Socio-economic Determinants of Smallholder Farmers Sisal Productivity and Profitability: A Case of Korogwe District, Tanzania

Beleko, A.H. and J.K. Urassa*

Department of Policy, Planning and Management, Sokoine University of Agriculture
P.O. Box 3035, Morogoro, Tanzania

*Corresponding author e-mail: jkurassa@yahoo.co.uk;urassa@sua.ac.tz

Abstract

Tanzania's sisal industry employs about 100 000 individuals with its current total production estimated at 40 000 tons per year. This follows efforts by theTanzania's Sisal Board (TSB) to promote smallholder farmers participation in the sisal industry. However, there is a lack of enough information on socio-economic determinants associated with smallholder farmers' sisal productivity and profitabilty. Therefore, the study was conducted to address the above. Specifically, the study aimed at identifying determinants of the smallholder farmers'sisal productivity and profitability in the study area. A cross-sectional research design was used in the research whereby data were collected from 150 randomly selected smallholder sisal producing households based on registers availed by estate managers in Ngombezi and Mwelya Wards. Primary data were collected through questionnaire with close and open ended questions. In addition, focus group discussions and key informant interviews were used to gather complementary data. Quantitative data from the questionnaires were analyzed using the IBM-SPSS software whereby descriptive (ie. ferequencies and percentages) and inferential statistics(through the use of simple linear regression) were determined. Qualitative data were analyzed using thematic content analysis whereby collected information were summarized based on themes and objectives of the study.Generally, study findings show that factors significantly associated with the smallholder sisal farmers' productivity were amount of land allocated to sisal production and amount of sisal harvested (P≤0.001) and amountof land owned by household (P≤0.05). On the other hand, factors associated with the sisal famers profitability included sex of the household head (P≤0.1), farm size (P≤0.05) and amount of sisal harvested (P≤0.001). Therefore, the study recommends that agricultural and investment banks should consider financing smallholder sisal farmers so as to enable them raise their incomes and capital needed for sisal production in order to increase sisalproductivity and profitability.

Keywords: Sisal, socio-economic determinants, smallholder sisal farmers, productivity, profitability

Introduction

Sisal (*Agave sisalana*) is a succulent perennial crop. It is a species of Agave originated from southern Mexico. It is a drought resistant plant that can grow well in the arid and semi-arid regions and rainfall amount suitable for its growth range from 1000 to 1250 mm. Sisal plant grows well in hot climate of temperatures between 10°C to 30°C. It can also tolerate temperatures of 40-50°C (Saxena *et al.,* 2011; Srinivasakumar *et al.,* 2013). Sisal was introduced in Tanzania by the German East Africa Company in 1893. The company was then largely focused with the development of the country thus, introduced sisal to the coastal areas as an alternative crop because the areas had hotter and drier conditions (FAO, 2013). In addition, the first sisal estates were located near the sea on tidal estuaries to support easy shipment of the sisal fibres and other products.

Generally, Tanzania used to be the world's leading sisal producer in the 1960s. Exportation of sisal contributed to more than a quarter of Tanzania's foreign income in the early 1960s however, by 1967 the production declined drastically. Currently, the production is a quarter

of the 1960s production level (FAO, 2016). According to Kimaro *et al.* (1994) the decline of Tanzania's sisal industry was mainly caused by shrinking of the world market and the sisal price, nationalization of sisal estates, poor marketing arrangement and lastly, shortage of labour.

Currently, Brazil tops the list of countries producing sisal, followed by Tanzania then Kenya (Mwaniki, 2018). Over 281 000 tons of sisal was produced in the world, with Brazil producing 150 584 tons, followed by Tanzania which produced 34 875 tons in 2013. Other sisal producing countries include Madagascar, China, Guinea, Central Africa Republic, Ethiopia, Malawi, Mozambique, Angola, South Africa and Morocco (FAO, 2016). On the other hand, small-scale sisal production plays a crucial role in an overall contribution to the sisal industry globally. In Tanzania, the sisal industry employs over 100 000 people, with a total production of about 40 000 tons (TIC, 2016).

