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CORRELATION BETWEEN LIVELIHOOD OUTCOMES ATTAINED BY SMALLHOLDER SUGARCANE OUTGROWERS IN MOROGORO REGION, TANZANIA AND THEIR HOUSEHOLD CHARACTERISTICS

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ARTICLE INFO	ABSTRACT
	Livelihood outcomes among sugarcane outgrowers are substantially determined by their participation in contract farming. However, there is a debate among authors on whether there is a correlation between farmers' household characteristics and their livelihood outcomes or not. Responding to the debate; this paper measured the correlation between livelihood outcomes attained by farmers and their household characteristics. The paper employed a cross-sectional study design and 300 sugarcane outgrowers were interviewed. Using the IBM Statistical Package for Social Sciences Statistics, data were analysed descriptively and inferentially. For the latter analysis, all independent variables recorded at the ratio level were correlated with the dependent variable using Pearson Correlation to determine the levels of correlation and significance with the dependent variable. It was found that three out of five independent variables that were correlated with the dependent variable had significant correlation. Land size under sugarcane was moderately correlated with sugarcane yield and the monetary value from sugarcane ($r = 0.573$ and 0.529 respectively), and the correlation was highly significant ($p \leq 0.001$). It is concluded that household characteristics are helpful in improving smallholder farmers' livelihood outcomes. Therefore, available sugarcane farmers' associations in the study area should consider farmers' characteristics in raising their livelihood outcomes.

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INTRODUCTION

Contract farming (CF) has been promoted over the last decades as an institutional innovation to improve agricultural performance in less developed countries, sometimes as a key element of rural development (Rehber, 2007). It seeks to attain higher technical efficiency, farm production operations (preparation, harvesting, transportation) and higher income to farmers' households while contract serves as legal basis for binding the parties in their responsibilities and obligations (Tuan, 2012). Studies indicate that CF is not a new phenomenon in agricultural production (Singh, 2006; Key and Runsten, 1999; Casaburi *et al*., 2012). It was used for vegetable production in the United States of America (USA) by seed industry in Europe in the decades before Second World War and pig production in the USA immediately afterwards.

Since then, CF has expanded to become a significant and expanding form of agricultural organisation. Literature indicates that, in Latin America, CF started in the 1950s; in India it started in the 1960s by seed industry; in China it started in the 1990s and in sub-Saharan Africa it started in the late 1980s and being practiced to various crop including sugarcane (Rehber, 2007, Prowse, 2012). The important sugar-producing countries in tropical Africa are Mauritius, Kenya, Sudan, Zimbabwe, Madagascar, Ethiopia, Malawi, Zambia, Tanzania, Nigeria, Cameroon and Zaire. In all these countries contract farming is applied so as to improve farm production operations and farmers' wellbeing (Girei and Giroh, 2012; Tuan, 2012). The sugar industry in Tanzania started in early 1924 when Tanganyika Planters Limited was incorporated in Tanganyika in Kilimanjaro Region. In 1961, Mtibwa Sugar Estate Limited (MSEL) started, followed by Kilombero Sugar

Company Limited (KSCL) at Ruhembe (Matango, 2006). The industry employs about 14 000 people directly in the estates, and accounts for about 30 000 seasonable employees in the outgrowers' schemes (Matango, 2006). Although CF has evolved in order to solve smallholder farmers' problems, contracts have often served to generate asymmetric power relations to the relative disadvantage of smallholders (Carney, 1988; Singh, 2006; Oya, 2012). A study by Waswa *et al.* (2012) in Lake Victoria basin (Kenya) indicates that income distribution between companies and farmers is heavily skewed in favour of the companies and at the expense of smallholder farmers. Few smallholder farmers have managed to survive profitably within the CF. This division is mainly effected through cost deductions for which farmers have no control and no idea on the rationalization process. On the other hand, a study by Morrison (2006) in Sarawak (Malaysia) shows that contracting of smallholders for commercial production can provide a support framework for farmers who, in the absence of such schemes, might have few networks to learn, raise funds and sustain their initiatives.

The two studies left one key question; can contract farming alone assist farmers to improve their livelihoods and likely being able to ignore their household characteristics? Accordingly, it is still debated whether the asymmetric power relations in contract farming necessarily discriminate the small farm sector *per se* or depends on the nature of CF household participants' characteristics (Simmons *et al.*, 2005; Morrison *et al.*, 2006; Barrett, 2011). The debate is on progress and requires generalization on specific crops and geographic locations to be able to advise smallholder farmers. As a response to the debate and the question rose, this paper measured the correlation between livelihood outcomes attained by smallholder sugarcane outgrowers in Morogoro Region, Tanzania and their household characteristics. The paper is therefore guided by the hypothesis which states that there is no correlation between livelihood outcomes attained by farmers and their household characteristics.

