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SOCIO-ECONOMIC DETERMINANTS OF SMALLHOLDER SUGARCANE FARMERS' PARTICIPATION IN CONTRACT FARMING THROUGH AGRICULTURAL MARKETING CO-OPERATIVE SOCIETIES IN KILOMBERO VALLEY, TANZANIA

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ABSTRACT
Participation in farming as well as membership in a cooperative society is voluntary. However, farmers' decisions to participate are pre-determined by a variety of factors. This paper examines the socio-economic factors which influenced smallholder farmers in Kilombero Valley to participate in sugarcane contract farming, following a shift from the business association model to Agricultural Marketing Cooperative Societies (AMCOS) model in 2017. A cross-sectional research design was used whereby 440 respondents were selected among smallholder sugarcane farmers. The unit of analysis was smallholder sugarcane farmers in the Valley. Data were collected by using a self-administered survey questionnaire, documentary review and key informant interview guide. The data were analysed by using descriptive statistics and binary logistics regression. The findings indicate that farmers' age, marital status, farming experience, land size and land ownership significantly influenced smallholder sugarcane farmers to participate in contract farming (CF) through AMCOS at $p < 0.01$. Moreover, market information sharing, improved yields and improved farming knowledge and skills were the key benefits which determined the participation of farmers in CF through AMCOS. It is concluded that participation of the majority of the smallholder sugarcane farmers in the study area is influenced by CF through AMCOS. It is recommended that AMCOS should take advantage of the CF strategy to attract more farmer members through improved market gains. Moreover, AMCOS operations through CF should instil business confidence in both AMCOS members and non-members in the study area.

Keywords: Smallholder Farmers, Participation, Contract Farming, Perceived Benefits, AMCOS

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1.0 INTRODUCTION

Contract farming (CF) is currently gaining pace among agribusinesses and smallholder farmers around the globe. The CF system has turned out to be a promising strategy between farmers and agribusiness firms with a vested interest in sharing risks associated with the production and marketing of different products (Anh *et al*., 2019; Luh, 2020). Contract Farming (CF) has been used as a pre-harvest arrangement between smallholder farmers and buyers whereby farmers are linked to a high-value supply chain (Meemken *et al.*, 2020). Globally, CF has become attractive to many agricultural producers in countries like the USA, India, Vietnam, Thailand, and Belgium thanks to benefits associated with it, such as market assurance to producers, access to production inputs, higher yields, better technology, profit due to higher revenue, access to credit, and a guaranteed pricing system to smallholder farmers (Mishra *et al.*, 2018; Swain, 2018).

In Sub-Saharan Africa (SSA), CF remains a highly contested institutional arrangement in terms of poverty alleviation and rural development. It is practised particularly in the production and marketing of cash crops including cotton, tobacco, sugarcane, tea, cassava, sisal and poultry (Dubbert, 2019; Poku *et al*., 2018). Similarly, in East African countries especially Kenya and Uganda, CF is common for the horticultural subsector and other sub-sectors such as poultry, sugarcane, tobacco and tea production (Kangwiria, 2017). In Tanzania, CF was introduced in the 1990s for most of the traditional cash crops, namely sugarcane, cotton, sisal, tobacco and tea (Schemes, 2016). The aim was to promote agricultural production, protect the relationship between and among involved parties and provide farming support to smallholder farmers such as inputs, credit, reliable markets, modern technology and other services (Henningsen *et al.*, 2015). The study by Martiniello *et al*. (2019) observed that CF has been promoted to improve the productivity and income of smallholder farmers.

On one hand, smallholder farmers may engage themselves in production or marketing contracts (Sulle, 2017) whereby several CF models may be used such as semi-formal production contracts (informal model) and direct contracting with farmers (nucleus model). On the other hand, a multipartite model has been used whereby private or public providers of credit, extension services and provision of inputs are involved. Similarly, a centralized model was also used whereby purchasers buy from a large number of farmers with pre-determined product quality and quantity to be supplied. Also, an intermediary model which involves farmers groups/associations, buying agents and cooperative societies that manage farmers' production and provide services (Anh *et al*., 2019; Viinikainen *et al*., 2018). Ideally, CF helps smallholder farmers exposed to many challenges, including low productivity, low level of technology, low capital investment, natural resource degradation and inadequate basic services (Olounlade *et al*., 2020; Musungu *et al*., 2017).