According to FAO (2013), small-scale sisal farmers in Tanzania are defined as farmers holding usually less or sometimes above 6 hectares of sisal land but, not more than 200 hectares. They are also referred to as emerging farmers and they are often characterized by lack of market experience, lack of access to resources and technology and limited use of agro-chemicals (Oxfam, 2013). In addition, small-scale sisal farmers in Tanzania's sisal value chain involve those in estates and smallholders growing sisal as a cash crop in non-estate areas (BOT, 2016).

Tanzania has for a long time been making efforts to improve production, productivity and commercialization of the crop sub-sectors (sisal included) under the Agricultural Sector Development Programme Phase Two (ASDP II). For example, financing agriculture and promoting good agricultural practices, improving extension services provided to smallholder farmers, training for updating skills and knowledge of farmers, improving agricultural mechanization and promoting contract farming (URT, 2016). Despite the above efforts (Kimaro *et al.,* 1994; Salum, 2012; BOT, 2016) sisal productivity among small-scale farmers is still low (FAO, 2013); according to TSB (2017) as cited by Senkoro and Mkorongwe (2018) production of sisal fibre per unit area in Tanzania is generally low i.e. 0.8 - 1.1 tones per ha for farmers and 2 - 2.5 tones per ha for estates.

Several studies have assessed the situation of sisal crop, for example Kimaro *et al.* (1994) examined sisal production and research in Tanzania; Salum (2012) who studied sisal production and henequen industry from the producers' perspective, and BOT (2016) an assessment of sisal contract farming schemes in Tanzania. Nonetheless, previous studies have not documented on the socio-economic determinants associated with small-scale sisal farmers' productivity hence, little is known on the same. Therefore, the study on which the paper is based aimed at determining socio-economic determinants of smallholder farmers' sisal productivity in Korogwe district, Tanzania.

Korogwe district constitutes the center of Tanzania's sisal industry. Sisal production in Korogwe district is mainly based on estates that are controlled and owned by the Tanzania Sisal Board (TSB). Currently, the board is in charge of five estates namely, Hale, Ngombezi, Mwelya, Magunga and Magoma. Nonetheless, the board still applies the Sisal Smallholders and Out-growers scheme (SISO) that gives small-scale farmers access to farms within these estates and also the market for their produce to both farmers working within the estates and out growers.

Generally, small-scale sisal farmers' productivity is determined by a number of socio-economic factors. According to Krugman (1994), productivity is the measure of efficiency in converting inputs into useful outputs. Sisal productivity is highly reliant on what the farm is used for and is highly determined by physical capital used for sisal production, human capital, training, experience and lastly, natural resources including land. But, for the case of this study, sisal productivity refers to sisal output in terms of the land input (i.e. tons/ha).

Theoretical Framework

The study is guided by the theory of production. The theory argues that the business firm decides how much of each commodity that it sells particularly its outputs and products it will produce, and how much of each kind of labour,

raw materials and fixed capital goods that it will use (Kurz and Salvadori, 1995). The theory of production was relevant to this study because it emphasizes on creation of goods or services that are suitable for use or exchange in a market economy using suitable economic resources or factors of production. Thus, high productivity can be achieved through the availability of suitable factors of production. The link between the theory and the study is based on the key point that the availability and use of suitable economic resources can facilitate high sisal productivity among small-scale sisal farmers. The study assumed that sufficient availability and use of suitable factors of production mainly land; labour and capital by small-scale sisal farmers could lead to higher sisal yields thus, enabling households to generate more profits from sisal production. However, this is only possible with the support and readiness of policies, rules, regulations and social, political and economic spheres.

Conceptual Framework

The study's conceptual framework (Fig. 1) shows the interaction of the independent and dependent variables. The independent variables include the households' background variables (i.e. household head's age, sex, marital status, main occupation and education) and intermediate variables (i.e. policies and marketing conditions) which influence the dependent variable (small-scale farmers' sisal productivity). Generally, productivity is as an outcome of access to a number of crucial services required for production such as access to credit, extension services, land, inputs and transport facilities. On the other hand, the agricultural, marketing and investment policies can greatly influence smallholders' sisal productivity.