MATERIAL AND METHODS

Research design, description of the study area, sampling procedure and sample size

The study adopted a cross-sectional research design, whereby data were collected only once, was adopted (Bryman and Bell, 2011). The study was undertaken in Kilombero and Kilosa Districts, Tanzania. The selection of the two districts was on the basis that they represented the bigger proportions of sugarcane outgrowers in Tanzania (Sulle *et al.*, 2014; Ngirwa, 2010; Chongela, 2008). The districts had over 5 000 smallholder outgrowers by 2013 (Table 1). Since there were more than six farmers' associations by 2013/14 the research focused on six of them which had large number of smallholder sugarcane farmerswith farm sizes which ranged from 0.9 to 3.0 hectares (smallholders) (URT, 2013) (Table 1). The six farmers' associations were purposively selected. 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 farmers to be interviewed was done. The sample size was determined by employing Yamane formula as detailed below:

$$n = \frac{N}{1 + N\left(e^2\right)}$$

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

Where:

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

The sample size was reduced to 300 (80%) of the 375 respondents were supposed to be interviewed due to difficulty in getting other potential respondents. Moreover, 14 key informants were interviewed on the basis on their positions. They include six farmers' associations' administrative secretaries, six ward executive officers (WEOs), one member from the Sugar Board of Tanzania (SBT) and one KSCL representative-Outgrowers Manager.

Data collection and data processing and analysis

Copies of a questionnaire and of a key informant interview guide were the instruments used for data collection. Both qualitative and quantitative data were collected. Before actual data collection, the research instruments were calibrated by conducting a pilot survey to check their validity. In this study, quantitative data were collected using a structured questionnaire in which both closed and open-ended questions were used. 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 categorized into three categories after computing the mean score (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 correlation between livelihood outcomes attained by sugarcane smallholder farmers and their household characteristics, all independent variables recorded at the ratio (scale) level were correlated with the dependent variable using Pearson's correlation to determine the levels of correlation and significance with the dependent variable. The correlation results were interpreted according to Cohen and Holliday (1982), cited by Bryman and Cramer (1993) who have it that, correlation coefficients (regardless of positive or negative signs) are interpreted as follows: below 0.19 is very low, 0.20 - 0.39 is low, 0.40 - 0.69 is modest, 0.70 - 0.89 is high and 0.90 - 1.00 is very high.

RESULTS AND DISCUSSION

Smallholder Sugarcane Farmers' Characteristics

Sex of respondents and marital status

The results showed that, of the 300 households which participated in the study, male headed households were dominant making 90.3%, while female headed households were only 9.7%. This implies that there were a limited number of female headed households participating in sugarcane contract farming in the study area. Various studies have asserted that male dominate in crops production which are perceived to be profitable (Mapuva, 2013; Mende *et al.*, 2014). The results on marital status showed that the majority (87.3%) of the farmers from the study area were married. Given the very low rate of single (10.3%) and widowed (3.4%) household heads in the study area, this might imply that the majority of the respondents would have additional family labour supply to maintain their sugarcane farms. A study by Mshiu (2007) indicated that marital status has remarkably positive implication in agricultural production. The presence of more married couples in the study area is expected to influence more sugarcane yield when compared to household heads that were single.

For this reason they need active people. Those in the 20 to 35 years age group accounted for 32.8%, and the age group between 51 and 65 years had 18.1%. The proportion of household heads in the 66 to 81 years group was relatively small (5.7%). This result indicates that young to middle aged household heads (20 to 35 years and 36 to 50 years) were more active in sugarcane production. Fewer old household heads were involved in sugarcane production. Girei and Giroh (2012) affirm that the level of involvement in sugarcane farming tends to increase with the optimum age group and similarly starts to drop with increase in age.