The government of Tanzania has been working to help smallholder farmers improve their business performance by encouraging them to participate in CF with the assurance of high income, provision of production inputs, good infrastructures, and technical and managerial support (Martiniello, 2021; Mpeta *et al*., 2017). Various efforts have been made by the government to support smallholder sugarcane contract farmers in Kilombero Valley, such as forming farmers' associations in the 1990s which facilitated communication between smallholder sugarcane farmers and Kilombero Sugar Company Limited (KSCL). Moreover, farmers' associations were transformed into Agricultural Marketing Cooperative Societies (AMCOS) in 2017 to eliminate problems experienced by farmers during farmers' associations operations also to ease contractual relations with Kilombero Sugar Company Limited (KSCL) (TCDC, 2020; Isager *et al*., 2018).

The AMCOS that were introduced in Kilombero Valley were considered more essential than farmers' associations in order to enhance win-win situations between smallholder farmers and sugarcane buyers (Ton *et al*., 2017), mitigating production risks through technology transfer, training, extension services, rebalancing power relations and reducing information asymmetry

and opportunism (Christina *et al*., 2018; Parwez, 2017). Smallholder sugarcane farmers voluntarily opted for joining AMCOS as per cooperative principles (TCDC, 2020). Studies by Christina *et al.* (2018) and Mirsha *et al.* (2018) showed that smallholder farmers participation in CF through AMCOS created high chances of accessing training, extension services, rebalancing of power relations, mitigating their production risks and reduction of information asymmetry.

Sugarcane CF in Kilombero Valley started when the government of Tanzania advised the farmers in the area to form associations that aimed to ease communication between farmers and Kilombero Sugar Company Limited (KSCL). Therefore, in 1991, Kilombero Cane Growers Association and Ruhembe Cane Growers Association were formed (Isager *et al*., 2018). The KSCL provided services to smallholder farmers who voluntarily opted for engaging themselves in CF through farmers' associations from land preparation to harvesting (Sulle, 2017). In 2013, there was a mushrooming of farmers' associations resulting from operational dissatisfaction from smallholder sugarcane farmers. The associations grew from 2 to 17 (Martiniello *et al*., 2019). However, services offered through farmers' associations were inconsistent, and farmers frequently experienced payment delays (Sulle, 2017). In this respect, Machimu and Kayunze (2019) conducted a study and identified some of the weaknesses of the farmers' associations in the study area such as low sugarcane prices, delays of farm inputs supply, and poor harvesting services. In addition, dissatisfaction with sugarcane sucrose content measurement, high deductions by associations, corruption, favouritism, and poor cane transportation services were other issues which the farmers were dissatisfied with.

Studies by (Rondhi *et al*., 2020; Ruml *et al*., 2021; Wongwai *et al.*, 2021) show that production inputs, access to information, access to the market, access to credit, technical assistance, agricultural extension and technological transfer provided to smallholder farmers through the CF model help them to increase their productivity. Moreover, studies e.g..Anh *et al*., 2019; Christina *et al*., 2018) showed that smallholder farmers were more likely to participate in CF through AMCOS to mitigate production risks through training, extension services, acquisition of technology and rebalance of power between buying firms and smallholder farmers.

Nevertheless, Waniset *et al*. (2018) argues that participating in CF through AMCOS smallholder farmers faced obstacles such as inadequate cooperative business management skills, leadership inability and lack of professional ethics and conduct. However, it is perplexing that some farmers have voluntarily participated in CF through AMCOS while others have not. The situation raises questions about why this is happening. In the light of the perplex, the objectives of this study were to (i) determine Socio-economic factors influencing smallholder farmers to participate in CF through AMCOS and (ii) assess perceived benefits that attracted farmers to participate in CF through AMCOS.

2.0 THEORETICAL REVIEW

2.1 Principal-Agency Theory

The Principal Agency Theory (PAT) by Rehber (2007) states that a principal hires an agent under a contract for compensation to achieve the desired outcome. By this theory it is assumed that the principal and the agent have rational behaviour and the agent's actions have external effects on the principal's profit and success. The principal gives away some decision-making authority to the agent although he/she may not be sure that the agent will always act in the principal's best interest. The theory was applied in this study because AMCOS as business enterprise were facilitating sugarcane transactions between smallholder farmers and sugarcane buyer. Smallholder farmers were receiving farming support from sugarcane buyer and other stakeholders through AMCOS. The AMCOS on behalf of their members and the sugarcane buyer (principal) were bound to operate in contractual terms to achieve the desired goal. AMCOS were expected to act based on terms and conditions under the contract to meet buyers' requirements.

It was important to assess if the contract between the buyer and the AMCOS influenced smallholder sugarcane farmers' participation in CF through AMCOS and if it was beneficial to both parties. According to Wendimu *et al*. (2017) the information asymmetry between the principal and the agent is very limited since the agent will be paid according to the weight of sugarcane supplied to the sugarcane buyer. Furthermore, the theory does not guide the conception of what determines smallholder farmers' decision to participate in CF through AMCOS. Therefore, PAT was complemented by the Participation Chain Model (PCM).