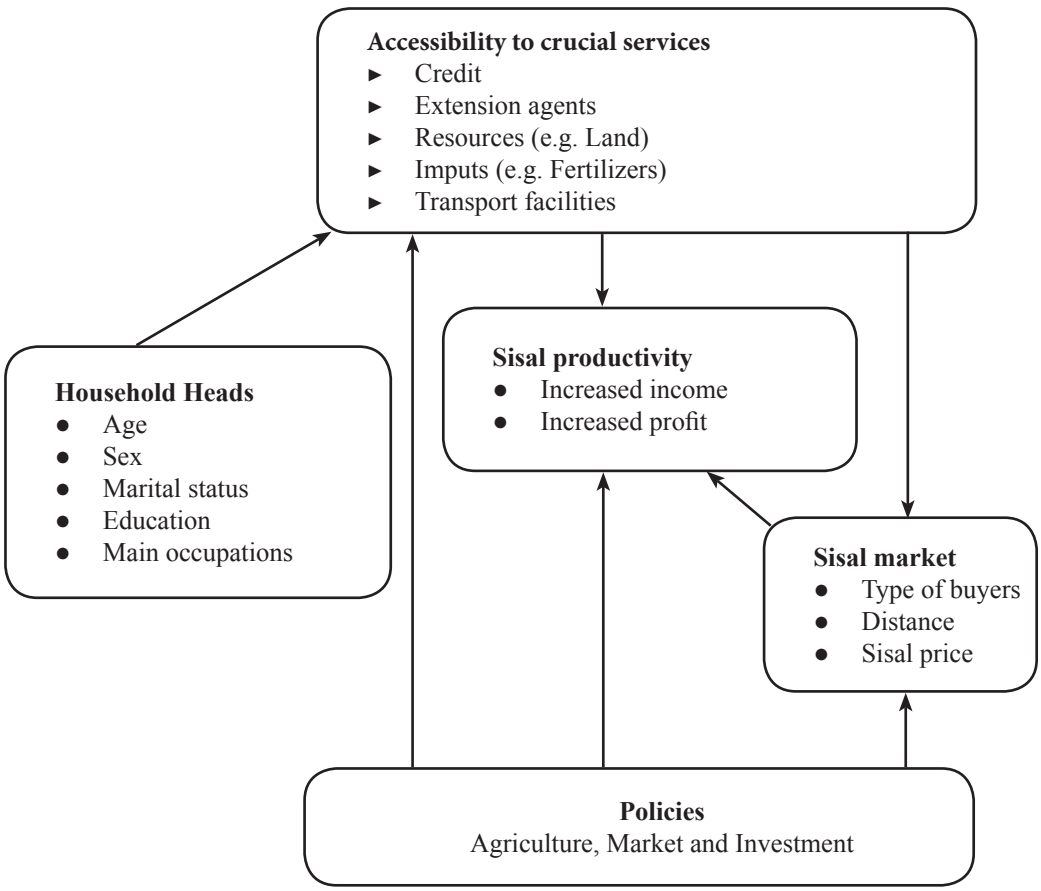

Figure 1: Conceptual Framework (CF) for the socio-economic determinants of small-scale sisal farmers' productivity

Methodology

The study was conducted in Korogwe district, Tanga region, specifically in Ngombezi and Mwelya wards. Korogwe district was selected due to having many small-scale sisal producers relative to other areas. In addition, the district constitutes the center of Tanzania's sisal industry. According to TSB (2018) the district had 1207 small-scale sisal farmers in 2018 compared to Muheza district which had 49 small-scale farmers. The district lies between latitudes 4°15' and 5°15' South of the Equator and between longitudes 38°0' and 38°45' East of the Greenwich Meridian. Korogwe district borders Lushoto to the North, Muheza district to the East, Handeni district to the South and Lushoto as well as Kilimanjaro region to the West. The district's total area is 3 756 square kilometers (URT, 2013).

The variations in topography and climate in Korogwe District provide different cropping possibilities which can be divided into three major agro-ecological zones namely mountainous, low wetlands and semi-arid zone. An irrigational zone can also be identified along the major rivers (Agroberichtenbuitenland, 2018). Sisal is mainly cultivated in the semi-arid zone. Agriculture is the mainstay of the district's residents, employing 90% of the households. The crops grown are millet, cassava, beans, paddy, sisal, cotton, sunflower, and cashew nuts while domestic animals kept include goats, sheep, cattle, pigs and chickens.