Educational level and household size

The findings revealed that 90% of household heads from the study area had primary education, and only 10% had secondary education. The implication of these results is that the majority of household heads were literate enough to adopt and use contract farming services from farmers' associations as well as from the sugarcane buyer. It is also expected that more educated farmers would be at higher level of livelihood outcomes than those with low formal education. Low formal education level can lower farmers' efforts to improve their levels of livelihood outcomes. Previous studies such as those by Amrouk *et al.* (2013) and Casaburi *et al.* (2007) established

Table 1. Sample size

Farmers' Association Name	Sugarcane Outgrowers 2013/14	Smallholder Sugarcane Outgrowers 2013/14	Smallholder Farmers interviewed (5 %)
Ruhembe Cane Growers Association (RCGA)	4 000	2 480	124
Kilombero Cane Growers Association (KCGA)	2 500	1 375	69
Msolwa Ujamaa Cane Growers Association (MUCGA)	969	629	32
Bonye Cane Growers Association (BCGA)	780	608	30
Msindazi Cane Growers Association (MCGA)	760	595	30
Kidatu Ikela Cane Growers Association (KICGA)	426	298	15
Total	9 435	5 985	300

Source: Sugarcane Farmers' Associations (2013)

Table 2. Correlation between independent variables and the dependent variable*

Independent variables	n	Pearson's correlation coefficient (r - value)				Level of significance (p - value)			
		Sugarcane yield	Monetary value from sugarcane	Monetary value from other crops	Amount saved	Sugarcane yield	Monetary value from sugarcane	Monetary value from other crops	Amount saved
Age of the household head	300	0.166**	0.188***	0.049	0.035	0.004	0.001	0.396	0.545
Years of schooling	300	-0.018	-0.005	0.099	0.005	0.761	0.935	0.088	0.926
Years in contract farming	300	0.199***	0.225***	0.012	0.045	0.001	0.000	0.838	0.436
Household size	300	0.030	0.001	-0.005	-0.010	0.600	0.989	0.938	0.868
Land size under sugarcane	300	0.573***	0.529***	0.089	0.226***	0.000	0.000	0.122	0.000

*The dependent variable was livelihood outcomes in terms of sugarcane yield, net monetary value from sugarcane, total monetary value from other crops and amount of money saved by farmers from sugarcane.
** Correlation is significant at the 0.01 level (2-tailed).
*** Correlation is significant at the 0.001 level (2-tailed)

Age of respondents

The minimum age of the respondents was 20 years while the maximum was 81 years, with a mean age of 42.9 years. The majority of the respondents were in the 36 to 50 years age group. This age group accounted for 43.5% indicating that most of the household heads were of productive age, the age at which they were still active to participate in farm activities (URT, 2014). Similarly, Girei and Giroh (2012) reported that age has influence on sugarcane production, given that activities linked with its production are very hard.

that educational level has positive implication on farmers' livelihood outcomes. The mean household size of the respondents was 4.0 persons while the minimum and maximum household sizes were one (1.0) and seven (7.0) persons respectively. The results showed that the household size which consisted of (1) to two (2) people accounted for 19.0% while those which had three (3) to four (4) people accounted for 46.7%. Also, the household size of between five (5) to seven (7) people accounted for 34.3%. The results show that the greatest proportion of the households had family sizes between three (3) to four (4) persons.

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Household size has implication on family labour supply and levels of livelihood outcomes. Large household size is an important asset in working together in household economic activities. However, this occurs where almost all of the household members take part in production and or service provision to contribute to the economy of the household (Kayunze, 2000).

Farmers' duration in contract farming

The results showed that the mean experience of years in contract farming was 7.3 years, with a minimum of two (2) years and a maximum of 30 years. The majority (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 the 11 to 30 years' experience was relatively small, and they accounted for 18.7%. Farmers' duration in contract farming is an important factor determining both yield and the levels of livelihood outcomes as it may lead to improved decision-making skills being attained over time. According to Mwanselle (2010) the period which farmers have been involved with contract farming plays an important role in awareness of contract arrangement practices. The author did an economic analysis for small scale tobacco producers in Songea District; in the analysis it was found that the average number of seasons that farmers in the study had been in CF arrangement was about six years. Therefore, there was a difference of more than a year when you compare with the mean experience of sugarcane smallholder contract farmers in Kilombero Valley (7.3 years). One female sugarcane smallholder farmer from Ruaha said:

"I have been a sugarcane farmer for seven years now (2014). I cannot stop because that is the only survival strategy I have……..I am a standard seven leaver but through practice I am capable of handling my sugarcane business…" (Interview, Ruaha, 19 February 2014)

That quotation establishes a concern of farmers that had low education but through sugarcane CF practices farmers were able to manage their sugarcane business. However, it was important for smallholder farmers in Kilombero Valley to further their education in order to manage their sugarcane business efficiently. The findings on education level indicated that 90% of household heads from the study area had primary education.