2.2 Participation Chain Model (PCM)

The Participation Chain Model (PCM) as proposed by Birlchall *et al*. (2004) establishes the determinants of individual's participation in any undertaking including cooperatives. The model explains that participation depends on a number of issues including personal resources, mobilization and motivations. Essentially the model raises a question on how individuals choose to participate in any enterprise. The PCM is applied in this study as the study examines the socio-economic determinants (age, sex, marital status, education of the household heads, farming experience, land size, and land ownership) of farmers' participation in CF. Members of AMCOS are critical resources for the survival and growth of their businesses, though their rates of participation vary (Ribas *et al*., 2022).

AMCOS are formed by farmers to meet their goals such as to increase negotiation power in the market and to balance power relations and they are guided by principles and values (Williams *et al*., 2021). About 65% of the smallholder sugarcane farmers in Kilombero Valley voluntarily opted to participate in CF through AMCOS. They do participate in different AMCOS activities as per cooperative legislation and bylaws. For example, they attend annual general meetings, regular meetings, participate in training sessions, approving AMCOS strategic plan, annual budget, bylaws and election of their leaders. The success of AMCOS depends on active participation and involvement of its members (Buang *et al*., 2021). On basis of the model, it was hypothesised that:

Ho: Socio-economic factors do not influence smallholder sugarcane farmers to participate in contract farming through AMCOS.

2.0 METHODOLOGY

A cross-sectional design was used because the study collected the information at single point in time to generate conclusion. Additionally, the design allows the use of various analytical techniques including mixed methods for data collection and analysis of relationships between dependent and independent variables (Saunders *et al*., 2019). The study was conducted in Kilombero Valley in Morogoro Region, Tanzania. The valley was purposely selected since it was the largest sugar-producing area in Tanzania. By the time this research was conducted in 2021, the valley was contributing about 45% of the total sugar produced in Tanzania (SBT, 2020; Schemes, 2016). In the study area, sugarcane farming was operated under CF through AMCOS, and there were 19 registered AMCOS with 5887 smallholder sugarcane farmers (SBT, 2020; Schemes, 2016).

Furthermore, 19 AMCOS were purposely selected because all AMCOS were included in the study, and smallholder farmers were sampled from Miwa AMCOS (20), Bonye AMCOS (27), Ruhembe Cane Growers AMCOS (40), Mkula AMCOS (10), Msolwa Station Nyange AMCOS (12), Mang'ula AMCOS (9), Harambee AMCOS (12), Hope AMCOS (20), Kidatu Ikela AMCOS (17), Sanje AMCOS (11), Kitete Msindazi AMCOS (10), Muungano AMCOS (29), Msowero AMCOS (13), Kidodi AMCOS (39), Miwangani Mtendezi Lukonga AMCOS (9), Msindazi AMCOS (39), Msolwa Ujamaa AMCOS (7), Chauamiho AMCOS (13) and Kilombero Cane Growers AMCOS (24).

The study respondents constituted smallholder sugarcane contract farmers, non-contract farmers, AMCOS leaders and representative from KSCL. The unit of analysis were smallholder sugarcane farmer who owned sugarcane farms with a size between 0.9 and 3.0 hectares and

allocated their land for sugarcane CF production (Anderson *et al*., 2016; URT, 2020). In addition, respondents were those who were members of farmers' associations before the introduction of AMCOS and active members of AMCOS. The study used purposive sampling technique to select Kilombero Valley and the census technique to select all 19 AMCOS because it was the only sugar producing area in Tanzania which operated under a combined model of CF and AMCOS. Three key informants were selected purposely based on the positions they held in the study area. The lottery method was used to select the smallholder sugarcane contract farmers randomly from each AMCOS based on their homogeneous characteristics.

The study used a 5:1 ratio for comparing unbalanced groups to select non-contract sugarcane farmers due to a small number of unregistered smallholder sugarcane farmers. This approach was supported by studies by Alomar and Visscher (2019) on comparative study. In addition, the study used the snowball sampling technique to complement the pre-stated approach to get non-contract smallholder farmers. A total of 440 smallholder sugarcane farmers were sampled among whom 361 were smallholder sugarcane contract farmers' sampled using a stratified proportionate sampling procedure, 79 of whom were non-contract farmers. The sample size for sugarcane contract farmers was estimated by using Cochran's (1977) formula for finite populations because the formula is suitable for known and unknown populations.

