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Exploring Factors Affecting Performance of Smallholder Tea Farmers in Tanzania

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Abstract
Tea sub-sector is a major driver of poverty reduction for Tanzanians, especially smallholder tea farmers, who depend mostly on tea farming as the source of employment and household earnings. However, their tea production has been experiencing a declining trend, and so far, the reasons behind this decline remains unclear. Therefore, the aim of this study was to explore factors affecting the performance of smallholder tea farmers in two Tanzanian tea producing districts; Muheza and Njombe. Questionnaires were administered to smallholder tea farmers (n = 320) and key informants (n = 80) to gather all the required information, which were then analysed using Statistical Package for Social Sciences (SPSS; Version 21.0) software. The level of education, number of household members who assist in tea farming activities, tea farming experience, age of the farmer, tea membership status, as well as access to extension and credit services were the significant ($p < 0.05$; in all cases) determinants on the performance of smallholder tea farmers. Strategies that aim at; encouraging the participation of young and energetic population in the tea sub-sector, prioritizing the provision of education and extension services, expanding access to credits, strengthening tea associations, building markets closer to smallholders' tea farms, and improving the conditions of the roads that connect market centres and tea farms, are recommended. The findings from this study are crucial, and should be used by relevant stakeholders in addressing challenges that impede the performance of smallholder tea farmers across the country.
Keywords: smallholder tea farmers, performance, Muheza, Njombe, Tanzania

1. Introduction

Globally, agriculture is and will continue to be the backbone of many countries economy, particularly developing countries. A projected increase in the world population to over 9 billion by 2050 (United Nations 2013) could results into an estimated increase in crops demand to 100%-110% (Tilman *et al*. 2011). Thus, to feed more than 9 billion people by that time, agricultural production should increase by ~70% (IFC 2011) and this will, certainly, require better performance of agriculture sector worldwide. Since its independence in 1961, Tanzania has largely relied on agriculture as the mainstay of its economy (Salami *et al.* 2010; Kariuki 2011; NBS 2012; Siyao 2012; Leyaro & Morrissey 2013; Mbunda 2013; Magesa *et al.* 2014; Makorere 2014; URT 2013 & 2017) with small-scale farmers dominating the sector; cultivating numerous horticultural crops for cash and subsistence (e.g. Siyao 2012; Mbunda 2013; Magesa *et al.* 2014). In Tanzania, about 80% of the total population lives in the rural areas, and most of them depend on agriculture as the main economic activity for sustaining their livelihoods (Leyaro & Morrissey 2013; Mbunda 2013; Makorere 2014; Magesa *et al.* 2014). Generally, the agricultural sector accounts for more than 75% of the national employment (Mbunda 2013; Magesa *et al.* 2014; Chongela 2015), and in 2015, approximately 29% of the country's Gross Domestic Product (GDP) were generated from it (URT 2017). Furthermore, agriculture provides Tanzania with; ~85% of the export earnings (URT 2013), ~50% of the government revenue (Siyao 2012), ~65% of the raw materials used in industries (Mbunda 2013; Chongela 2015) and ~100% of the food consumed in the country (URT 2017). Agriculture has great potential to become a leading supporter ofTanzania's economic growth and local communities' poverty alleviation; therefore, the sector needs special attention (Siyao 2012; Magesa *et al*. 2014; Makorere 2014).

In Tanzania, tea (*Camellia sinensis*) is one of the most important cash crops, accounting for ~$30 million to the country's export earnings, only next to cashew nuts, coffee, cotton and tobacco (Baffes 2004). Tea was discovered in Asia around 2700 BC (Chang 2015) and is currently considered as one of the world's most popular (Hicks 2009; Majumder *et al*. 2012b; Onduru *et al.* 2012), oldest (Majumder *et al.* 2012a & 2012b; Onduru *et al.* 2012; Chang 2015; Chimoita *et al.* 2015; UNCTAD 2016) and lowest cost (Hicks 2009; Majumder *et al.* 2012b; Onduru *et al.* 2012) beverages. The industry has been contributing substantially in poverty alleviation (van der Wal 2008; Salami *et al.* 2010; Dube & Guveya 2014; Ezra *et al.* 2014;Yuliando *et al.* 2015; Kipesha 2016;

