AMCOS leaders were committed to sharing accurate and reliable market information such as the supply of farming inputs and their prices, and the agreed price of the sugarcane per ton to their members. This was done during general or regular meetings which involved all members. However, sugar processing mills were also sharing information on weather forecasting and sugarcane price review. Through farmers association operations few members were favoured to

get market information from their association leaders depending on their relationship. The findings are supported by (Johnny *et al.*, 2019) that access to marketing information was vital for improving the quality of the produces and enhancing prices for smallholder farmers.

The study revealed the positive significant changes in sugarcane transportation arrangements through AMCOS whereby the number of cane transport vehicles required was agreed upon by the AMCOS at the beginning of each season. Transportation of the sugarcane was supervised and arranged by the AMCOS leaders and the employees by coordinating transport services at the required standard. Contrary to transportation services offered through associations whereby the service was inconsistent it was also noted by previous studies by Akyoo *et al.* (2018) who ascertain that smallholder farmers who were under associations could also coordinate sugarcane transportation individually. According to principal Agency Theory, the AMCOS and the association were acting as an agent to facilitate sugarcane transportation. In addition, there were new provisions added in the contracts between AMCOS and KSCL regarding cane transportation such as driver safety, speed limit, safety procedures, and offloading system.

The contract between AMCOS and KSCL stipulated that 90% of the monthly payment were paid in 15 days after delivery and remained 10% was retained (retention fund) by KSCL and paid at the end of the season. The findings revealed that AMCOS leaders were making follow-up on their members' payments by reminding buyers of their obligation of paying on time and in full as agreed in the contract to avoid delays. However, late sugarcane payments were experienced by farmers during farmers' association operations. The findings contradict the study by (Anh *et al.*, 2019) that, 58.3% of the smallholder contract

farmers through AMCOS were paid within one week after delivery while 41.7% were experiencing late payments which distort their business.

In addition, the study revealed that the sugarcane price negotiation team comprised SBT, TCDC, AMCOS leaders and KSCL after the introduction of the AMCOS aiming at rebalancing power relations and setting reasonable prices. Unlikely during farmers' association operations where sugarcane negotiation team comprised associations' leaders, and KSCL. However, sugarcane prices offered through AMCOS were a minimum of TZS 80,000 while through the association minimum sugarcane prices were TZS 50,000. Despite the positive changes AMCOS members were doubting the process because they were not directly involved in the process. The sugarcane price-setting considered world market sugar prices and the quality of the cane (sucrose content) whereby the good sucrose content of the cane ranges from 10 to 12.

Consequently, the results show that the Pseudo-R<sup>2</sup> values for Nearest Neighbor were significant at  $p < 0.01$  in Pseudo-R<sup>2</sup> values were 0.0612 respectively. Specifically, in matching quality indicators the Pseudo R<sup>2</sup> for Nearest Neighbor Matching (NNM) has a lower value and can be concluded that it was the best fit matching estimator in this case. Before matching the Pseudo R<sup>2</sup> was 0.0633 which is greater compared to the NNM matching results. Therefore, according to the findings, the null hypothesis that the contribution of CFAs through farmers' associations and through AMCOS do not defer is rejected. The observed outcomes for smallholder sugarcane farmers' CFAs through associations and AMCOS have the same distributions in covariates after matching.

## 5.0 Conclusions and Recommendations

### 5.1 Conclusions

The study concludes that CFAs provided by AMCOS have increase farmers' productivity by 44% due to availability of extension officers in each farming zone and training provided to the farmers. Also farming inputs were bought in bulk which resulted to lower cost of fertilizers, pesticides and seeds. The formal agreements (three years renewable) between AMCOS and KSCL with new terms and conditions facilitated contract partners in meeting their obligations, reduction of opportunistic behaviour, and balancing power relations.

Furthermore, AMCOS leadership is well-structured, with each member having the right to vote and be elected as a leader. It also concluded that farmers' ability to participate in sugarcane price negotiation and settings was limited but despite the complaints about the sugarcane negotiation and setting process, AMCOS facilitated the increase of sugarcane prices by 46%. However, the operations board were given additional functions such as dealing with submitted complaints and enforcing penalties and corrective actions.

### 5.2 Recommendations

The study recommends the following based on the findings and conclusions: in order to improve CFAs provided to smallholder farmers all AMCOS members, operations board, and employees should participate actively on their AMCOS' activities. Also, to comply with their by-laws, laws, policies, regulations, and directives which govern cooperatives. Contract parties should adhere to their obligations so as to minimize complaints. AMCOS management and board members should adhere to approved harvest plan(s) to improve service excellence and fairness. The sugarcane price negotiation and the

setting team should ensure the farming costs are considered while setting the sugarcane prices in order to ensure farmers are getting profit from sugarcane sales. On the other hand, AMCOS, TCDC, SBT, local government authorities and other sugarcane stakeholders should conduct awareness campaigns to non-AMCOS members so that they can understand the value of accessing CFAs through AMCOS.

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