Sample size formula

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

Whereby:

no = Cochran's recommended sample size
N = population size
n = sample size

Qualitative data were collected using a key informant interview guide whereby two AMCOS chairpersons and one KSCL representative were interviewed with respect to participation of smallholder farmers in CF through AMCOS. Also, documentary review was applied in qualitative data collection by reviewing some relevant documents including the Sugar Industry Act 2001, Cooperative Policy 2002, Cooperative Societies Act 2013, Cooperative bylaws Cane Growers Cooperative Societies Policies, financial statements, contracts offered to smallholder sugarcane contract farmers and cane supply agreements. Similarly, both qualitative and quantitative data were collected using a structured questionnaire with open-ended and closed-ended questions respectively. The combination allowed the triangulation of data and was presupposed to ensure the validity of the findings.

Content analysis and NVivo (12.x64 version) were applied to analyse qualitative data whereby the recorded data were transcribed, categorized, coded and grouped into themes and concepts. The descriptive statistics were also used to analyse the socio-economic characteristics of the respondents and the perceived benefits by farmers who participated in CF through AMCOS. The binary logistic regression model was used to analyse Socio-economic factors influencing smallholder sugarcane farmers to participate in CF since the dependent variable (participation) was dichotomous (1 = participant; 0 = non-participant). The model was used because the responses were to determine whether a smallholder farmer was participating in CF through AMCOS or not. The binary logistic regression assumptions were considered such as the dependent variable being dichotomous and the sample size being large (440 respondents) as advised by Berger (2017). Therefore, the model was suitable to the hypothesis stated prior to data collection whereby the independent variables included sex (*sex*), marital status (*ms*), age (*age*), education level (*edu*), land size (*ls*), household size (*hz*), farming experience (*fxp*) and land ownership (*lw*). The binary logistic regression model was specified as follows:

$$\log(\frac{P}{1-P}) = \beta_0+\beta_1, sex + \beta_2, ms + \beta_3, age + \beta_4, edu + \beta_5, ls + \beta 6, hz + \beta 7, fxp + \beta 8, lw + \beta 9 \ldots\ldots\ldots \varepsilon i$$

Where, P is the likelihood of participating in CF through AMCOS; $\beta 0 =$ constant (y – intercept); $\beta 1 \ldots \beta n$ are coefficients of explanatory variables; β Coefficient (-1 or 1) εi = error term 0.05 (CI 95).

Table 1: Variables Matrix

Variable	Description of Variables
Dependent variable (Pi)	"1" if farmer participates in CF; "0" Otherwise
Sex	Gender (0 = Female, 1 = Male)
Marital status	Marital status (0 = Otherwise, 1 = Married)
Age	Age (in years)
Education level	Education level (number of years spent in school)
Land size	Land size (number of hectares)
Household size	Family members (number of members)
Farming Experience	Farming experience (in years)
Land ownership	(0= Inherited, 1= Bought/rent)

4.0 FINDINGS AND DISCUSSION

4.1 Socio-economic characteristics

The respondents selected for this study were smallholder sugarcane farmers, both contract farmers and non-contract farmers. The respondents' responses were analysed by linking them to the socio-economic factors influencing smallholder sugarcane farmers to participate in CF through AMCOS. The socio-economic characteristics such as sex, age, marital status, household size education level, land size, farming experience and land ownership were measured for both contract and non-contract farmers. The descriptive findings are presented in Table 2.

Table 2: Socio-economic Characteristics of the Smallholder Sugarcane Farmers

Variables	Contract farmers		Non-contract farmers	
	n (%)	Median/Mean ± STD	n (%)	Mean ± STD
Sex				
Male	245 (68)		60 (76)	
Female	116 (32)		19 (24)	
Marital status				
Otherwise	50 (14)		18 (23)	
Married	311 (86)		61 (77)	
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 ± 12.26		39.06 ± 9.86
21-30	39 (11)		17 (22)	
31-40	103 (29)		31 (40)	
41-50	107 (30)		20 (26)	
51+	111 (30)		10 (12)	
Household size		4		3
1-4	118 (33)		33 (42)	
5+	243 (67)		46 (58)	
Farming experience (Years)				
1-10	162 (45)		66 (84)	
11-20	126 (35)		9 (11)	
21-30	73 (20)		4 (5)	
Land size cultivated(hectares)		3.66 ± 1.49		2.63 ± 0.91
<3	83 (23)		38 (48)	
3≤	278 (77)		41 (52)	
Land ownership				
Inherited	149 (41)		51 (65)	
Bought	143 (40)		21 (27)	
Rented	69 (19)		7 (8)	

Notes: STD= Standard Deviation, N= Number of responses, %= Percentage

The study examined sex and marital status for contract and non-contract farmers. The findings show that 68% male and 32% female voluntarily participated in CF through AMCOS and that non-contract farmers were 76% male and 24% female (Table 2). The findings imply that male smallholder farmers had more chances to participate in farming activities than female farmers. Studies (Dubbert, 2019; Meemken *et al*, 2019) assert that the proportion of women participating in CF was significantly low due to their household responsibilities. For example, in most communities in Tanzania, men are in most cases land owners and responsible for household welfare. On the other hand, most of contract farmers were married (86%) and 77% of non-contract farmers were also married. The findings imply that chances of married couples to participate in sugarcane farming activities were high compared to single headed families (14%). This could be due to commitment to the family economy and development.