UNCTAD 2016) through employment provision particularly in developing countries (OXFAM 2002; Baffes 2004; van der Wal 2008; Onduru *et al.* 2012; Potts *et al.* 2014; Kipesha 2016; UNCTAD 2016). Tea is produced in more than 35 countries worldwide (OXFAM 2002; van der Wal 2008; Onduru *et al.* 2012) and Asian countries i.e. China, India and Sri Lanka, are the leading producers (OXFAM 2002; van der Wal 2008; Hicks 2009; FAO 2012; Majumder *et al.* 2012a & 2012b; Onduru *et al*. 2012; Chang 2015; UNCTAD 2016). In Africa, Tanzania has been ranked as the 4th tea producer, next to Kenya, Malawi, and Rwanda (Majumder *et al.* 2012b; Chang 2015; Chimoita *et al.* 2015) and 13th worldwide (Kipesha 2016). In 1902, tea was for the first time introduced in Tanzania at the Agricultural Research Station in Amani and Rungwe by the German settlers and in 1926, the production was commercialized in Usambara and Njombe (Baffes 2005). Before the country's independence, tea was only produced by larger estates and all the matters related to its production were handled by the Tanganyika Tea Board (renamed later to; Tea Board of Tanzania) (Baffes 2005). After the independence in the early 1960s, smallholder's tea production was introduced under the Ministry of Agriculture (Baffes 2005) and by the mid of 1960s, several steps were put in place under the supervision of Tanzania Tea Authority (TTA) to effectively promote smallholder tea farmers and in 1985, they contributed to ~30% of the total tea output (Baffes 2004 & 2005; Loconto & Simbua 2012). Currently, tea growing areas are located in five Tanzanian regions; three of them are in the southern highland i.e. Iringa (Mufindi District), Mbeya (Rungwe District), and Njombe (Njombe District Council) and two others are in the northern zone, namely; Kagera (Bukoba District) and Tanga (Muheza, Korogwe and Lushoto Districts) regions.

Throughout the World, smallholder farmers have been playing a significant role in the tea industry (van der Wal 2008; FAO 2012; Onduru *et al.* 2012; Samaraweera *et al.* 2013; Magesa *et al.* 2014; Ng'ang'a 2015) and their contributions are increasing (Samaraweera *et al.* 2013; FAO 2012 & 2016). For example; over 400,000 smallholders in Sri Lanka, ~160,000 in India and ~560,000 in Kenya have accounted for ~76%, ~26% and ~62% of the total tea production, respectively (Agritrade 2011). Furthermore, smallholder tea areas in China, Kenya and Vietnam have increased significantly between 2001 and 2010. Between these periods, China has experienced an increase of almost 73%, from ~1.1 million ha to ~2 million ha whereas the increase was 34% for Kenya, from 85,511 ha to 115,023 ha and 30% for Vietnam, from 101,884 ha to 132,000 ha (Agritrade 2011).
Despite the growing trend of tea production by smallholders worldwide (Agritrade 2011; Chang & Brattlof 2015), their production in many countries are continuously being challenged by different factors; such as poor extension services, poor access to credit, low farm gate prices, low level of farmers organization, limited marketing channels (OXFAM 2002; van der Wal 2008), higher cost of production and poor infrastructures (Kagira *et al.* 2011; Chang & Brattlof 2015; Ng'ang'a 2015). Tanzania is a good example, because, it contains >30,000 smallholders (Kipesha 2016), yet, its tea production is largely dominated by estates. In the country, smallholders have been producing about half (i.e. ~1,028 kg/ha) of the amount the estates are producing (i.e. 2,354 kg/ha) (Tea Board of Tanzania 2009; Simbua & Loconto 2010), affecting significantly their household earnings that depend for over 80% from tea production (Simbua & Loconto 2010). Lack of appropriate measures on this, could continue harming smallholder tea farmers, who rely entirely on tea production for their livelihoods. Thus, there is urgent need to understand what limits smallholder's tea farming in Tanzania, particularly in Muheza District (Tanga Region; Northern part) and in Njombe District Council (Njombe Region; Southern part), as the previous studies (Baffes 2004 & 2005; Barrett 2008; TSHDA 2009; Salami *et al.* 2010; Loconto & Simbua 2010; URT 2010 & 2013), to the best of our knowledge, have paid less attention on it. The objective of this study was to determine factors that affect the performance of smallholder tea farmers in Muheza and Njombe districts and to provide evidence-based policy recommendations for the improvement and sustainability of smallholders' tea production. This could in turn, increase their household earnings and their contributions to the country's foreign exchange earnings.