The study adopted a cross-sectional research design whereby data were collected once (Setia, 2016).The approach allows one to collect data and determination of association between variables. In addition, it is cost effective and less time consuming while ensuring the appropriate quality of data (Kesmodel, 2018). Furthermore, the study adopted the mixed methods approach whereby both quantitative and qualitative data were collected to enable triangulation of findings. Primary data were collected using a structured questionnaire with open and close-ended questions from the 150 selected households. The questionnaire was used to collect data on households' demographic and socio-economic data. In addition, the questionnaire gathereed information on the households sisal production and marketing. On the other hand, qualitative data was collected through FGDs and key informant interviews: a total of 6 FGDs were conducted three in each ward and these involved a total of 67 participants; participants for the FGDs ranged between 7 – 9 and the sessions lasted for one to two hours. The FGD participants weresmallholder sisal farmers from the two wards covered by the study and were purposively selected based on the number of years they have been engaged in sisal production. Two key informant interviews were conducted with the managers of Mwelya and Ngombezi Sisal Estates. The key informants were purposively selected based on their experience in sisal production. Information collected from the FGDs and key informant interviews was mainly on general sisal production, existing oportunities and challenges faced by small-scale sisal producers.

The study's sample size was determined using the formula by Yamane's (1967) formula, which is $S=N\div[1+N(e)^2]$, where; S=sample size, N=population size and e=error term. Given N=1207, e=0.05 then $S=1207/[1+1207\times 0.052] = 300.435$. Therefore, the sample size for the study ought to have been 300 respondents. But the determination of sample size (S) in this study took into consideration all other important factors including time available for the accomplishment of the study, length of questionnaires, types of questions, analysis to be employed, availability of field helpers, manageability of data and funding available to accomplish the task (Chandler, 2017). Due to these factors, a sample size of 150 respondents was proportionally and randomly selected from the two wards.

Quantitative data collected through the questionnaire were coded and entered into the IBM SPSS software (version 20) for data cleaning and analysis. Linear regression was used to determine determinants for smallholder farmers' sisal productivity and profitability. The model is effective in determining impacts of independent variables on a ratio level measured dependent variable which for this study are sisal productivity and profitability. Qualitative data were analyzed using content analysis whereby emerging themes from the FGDs and key

informant interviews were summarized based on themes and objectives of the study. Some of the emerged themes include smallholder sisal farmers' perception on the level of sisal production and the market situation of sisal within the district. Differences or association between variables were considered statistically significant if the p-value was ≤ 0.001, ≤ 0.05 and ≤ 0.1. The statistical model and the variables that were used are presented below.

The linear regression model for determining productivity of sisal smallholders was specified as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots b_nX_n + \varepsilon_i \quad \ldots\ldots(1)$$

Y = The expected or predicted sisal productivity (tons/ha)

b_0 = the value of Y when all of the independent variables (X_1 through X_n) are equal to zero.

b_1-b_n = estimated regression coefficients

X_1-X_n = predictor variables entered in the linear regression model.

X_1 = Years of experience in sisal production,

X_2 = Education of the household head (Primary and above 1, 0 otherwise)

X_3 = size of land cultivated with sisal in hectares, X_4 = Amount of labour used (total number of people used in production by a household), X_5 = Crops produced as first choices (Sisal 1, 0 otherwise),

X_6 = Household main source of income (Agriculture 1, 0 otherwise),

X_7 = Sex of the household head (Female 1, 0 Male),

X_8 = Type of inputs used (Advanced inputs 1, 0 otherwise),

X_9 = Number of support given

Likewise, the linear regression model for determining profitability of sisal smallholders was specified as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots . b_nX_n + \varepsilon_i \quad \ldots\ldots(2)$$

Y = The expected or predicted profitability

b_0 = the value of Y when all of the independent variables (X_1 through X_n) are equal to zero.

b_1-b_n = estimated regression coefficients

X_1-X_n = predictor variables entered in the linear regression model.

X_1 = Household head's age measured in years,

X_2 = Household head's sex (Female 1, 0 male),

X_3 = Amount sisal harvested (tons),

X_4 = Years of experience in sisal production,

Table 1: Expected impact of each predictor variable on sisal productivity.