The maximum and minimum age of respondents were 77 and 21 years respectively for sugarcane contract farmers while for non-contract farmers the maximum and minimum age was 60 and 25

years respectively, with the mean age of 45 years for contract and 39 years for non-contract farmers (Table 2). The respondents above 51 years were 30% among contract farmers through AMCOS and 40% among non-contract farmers. The findings indicate that in the age group above 51 years voluntarily participated in CF through AMCOS due to enough experience in farming activities. The findings are supported by (Johnny *et al*., 2019; Vamuloh *et al*., 2019) who argue that older farmers were participating in CF due to resources needed to participate in CF such as land, and they were more confident due to the farming experience they had.

The findings indicate that 97% of the smallholder sugarcane farmers who were participating in CF through AMCOS had formal education. Sixty nine percent (69%) of them had attended primary education; 23% had attended secondary education; and 5% had attended tertiary education. However, among non-contract farmers, about 99% had attended formal education. The finding imply that the majority of the smallholder sugarcane farmers had formal education, signalling that smallholder farmers in the study area were literate enough to be able to understand CF practices. It is anticipated that formal education has positive implications for increasing chances of participation in CF among smallholder farmers (Rondhi *et al*., 2020; Wongwai *et al*., 2021).

The findings on household size showed that the households with one (1) to four (4) members were 33% and 42% among contract members and non-contract farmers respectively (Table 2). The group of households which had five and more than five family members were 67% and 58% among contract farmers and non-contract farmers respectively. Households with big family members were more likely to participate in CF through AMCOS because they were minimizing labour cost which was ranging from TZS 100,000 to 300,000 per hectare in one sugarcane farming season. The findings imply that smallholder farmers used more family members for farming activities than hired labour. The findings were also supported by (Swain, 2018) who contended that farmers were more engaging family members in farming activities than hired labour.

Farming experience in this study was measured by the number of years smallholder farmers had been participating in farming. The findings showed that 45% and 86% of smallholder farmers had the experience of one (1) to 10 years in growing sugarcane among contract and non-contract farmers. The group with 11 to 20 years farming experience accounted for 35% and 11% among contract farmers and non-contract farmers respectively. The group with 21-30 farming experience accounted for 20% and 5% among contract and non-contract farmers. The findings imply that smallholder farmers with more than 10 years of farming experience were more likely to participate in CF through AMCOS.

A study by (Vamuloh *et al*., 2019) revealed that farming experience attained by smallholder farmers AMCOS was more likely to participate in CF. The findings revealed that the mean farm sizes were 3.7 and 2.6 hectares among contract and non-contract farmers respectively. The group with less than three (3) hectares land accounted for 23% and 48% respectively among contract farmers and non-contract farmers. The group with three and more hectares of land accounted for 77% and 52% of contract and non-contract farmers. The findings imply that farmers with three and more hectares were more likely to participate in CF through AMCOS.

The land ownership for sugarcane farming was also determined among both contract and non-contract smallholder farmers. Smallholder farmers who had inherited land comprised 41% and 65% of contract and non-contract farmers respectively. Smallholder farmers who had bought their land were 40% and 27% among both contract and non-contract farmers respectively. Smallholder farmers who rented land for sugarcane production were 19% and 8% of contract and non-contract farmers respectively. The findings imply that sugarcane cultivation needed land as one of the most important resources regardless of whether one was a contract farmer or not. The smallholder farmers who had inherited the land were more compared to those who had bought land and those who rented land, which means that the majority of the farmers had inherited family land.

4.2 Socio-economic factors influencing smallholder farmers' participation in CF through AMCOS

The study aimed to determine socio-economic factors influencing smallholder sugarcane farmers to participate in CF. Using binary logistic regression, the influence of sex, marital status, education level, age, household size, farming experience, size of land cultivated and land ownership on chances of smallholder sugarcane farmers' participation in CF through AMCOS was determined. The findings present the unadjusted and adjusted binary logistic regression results (Table 3). In unadjusted analysis, the findings showed that married couples were significantly more likely to participate in CF than unmarried participants (OR = 1.84, p = 0.049). Sugarcane CF married couples accounted for 86% while unmarried respondents were 14%. (Machimu, 2017) argue that married couples were more likely to participate in CF than unmarried couples due to family commitment.