2. Materials and Methods

2.1 Study sites and sampling procedures

The study was conducted in Tanzania's most important tea growing districts i.e. Njombe District Council and Muheza District (Figure 1). Njombe District Council, one of the 6 administrative districts of the Njombe Region, is located in the country's southern highlands at latitude 09°12'33" south and longitude 35°07'57"east. The district has a population of about 85,747 inhabitants within an area of ~3,154 km^2 (URT 2016). It is bordered by Makambako Town Council and Mufindi District Council to the north, Morogoro Region to the east, Njombe Town Council to the south, Ruvuma Region to the south-west and Wanging'ombe District Council to the west. On the other hand, Muheza District is one of the 8 administrative districts of the Tanga Region, lying in the northern zone of Tanzania, around latitude 4°54'18" south and longitude 38°55'23" east. The district borders Kenya to the north, Tanga District and the Indian Ocean to the east, Pangani District to the south as well as the Lushoto and Korogwe Districts to the west. With a population of over 204,461 people (NBS 2013), the district occupies an area of approximately 4,922 km^2(URT 2008).The agro-ecological zones of the two districts are suitable for tea plantation as they have average annual temperatures ranging between 18°C and 24°C, average

annual rainfall varying from 200 mm to 2000 mm and rich nutrient soils (pH ranges from 4.5 to 5.6) (URT 2008 & 2016). However, according to the Tea Board of Tanzania (2016), smallholders' tea production in these districts, particularly in Muheza, has been experiencing a declining trend and so far, the reasons behind this decline remains unclear. Therefore, to provide information that could be useful in reversing the current trend, we conducted a study by randomly selecting 8 villages (4 per district) from the list of villages with reasonable number (at least 50) of smallholder tea famers. In each village, 40 participants were administered with closed- and open-ended questionnaires, making a total of 320 participants for the entire study (2 districts × 4 villages' × 40 smallholder farmers). Again, 10 key informants were randomly chosen per village, either from tea smallholder association leaders, village council leaders, or agricultural officers, making a total of 40 and 80 key informants per district and for the entire study, respectively. The ability to provide the required information correctly and timely, were the key criteria for the selection of the key informants. Furthermore, to determine the reliability and validity of the survey questions, two villages i.e. Mlesa and Shebomeza (both in Muheza District) were used to pre-test them.

2.2 Data analysis

Data from questionnaires were extracted, coded and analysed using Statistical Package for Social Sciences (SPSS; Version 21.0) software. Descriptive statistics were used to calculate the frequencies and percentages of the investigated variables. Factors affecting the performance of smallholder tea farmers were determined using multiple regression model, which was found to be a good fit for the data ($F = 11.777$; $p < 0.0001$; $R^2 = 0.255$). The quantity (yields) and quality (grades) of smallholders' green tea leaves were used as performance (pfm) indicators. The model for the current study, with a response (Y) variable and 10 explanatory (X) variables, was specified as shown in equation 1 and 2 below.

$$Y_i = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \ldots\ldots\ldots\ldots + \beta_n X_n + \varepsilon_i \quad (1)$$

$$pfm = \beta_1 age + \beta_2 educ\_level + \beta_3 gender + \beta_4 access\_credits + \beta_5 yrs\_experience + \beta_6 lab\_size + \beta_7 distance + \beta_8 memb\_st + \beta_9 market\_areas + \beta_{10} ext\_serv + \varepsilon_i \quad (2)$$

Where: Y_i= Performance of smallholder tea farmers; X_1 = Age; X_2 = Education level; X_3 = Gender; X_4 = Access to credits; X_5 = Experience (in years); X_6 = Labour size; X_7= Farm to market distance (in km); X_8 = Membership status; X_9 = Market areas; X_{10}= Extension services; ε_i= Random error term.

3. Results

3.1 Socio-economic and demographic characteristics of smallholder tea farmers in Muheza and Njombe Districts

Table 1 provide frequencies and percentages of socio-economic and demographic characteristics for smallholder tea farmers across the two study sites. Smallholder farmers aged 47–55 years were the largest group (n = 41; 25.6%) in Muheza whereas in Njombe, the largest group comprised of respondents with 26–35 years (n = 63; 39.4%). The two study sites differed in their average age of respondents, being slightly higher (39.38 years) in Muheza compared to Njombe (37.69 years). Males were the dominant respondents, both in Muheza (Males: n = 124, 77.5%; Females: n = 36, 22.5%) and Njombe (Males: n = 104, 65%; Females: n = 56, 35%). Likewise, compared to other marital status categories, married respondents were the largest group in our study sites (Muheza: n = 133, 83.1%; Njombe: n = 131, 81.9%). Majority of smallholder tea farmers in Muheza (n = 133; 83.1%) and Njombe (n = 98; 61.3%) had acquired primary education. Over half (n = 97; 60.6%) of the respondents in Muheza had tea membership whereas the opposite was observed in Njombe (n = 37; 23.1%). Moreover, many respondents in Njombe had access to extension services and credit facilities (n = 146; 91.3% in all cases) relative to Muheza (extension services: n = 37, 23.1%; credit facilities: n = 27, 16.9%).