Predictor variable	The expected impact
Years of producing sisal	Number of years a farmer has been engaging in sisal production would positively influence sisal productivity.
Household's head education	The level of household's head education would have a positive impact on the level of sisal productivity.
Land allocated to sisal	Number of hectares allocated to sisal production would positively affect sisal productivity.
Amount of labour used	Amount of labour used by a household in production would affect sisal productivity positively.
Producing sisal as a first choice crop	Producing sisal as a first crop would positively affect sisal productivity.
Household's main source of income	Household's main source of income would positively affect sisal productivity.
Household head's sex	Male household heads were expected to report a higher sisal productivity.
Type of equipment used	Use of advanced equipment was expected to positively affect sisal productivity.
Support provided	Type and frequencty of support provided to smallholder sisal producers was expected to affect sisal productivity.

X_5 = Household head's marital status (Married 1, 0 otherwise),
X_6 = size of land cultivated with sisal in hectares,
X_7 = Household head's main occupation (Agriculture 1, 0 otherwise),
X_8 = Type of sisal products sold (Processed fibres 1, 0 otherwise),
X_9 = Household head's education level (Primary and above 1, 0 otherwise)

Table 2 below presents the assumed relationship of the independent variables and profitability of smallholder farmers' sisal production.

husbands who could not be available during the interviews. Moreover, the study used random sampling which ensures an equal chance for all the individuals in the study population to be included in the sample. Therefore, the study randomly picked the sample from the ward estate registers. In addition, women mostly cultivate crops which involve light manual work while sisal requires great labour intensity as it involves a lot of activities which are very intense. The study finding conform to findings by Kavita (2018) who argue that women mostly cultivate crops which involve light manual work unlike men who can cultivate all crops even

Table 2: Expected impact of eachpredictor variable on sisal profitability

Predictor variable	The expected impact
Household head's sex	The sex of the household head specifically male sex would positively affect sisal profitability.
Household head's occupation	Occupation of the household head would positively affect sisal profitability.
Household head's marital status	Households whose heads were married were expected to report a higher sisal profitability.
Years of producing sisal	Farmers' years of engagement in sisal production was expected to be positively associated with sisal profitability.
Amount of labour used	Amount of labour used by a household in production was expected to positively or negatively be associated with sisal profitability positively.
Land allocated to sisal	Number of hectares allocated to sisal production was expected to be positively associated with sisal profitability.
Household's main source of income	Sisal production as a households main source of income was expected to be positively affect sisal profitability.
Sisal products sold	It was expected value addition of harvested sisal would be positively associated with sisal profitability.
Tons of sisal harvested	Tons of sisal harvested was expected to be positively associated with sisal profitability.

Findings and Discussion

Respondents socio-demographic characteristics

The households' major socio-economic characteristics are as shown in Table 3. More than a half (60%) of the household heads were males. The lower number of female headed households (FHHs) was probably caused by the fact that fewer women are generally involved in sisal cultivation. Moreover, even some of the female respondents were only representing their

those involving intensive tasks requiring the use of machines such as sisal.

The age of the household heads ranged from 26 to 85 years. Nevertheless, the majority (55.3%) were in the age range of 36-60 years (Middle aged household heads) followed by those above 60 years of age (42.7%). The findings (Table 3) generally suggest that middle aged and older household heads were actively involved in cultivation of sisal. However, the findings also suggest that youth household heads

Table 3: Demographic and socio-economic characteristics of household heads (n=150)

Characteristic		Frequency	Percent
Age	20-35	3	2.0
	36-60	83	55.3
	61 and above	64	42.7
Sex	Female	60	40.0
	Male	90	60.0
Education level	Primary	98	65.3
	Secondary	35	23.3
	University	17	11.3
Occupation	Agriculture	144	96.0
	Employed	5	3.3
	Business	1	.7
Marital status	Single	6	4.0
	Married	134	89.3
	Divorced	10	6.7

were less involved in cultivation. This is because many youth lack patience when it comes to sisal production; unlike other crops, sisal requires much time for its cultivation and its production costs are high. One of the interviewed farmers reported that:

"Many youths prefer to engage in production activities that pay them shortly and with less production costs too. But, sisal cultivation takes time as it requires a number of years for it to be ready for harvesting while incurring various costs of production during all these years of waiting. So, this hinders many youth to get involved in sisal production"

A high proportion (65.3%) of household heads had primary school education level (Table 3). This suggests that the level of literacy in the study area was high and this could easily help farmers to adapt various farming programmes intended to raise their level of productivity and also understand instructions on inputs such as chemical fertilizers and pesticides (Lugamara, 2017).