Table 3: Socio-economic factors for smallholder farmers' participation in CF through AMCOS

Variable	Estimate (β)	Std Error	OR (95% CI)	Wald Test Value	P-Value
Sex					
Male	Ref		Ref		
Female	0.4022	0.2864	1.49[0.85,2.62]	1.40	0.160
Marital status					
Otherwise	Ref		Ref		
Married	0.6072	0.3084	1.84[1.01,3.36]	1.97	**0.049***
Years spent in school	0.0005	0.0427	1.00[0.92,1.09]	0.01	0.990
Age (Years)	0.0502	0.0125	1.05[1.03,1.08]	4.04	**<0.01****
Household size					
1-4	Ref		Ref		
5≤	0.3819	0.2543	1.47[0.89,2.41]	1.50	0.133
Farming experience (Years)	0.6630	0.1312	1.94[1.50,2.51]	5.05	**<0.01****
Land-size cultivated (hectares)					
<3	Ref		Ref		Ref
3≤	1.1328	0.2576	3.10[1.87,5.14]	4.40	**<0.01****
Land ownership					
Inherited	Ref		Ref		
Bought/Rented	1.0721	0.2584	2.59[1.56,4.30]	3.69	**<0.01****

Omnibus test, P-value=0.00, Cox &Snell= R square =0.5421, Hosmer and Lemeshow test (chi-square=74.38, p value=0.7129, Negelkerke R-square=0.625), STD=Stand Error, OR=Odds Ratio, β = Beta, Ref= Reference Category

It was noted that farmer's age was significantly positively associated with participation in CF through AMCOS (OR = 1.05, p < 0.01). The respondents who were above 51 years comprised 30% of contract farmers through AMCOS and among non-contract farmers those with corresponding age were 40%. The findings indicate that respondents in the age group of 41 years and above participated in CF through AMCOS due to awareness, attitude towards farming and reasonable experience in farming activities. The findings imply that senior farmers were more aware of farming activities, and had more experience and resources to participate in CF than junior

farmers. The findings are supported by (Johnny *et al*., 2019; Ruml *et al*., 2021; Vamuloh *et al*., 2019) who reveal that senior farmers were more likely to participate in CF through AMCOS due to resources they own such as land, compared to younger farmers.

Similarly, participation in CF was significantly influenced by farming experience (OR = 1.94, $p < 0.01$). The findings imply that more experienced farmers were more likely to participate in CF through AMCOS because they were more confident and had more experience regarding production costs, opportunities and challenges in sugarcane CF activities. One of the key informants said: *"… Most of the farmers are using their experiences to grow sugarcane and the majority of farmers are senior people because farming activities are more dependent on experience than education acquired at school*…" (KI 1, Kilombero 22nd February 2021). According to (Rondhi *et al.*, 2020; Temesgen, 2019) farming experience of smallholder farmers was significantly influencing smallholder farmers to participate in CF, and farming experience acquired was more important during making decision on participating in CF.

Moreover, farmers with land of three and more hectares were also significantly more likely to participate in CF than farmers who had less than three hectares (OR = 3.1, $p < 0.01$). Slightly more than three-quarters (77%) of smallholder sugarcane contract farmers had three and more hectares, whereas those with less than three hectares made up only 23%. The findings imply that smallholder farmers with three and more hectares were more likely to participate in CF because they could get more yield. The smallholder sugarcane contract farmers were harvesting up to 45 tons per hectare, and the price per ton was up to TZS 120,000.

Farm size also significantly influenced smallholder farmers to participate in CF. study by (Fikiru, 2019) report that smallholder farmers with larger farm sizes were more likely to participate in CF believing that an increase in land size increases the chances for smallholder farmers to participate in CF with an implication of transaction costs reduction. This was supported by one of the key informants who said:

…"*Smallholder sugarcane farmers with at least three hectares land could produce sugarcane on a large scale, strengthen bargaining power and reduce production and transaction costs including costs of fertilizers, pesticides, weeding, labour, cutting, transportation and loading*" …(KI 2, Kidatu 20 February, 2021).

Additionally, land ownership (bought or rented) had significant influence (OR = 2.59, $p = 0.01$) on participation in CF. Those who had inherited the land made up 40% of the smallholder sugarcane contract farmers. The findings imply that smallholder farmers who had bought or rented land (60%) for sugarcane farming were more likely to participate in CF to cover their initial investment costs and generate more income from sugarcane sales.