Correlation between livelihood outcomes attained by farmers and their household characteristics

The paper aimed to determine the correlation between farmers' livelihood outcomes and household characteristics recorded at the ratio (scale) level. Pearson's correlation was used to determine the relationships between the dependent variable (livelihood outcomes in terms of sugarcane yield, net monetary value from sugarcane, total monetary value from other crops and amount saved by farmers from sugarcane) and household characteristics in terms of age of the household head, years of schooling, farmers' duration in the CF, household size and land size under sugarcane. The correlation results in Table 2 show that three out of the five independent variables that were correlated with the dependent variable had significant correlation. Age of household head had very low correlation with sugarcane yield (r = 0.166), but the correlation was

significant ($p \leq 0.01$). This correlation suggests that the higher the age of household head the more the household is likely to have higher sugarcane yield. Land size under sugarcane was moderately correlated with sugarcane yield (r = 0.573), and the correlation was highly significant ($p \leq 0.001$). This implies that as land size gets larger, the probability of sugarcane yield to increase was high. The results of this paper contradict what was reported by Masute *et al*. (2014) that in India and Brazil, sugarcane yield depends much on technology use and labour skills. The two countries, the largest producers of sugarcane in the world, are reported to face the problem of labour shortage. It is a risk for farmers in Kilombero Valley for their sugarcane yields to be highly determined by land size cultivated. When sugarcane prices happen to go up, smallholder farmers may fall into temptations of selling their land to big farmers. Therefore, this may lead to a total exclusion of small scale farmers in the sugar industry. A paper by Livingston *et al*. (2011) argues that, in order for smallholders to increase production with less additional land and without major increases in labour inputs, they will need to increase their own productivity through greater capital and technology investment.

Similarly, land size under sugarcane was moderately correlated with net monetary value from sugarcane (r = 0.529) and the correlation was highly significant ($p \leq 0.001$). This implies that as land size gets larger, the probability of net monetary value from sugarcane to increase was high. Previous studies have shown that with low farming technology, smallholder sugarcane farmers' net income in Kilombero Valley to a large extent depends on land size cultivated (Ngirwa, 2010; Amrouk *et al*., 2013). Accordingly, a report by NEPAD (2013) demonstrates that agricultural growth in African countries is generally achieved by cultivating more land and by mobilising a larger agricultural labour force, which produces very little improvement in yields. The report concluded that there has been very little improvement in production factors (labour and land) in African countries, something which makes agriculture to be non-profitable. The findings in Table 2 further indicate that farmers' duration in the contract farming had a low correlation with net monetary value from sugarcane (r = 0.225), but the correlation was highly significant ($p \leq 0.001$). This correlation suggests that the higher the duration in contract farming of household head the more the household is likely to have high net monetary value from sugarcane. Similarly, a study report by Mwanselle *et al*. (2010) indicate that when small scale farmers who practised tobacco CF in Songea District reduced cost of production (7%), improved quality of their harvest (31%) and increased income (37%). On the other hand, a male smallholder farmer male respondent from Ruhembe village said:

"I managed to get more income in the 2012/13 sugarcane harvesting season when compared to my first harvest in 2009/10. The first harvesting season was very difficult to me because I had limited experiences in managing my sugarcane farm plots….sometimes I paid higher wages than the normal market price; I also had no social networks to support my sugarcane business….Now (2014) I am confortable, I pray to God that sugarcane price per tonne go up" (Interview, Ruhembe, 22 February 2014).

That quotation indicates that farmers' experiences in CF were crucial for them to cut unnecessary costs of production and at

the end increased their net monetary value from sugarcane. However, farmers were worried with the sugarcane prices to go down. In case sugarcane price falls, sugarcane smallholder farmers' income is likely to go down, and this may cause many of them to drop out from sugarcane farming. Based on the results in Table 2, three (land size, years in CF and age of the household head) out of the five independent variables that were correlated with the dependent variable had significant correlation at $p \leq 0.001$; $p \leq 0.001$ and $p \leq 0.001$ respectively, but all the other independent variables were not significant at $p \leq 0.05$; the null hypothesis stated in the introduction section that there is no correlation between livelihood outcomes attained by farmers and their household characteristics is rejected. The fact is that many of the independent variables used correlated positively with the livelihood outcomes attained by farmers in the study area.

Conclusion and Recommendation

It is concluded that household characteristics are helpful in improving smallholder farmers' livelihood outcomes. Therefore, it is recommended that in order to improve farmers' livelihood outcomes, land size under sugarcane, and household head's years in CF which were found to have positive correlation with the livelihood outcomes should be carefully considered by the sugarcane farmers' associations and the Sugar Board of Tanzania (SBT). Plans and any government interventions to sugarcane smallholder farmers should integrate the household characteristics in the contract farming philosophy.

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