Findings from the study (Table 3) further show that, almost all the surveyed household heads depend on agricultural production as their main occupation. The above is supported by Korogwe district socio-economic profile which shows that, agriculture employs over 90% of district residents (URT, 2016).

Level of Sisal Production in Korogwe District

Sisal as a crop was very important to many sisal cultivating households in Korogwe district and this was clearly identified during the household survey and focus group discussions whereby 99.3% of household heads ranked it as the most important crop to the household (Table 4). Both the FGDs and the interviewed farmers pointed out it was a great source of households' income. Most of the household heads who ranked sisal as the number one crop based their arguments on its importance both as their main source of income earnings, its minimum maintenance requirements, ability to withstand many agro-ecological conditions and lastly, its ability to produce continuous fibres for many years. The above is emphasized by the quote below:

'...sisal has fewer complications when compared to some other crops because it sustains many climatic conditions unlike other crops and its production and maintenance activities become less as years pass by and this gives farmers ample time to focus on other household's income earning activities" (Mwelya Estate Manager, Mwelya ward, Korogwe, 21st February, 2020).

The greater importance of sisal crop to the farmers was based on the quantitative estimates of sisal output and the area cultivated with sisal.

Table 4 shows that an average of 0.64 tons/ha (i.e. sisal yield) was reported for households in Mwelya ward which was relatively higher than the average reported for Ngombezi ward. The findings further show that average farm size allocated to sisal by all households was 8.6 ha. However, households in Ngombezi ward allocated relatively more land to sisal i.e. 9.97 ha. The observation that yields are highest in Mwelya, where average farm size is slightly smaller than Ngombezi suggests that larger farms are not as productive as smaller farms. However, other factors might be involved on the sisal yield differences noted. The study's observation conforms to Wickramaarachchi and Jeevika (2018) who found that smaller farms were more productive as their operators apply more inputs, particularly labour hence, resulting into higher output.

involved harvesting, transportation and lastly, processing and decortications costs. Unlike the former, the latter were at first paid by the buyer and then farmers would be obliged to wait until fibres have been processed and purchased by a buyer, then and only then the second phase's costs would be cut directly from the farmers' money during payments by cooperatives. One smallholder farmer said:

'Unlike other cash crops where buyers support farmers from farm preparation to harvesting, in sisal a farmer incurs all necessary costs all by himself. However, during harvesting season a buyer provides harvesting and transport services whose costs are later borne by a farmer but, in this way a buyer earns control over the sisal fibre quality"

Table 4: Respondents households sisal cultivation characteristics (n = 150)

Characteristic		Frequency	Percent	Overall (n=150)
Sisal's rank among crops cultivated by household	Fist	149	99.3	-
	Second	1	0.7	-
Households' sisal production-2018/2019	Ngombezi			
(nN = 75)	Mwelya			
(nM = 75)	-			
Sisal farm as a single unit	Yes	5 (6.7)	23 (30.7)	28 (18.7)
	No	70 (93.3)	52 (69.3)	122 (81.3)
Average households' sisal production (tons)	5.54	4.55	5.04	
Average households' sisal yield (tons/ha)	0.61	0.64	0.625	
Average farm size under sisal production (ha)	9.77	7.42	8.6	

NB: nN and nM refers to number of households from Ngombezi and Mwelya respectively

Costs of Sisal Production

The costs incurred by small-scale sisal farmers during sisal production were divided into two phases. The first phase involved the costs that farmers incurred during the early stages of production and which were paid directly by the farmers themselves. These costs included farm preparation, seed preparation, planting and weeding costs. The second phase

Market Situation of Sisal in Korogwe District

Table 5 shows that all farmers (100%) sold their sisal produce to a tenderer who happens to win a particular sisal selling season's tender. The tendering process is overseen by cooperatives unions under guidance of the Tanzania Sisal Board (TSB). The observation that all farmers relied upon one buyer per selling season suggests that there is a limited market for sisal produce

and that prices offered could be low due to lack of competition. The observation conforms to BOT (2016) who reported that presence of few buying companies impairs competition, leading to low prices. Table 5 also shows that type of sisal product sold mostly by small-scale farmers of sisal was processed sisal fibres (97.3%). This also suggests that there is a limit in range of type of products sold by small-scale sisal farmers hence, lower profitability to small-scale farmers. The quote below emphasizes the above:

"There is a good number of sisal products that farmers could offer to the market and some of them are handy made including ropes, in this way farmers could increase their profitability rate. However, since many farmers are obsessed with selling of sisal fibres only therefore, sisal production remains less profitable to them' (Mwelya Estate Manager, Mwelya ward, Korogwe, 21st February, 2020).

adopt more technology unlike in larger farms. Also, farmers with smaller farms usually employ family members, only hiring the more expensive low-hourly workers when family labour potential is exhausted unlike farmers with larger farms who have to employ expensive non-family labour" (Ngombezi Estate Manager, Ngombezi ward, Korogwe, 20th February, 2020).

Table 6 further shows there was a slightly significant (P≤0.1) association between sisal productivity and it being produced as a first choice crop. This means that the expectation that sisal is a great source of household income than other crops gives it an advantage of being highly prioritized by households. Therefore, much attention and higher priority including the use of more inputs and better technologies will be directed towards it thus, eventually leading to higher output. The results above conform to those of Mwaniki (2018) that, cultivating

Table 5: Sisal marketing by surveyed households (n=150)

Sisal marketing		Frequency	Percent
Buyer	Winning tenderer	150	100
	Others	0	0
Type of product sold	Raw leaves	4	2.7
	Processed sisal fibres	146	97.3

Factors Determining Sisal Productivity of Small-scale Sisal Farmers

Linear regression analysis results (Table 6) show that there was a significant (P≤0.001) association between sisal productivity and amount of land (ha) allocated to sisal. This implies that amount of land allocated to sisal production plays a bigger part in influencing and determining its productivity. According to literarature (e.g. Savastano and Scandizzo, 2017) there is usually an inverse relationship (IR) between farm size and productivity whereby there appears to be a smooth tendency of land productivity to decline with farm size. The quote below emphasizes the above:

"…Amount of land determines productivity however, in traditional agriculture, smaller farms have been associated with greater productivity because it is often perceived that less land allows farmers to use more inputs such as fertilizer, use the land more intensely and sisal as a source of income is a major factor encouraging uptake of the crop's cultivation in the rural households.

Further to the above, Table 6 shows existence of a significant association between sisal productivity (P≤0.05) and households' source of income. This means that a household's source of income can influence a household's sisal productivity whereby households with sufficient income sources are more likely to obtain higher productivity because they can afford to adopt better technologies and purchasing the same on time. The finding conforms to that of Ruiz (2014) who reported that improved access to finance can increase farmers' investment choices and provide them with more effective tools hence, improved productivity. The study is also in line with the theory of production by Kurz and Salvadori (1995) which states that suitable economic resources or factors of production, capital included, determine profitability.

Table 6: Factors determining sisal productivity of small-scale sisal farmers

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.880	0.105		8.386	0.000***		
Year of producing sisal	-0.003	0.004	-0.063	-0.803	0.423	0.932	1.073
Household head education	0.048	0.058	0.068	0.840	0.403	0.869	1.150
Land allocated to sisal (ha)	-0.012	0.003	-0.384	-3.721	0.000***	0.533	1.875
Amount of labour used	-0.046	0.103	-0.045	-0.444	0.658	0.548	1.823
Sisal produced as first choice	-0.076	0.040	-0.152	-1.883	0.062*	0.871	1.148
Household's main source of income	-0.057	0.029	-0.154	1.985	0.049**	0.949	1.053
Household head's sex	-0.003	0.037	-0.007	0.088	0.930	0.898	1.113
Type of equipment used	0.008	0.024	0.031	0.354	0.724	0.755	1.325
Number of support given	0.008	0.022	0.029	0.376	0.708	0.934	1.070