Table 4: Adjusted Binary Logistic Regression Findings

Variable	Estimate (β)	Std Error	AOR(95% CI)	Wald Test Value	P-Value
Marital status					
Otherwise	Ref		Ref		
Married	0.0719	0.3599	1.07[0.53, 2.18]	0.20	0.842
Years spent in school					
Age (Years)	0.0307	0.0146	1.03[1.02,1.06]	2.10	0.035
Farming experience (Years)	0.4871	0.1369	1.63[1.24,2.13]	3.56	**<0.01***
Land Size cultivated (hectares)					
<3	Ref				
3	1.1799	0.2814	3.25[1.87,5.70]	4.19	**<0.01***
Sources of land					
Inherited	Ref				
Bought/Rented	1.0379	0.2859	2.82[1.87,5.65]	3.63	**<0.01***

STD=Stand Error, OR=Adjusted Odds Ratio, β = Beta, Ref= Reference Category

The findings of multivariate analysis in Table 4 reveal that marital status had insignificant influence (p = 0.842) on CF participation through AMCOS. The value of the Hosmer-Lemeshow goodness-of-fit test was 6.89 with a p-value of 0.5491 which is not statistically significant (p > 0.05), meaning that the model well fitted the data. The adjusted odds of participation in CF was 1.03 times significantly higher for a unit increase in age (AOR =1.03, p = 0.035). Besides, a unit increase in the years of farming experience was significantly associated with adjusted odds of 1.63 of being involved in CF through AMCOS. In addition, farmers with at three hectares of cultivated land had significantly greater adjusted odds of being involved in CF than farmers with less than three hectares (OR = 3.25, p < 0.01). Moreover, farmers who had bought or rented land (AOR = 2.82, p < 0.01) were significantly more likely to be involved in CF through AMCOS than those who had inherited land.

4.3 Perceived benefits of participation in contract farming through AMCOS

Smallholder sugarcane contract farmers were asked to assess the perceived benefits of participation in CF through AMCOS. Since they had chances to provide multiple responses, the findings (Table 5) indicate that yield was perceived to improve by 17% whereby average tons harvested by smallholder sugarcane farmers through AMCOS were 76.06 tons per year unlike previously under farmers' associations (75.13 tons per year). This implies that there were slight changes in production among farmers with an improvement in their income. The average income of the smallholder farmers through AMCOS was TZS 10,907,764 per year while when they were under farmers' associations the average income was TZS 6,104,593 per year (Field, 2021). Studies by (Bellemare, 2018; Ragasa *et al*., 2018) and showed that smallholder farmers' yields increased due to improved farming practices such as application of fertilizers and pesticides.

Table 5: Perceived benefits by farmers from participating in contract farming through AMCOS (n = 361)

Benefits	Count	Percent (%)
Improved yields	188	17
Increase sugarcane income	137	13
Risk sharing	48	4
Adoption of improved farming practices	220	20
Market information sharing	250	23
Improved farming knowledge and skills	249	23

*Multiple responses

Sugarcane income was another perceived benefit; it was said by 13% of the respondents, implying that AMCOS services improved in terms of yield and prices which were negotiated by AMCOS with the buyers. The price under farmers' associations was TZS 60,000 per ton in 2014 (Machimu, 2017), and through AMCOS it was up to TZS 120,000 per ton in 2021. Studies by Kumar *et al.* (2019) established that prices offered by contracting firms were much better and stable compared to prices offered in spot markets due to high negotiation power among AMCOS leaders. Findings by Machimu *et al*. (2019) reveal that during farmers' association, leaders from the associations were not joining efforts as a team to negotiate for sugarcane price. Moreover, 4% of sugarcane farmers said that they were sharing risk with the buyer especially when fire accidents occurred. This implies that in case of risk such as fire accidents, smallholder sugarcane farmers were compensated up to 5% of the total losses by sugarcane buyer. The findings are in line with findings by (Mishra *et al*., 2018b) who reveal that risk is spread among CF partners so as to increase productivity and reduce technical inefficiency. However, the findings contradict findings of a study by (Louhaichi *et al*., 2018) that in some cases smallholder farmers refused to participate in CF if the crop was perceived to introduce new risks.

In the study area however, 20% of sugarcane contract farmers revealed that they were exposed to improved farming practices, implying that the introduction of AMCOS in the study area helped them use new technologies in farming activities from land preparation to harvesting. Findings of a study by Kumah (2018) maintain that cultivators and irrigation facilities were too expensive for most individual farmers to afford; so they were provided through their farmer organizations. Furthermore, 23% of smallholder sugarcane contract farmers reported that they participated in CF through AMCOS in order to get market information from the right sources. This implies that AMCOS were sharing market information with their members such as the agreed sugarcane prices, number of tons to be supplied to the buyer by the AMCOS, quality of sugarcane required and delivery schedules. According to (Ba *et al*., 2019), participation of smallholder farmers grew from 59% to 80% of all farmers due to market information sharing such as prices of inputs and outputs, marketing opportunities and suitable technologies.