*NB: ***, **,* are significance levels at 1%, 5%, and 10% respectively.*

Factors Influencing Small-scale Sisal Farmers Profitability

Linear regression results (Table 7) show a significant association between a household's head's sex and profitability. This implies that male headed households cultivating sisal are more profitable unlike female headed households. The observation suggests that the intensive nature of sisal cultivation forces women to use more of hired labour to help them perform the intensive cultivation tasks that cannot be performed by them. Thus, incurring more production costs unlike men who can perform all the intensive activities by themselves hence, saving the money they could have been paid to hired labourers. The study's observation conforms to what has been reported in literature with regards to a household's sex and its productivity in general. For example, Kapoor (2019) argues that male-headed households have greater assets endowments which also lead to better livelihood outcomes. In addition,

Table 7: Linear regression results on Factors determining profitability of small-scale sisal farmers

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	14.649	0.781		18.753	0.000***		
Sex of the household head	-0.204	0.107	-0.118	-1.911	0.058*	0.791	1.264
Occupation	0.157	0.202	0.045	0.779	0.437	0.909	1.100
Household head's marital status	0.186	0.149	0.072	1.250	0.213	0.915	1.093
Year of producing sisal	-0.011	0.011	-0.059	-1.045	0.298	0.953	1.049
Amount of labour used	0.021	0.015	0.112	1.418	0.159	0.489	2.043
Land allocated to sisal (ha)	-0.030	0.012	-0.246	-2.427	0.016**	0.295	3.388
Household's main source of income	0.194	0.124	0.090	1.570	0.119	0.915	1.093
Sisal products sold	-0.347	0.311	-0.066	-1.115	0.267	0.853	1.173
Tone of sisal harvested	2.591	0.281	0.916	9.220	0.000***	0.307	3.256

***NB:** ***, **,* are significance levels at 1%, 5%, and 10% respectively.*

Gebre *et al.* (2021) based on a study conducted in Ethiopia have reported that male-headed household's maize productivity to be 44.3 % higher than that of the female counterparts due to the latter's lack of resources.

Table 7 further shows a significant (P≤0.05) negative association between amount of land allocated to sisal production and its profitability. This means that the more land a household allocates to sisal production the less profit it gets. Therefore, suggesting that small farms are more profitable compared to bigger farms. The observation is in line with that of Yu *et al.* (2015) who found that subsidizing farmers to rent land without helping them to become better-equipped could result in resource misallocation towards larger farms using less-efficient labour technologies.

Findings in Table 7 further show there was a significant association (P≤0.05) between amount of sisal harvested and profitability. This implies that the more sisal produced by the small-scale sisal farmers the higher the profit and vice versa. Also, based on economies of scale, small-scale farmers with more produce are more profitable as their production costs become lowered through spread of costs over a large number of their harvests. This observation conforms to what has been reported by Kenton (2020) that individuals and companies can achieve economies of scale by increasing production and lowering costs because this enables costs to be spread over a large number of goods.

Conclusions and Recommendations

The paper has assessed the socio-economic determinants for smallholder farmers' sisal productivity and profitability of the same. Based on the findings it can be concluded that a household's choice to produce sisal as its first/major crop is associated with the crop's higher productivity. It is also concluded that a household's main source of income determines its sisal productivity. On the other hand, the study assessed the factors that determine household's sisal profitability. It is hereby concluded that a household head's sex determines small-scale sisal profitability with households headed by men profiting more than those headed by women. Moreover, the intensive nature of sisal cultivation forces women to use more hired labour unlike men who can perform most if not all the tasks by themselves. It is further concluded that farm size is highly associated with sisal profitability. Lastly, it is concluded that amount of sisal harvested (tones) determines sisal profitability of the sisal cultivating households with those producing more getting higher profits due to exploittation of economies of scale.

Based on the study findings and conclusions it is recommended that smallholder sisal farmers should prioritize more on cultivating sisal than other crops as this will help them directthe use of inputs and better technologies more on sisal hence, enabling them to raise their productivity and eventually lead to higher profit.Tanzania's Agricultural Bank and other formal financial institutions should work with farmer groups (i.e. Savings and Credit Cooperative Societies and Agricultural Marketing Cooperatives) to avail affordable loans to the smallholder sisal farmers. This will help farmers to raise their incomes and capital needed to cover all sisal production costs.Smallholder sisal farmers need to improve their sisal productivity level in order to raise the profitability. This can be done through the use of modern farm inputs and better technologies and the government through provision of extension services to smallholder farmers by the Tanzania Sisal Board and local government autorities as the need appropriate knowledge and skils to raise their sisal productivity and profitability.

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