On the other hand, 23% of the respondents reported improved farming knowledge and skills after participating in CF through AMCOS. This implied that the extension services provided to smallholder sugarcane farmers helped them to get more skills and knowledge in farming practices. The findings were supported by (Otsuka *et al*., 2016) who report that smallholder farmers were acquiring knowledge and skills in partnering to farming through training programmes. The findings were also supported by observation made by a key informant on perceived benefits achieved by smallholder sugarcane contract farmers through AMCOS, who was quoted saying:

> *Smallholder sugarcane farmers' participation in CF is subjective. It mostly depends on farmers' decision on whether to participate or not, regardless of the associated benefits. Non-contract farmers have been urged to be members of AMCOS because they don't have an alternative market for their sugarcane* (KI 3, Ruaha 18 February, 2021).

This quotation implies that the Kilombero Valley AMCOS provided more benefits to contract sugarcane farmers than non-contract sugarcane farmers because contract sugarcane farmers received farming incentives from their AMCOS.

4.4 Implication of the findings to the guiding Theory and Model

The findings strengthened the arguments from the theory and model that were applied to this study. The Principal Agency Theory (PAT) assumes that an agent is hired by one or more persons called a principal under a contract to act on behalf of the principal and be compensated by the principal to achieve the desired outcomes. This implies that AMCOS were working on behalf of their members to facilitate the sugarcane transactions between smallholder farmers and sugarcane buyer whereby 19 AMCOS were operating in Kilombero Valley with a minimum of 120 members for each AMCOS. Sugarcane farmers could not sell their sugarcane direct to buyers without being members of AMCOS. The findings indicate that farmers' membership to AMCOS was voluntary and bound by by-laws and contract entered by their AMCOS and the buyer to supply a specified amount of sugarcane as per delivery terms and agreed prices. This agreement had influence on smallholder farmers' participation CF through AMCOS.

Furthermore, the findings supported the arguments from the Participation Chain Model, which honours three levels for an individual when deciding to participate: resources, mobilization, and motivations. The model is in line with the study whereby the socio-economic factors (resources) such as age, marital status (being married), farming experience, land ownership and land size which significantly influenced smallholder sugarcane farmers to participate in CF through AMCOS. At the mobilization level, some sugarcane farmers were not participating in CF through AMCOS because they were unaware of AMCOS operations and the benefits they could receive from AMCOS. At the motivational level, non-cooperative members were side-selling their sugarcane to AMCOS members because they had no other market option for their sugarcane. It has been established that, the null hypothesis that socio-economic factors do not influence smallholder sugarcane farmers to participate in CF through AMCOS was rejected and the alternative hypothesis that socio-economic factors influence smallholder sugarcane farmers to participate in CF through AMCOS was accepted.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Contract and non-contract smallholder sugarcane farmers in Kilombero Valley had limited alternative markets for their sugarcane. However, in order for a farmer to sell their sugarcane, they had to be AMCOS members, and non-contract farmers were selling their sugarcane through AMCOS members. Based on the findings, 65% of smallholder sugarcane contract farmers voluntarily joined AMCOS and had opportunities to participate in various activities such as training and statutory meetings. Socio-economic factors were found to have a significant influence on smallholder sugarcane farmers' participation in CF through AMCOS. The results indicate, married farmers and those with more farming experience were more likely to participate in CF and had a positive perception toward sugarcane CF. Moreover, contract farmers with resources such as land, money, and farming experience outperformed young farmers who inherited land and those with a only few years of sugarcane farming experience.

Furthermore, farmer's sex, household size and education level insignificantly influenced smallholder sugarcane farmers' participation in CF, meaning that in both male-headed and female-headed families, the number of household members varied from one household to another, and farming activities involved both family labour and hired labour. On the other hand, it is concluded that smallholder sugarcane farmers who participated in CF through AMCOS benefited, despite the fact that a number of smallholder sugarcane farmers did not participate in AMCOS activities. The findings indicate that farmers' inactive participation was caused by a lack

of understanding on AMCOS operations; not being able to fulfil conditions for joining AMCOS, small land size, and mistrust of AMCOS operations.

5.2 Recommendations

From the findings and conclusions, it is recommended that smallholder sugarcane contract farmers should actively continue participating in CF through AMCOS. Furthermore, attitudes and awareness about farming practices differed between younger and elderly farmers; therefore, youth growers should be encouraged to participate in AMCOS activities. In collaboration with AMCOS leaders and other actors in the study area, the Tanzania Co-operative Development Commission (TCDC) is urged to continue promoting CF to non-contract sugarcane farmers by enhancing their understanding on the value of AMCOS' operations.

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