3.2 Factors affecting the performance of smallholder tea farmers across the two districts

The performance (response variable) of smallholder tea farmers was affected differently by our explanatory variables as revealed by the multiple regression analyses results (Table 2). Across the study sites, level of education ($t = 1.996$; $p \leq 0.05$), number of household members who participate in tea farming activities ($t = 2.284$; $p \leq 0.05$) and experience in tea farming practice ($t = 2.887$; $p \leq 0.01$) were found to increase considerably tea production. Relatively higher tea production was also observed in farms that were closer to the market; however, the effect was not significant ($t = 0.538$; $p \geq 0.1$). Tea production, on the other hand, was significantly lowered by age ($t = -2.944$; $p \leq 0.01$), tea membership ($t = -6.233$; $p \leq 0.01$), as well as access to extension ($t = -2.141$; $p \leq 0.05$) and credit ($t = -3.709$; $p \leq 0.01$) services. Furthermore, gender lowered tea production in the study area, but the effect was not statistically significant ($t = -1.071$; $p \geq 0.1$).

4. Discussion

4.1 Socio-economic and demographic characteristics of smallholder tea farmers in Muheza and Njombe Districts

Overall, tea farming practices were dominated by young people in Njombe compared to Muheza (Table 1), suggesting that the profit they obtain after selling tea is relatively higher, enough to attract them in tea farming business. Because they are capable of adopting new technology (Samaraweera *et al.* 2013); their involvement in tea farming might increase tea production in the area. In Muheza, possibly due to low price of the green tea leaves, young people have shifted to the cultivation of other profitable crops especially spice; clove, cinnamon and cardamom. Again, Sanga & Mgimba (2016) reported that some of them have and are still migrating to urban areas to find for non-agricultural jobs. Low involvement of the young and energetic generation in farming activities has been claimed to influence negatively agriculture production (Matsane & Oyekale 2014; Sanga & Mgimba 2016), further supporting our findings. In our study sites, participation of males in tea farming activities has outnumbered females, indicating the role of traditions and customs, which have biased land ownership towards men. This agrees with previous studies conducted worldwide that men dominate women in owning agricultural lands (Oni *et al*. 2010; Moobi & Oladele 2012; Mumba *et al.* 2012; Tanui *et al.* 2012; Botlhoko & Oladele 2013; Xaba & Masuku 2013; Sigei *et al.* 2013 & 2015; Magesa *et al.* 2014; Perera 2014; Sebatta *et al.* 2014; Achandi & Mujawamariya 2016). However, this must be taken with caution when it comes to actual work (Tanui *et al.* 2012), as a lot of them have been performed by women (e.g. Sanga & Mgimba 2016).

In agreement with the previous studies (Moobi & Oladele 2012; Boniphace *et al.* 2014; Matsane & Oyekale 2014; Achandi & Mujawamariya 2016; Sanga & Mgimba 2016), married respondents were the largest group compared to other marital status categories. Family, an outcome of marriage, has been a source of social institutions and economic development (Boniphace *et al.* 2014). As tea production requires higher labour supply (OXFAM 2002; van der Wal 2008; Loconto & Simbua 2010 & 2012; Tanui *et al.* 2012; Perera 2014), especially during peak seasons, using family members might be a better option, which will also help to reduce labour costs (Kagira *et al.* 2011; Moobi & Oladele 2012). Majority of the respondents had primary education, which is regarded as a basic education in Tanzania (Boniphace *et al.* 2014). Similar results have been reported by other researchers (Oni *et al.* 2010; Kgosiemang & Oladele 2012; Moobi & Oladele 2012; Boniphace *et al.* 2014; Magesa *et al.* 2014; Sanga & Mgimba 2016). In our study sites, primary education can play an important role in tea production. However, the number of respondents with informal education was also higher in Njombe, highlighting the need for them to pay more attention to extension services, as the way of improving their farming knowledge. The percentage of smallholder tea farmers who joined formal tea associations was higher in Muheza than Njombe, indicating their awareness on the importance of being a member of tea associations. However, most of these associations are not active enough to solve their tea farming challenges. Despite their low number in tea associations, smallholder tea farmers in Njombe are well empowered by the available associations, positively motivating them to participate effectively in tea farming practices.

Respondents from Njombe had higher access to extension services primarily from Ikanga and Igombole private tea processing companies relative to Muheza. The observed situation in Muheza that is also supported by other reports (e.g. Sanga & Mgimba 2016), could be due to poor performance of the tea industry, which has less attracted tea companies (e.g. East Usambara Tea Company/EUTCo), the major providers of extension services. Furthermore, shortage of extension officers, poor roads, shortage of transportation facilities, lack of incentives, etc are also among the factors that hinder smooth provision of extension services in the area, which agrees with the findings of the study conducted by Urassa (2015). Generally, these services were supposed to be provided either by; Tanzania Smallholder Tea Development Association (TSHTDA), Tea Research Institute of Tanzania (TRIT) or district level smallholder associations (Simbua & Loconto 2010), however, this was contrary to our field observation. Furthermore, higher access to credits for smallholder tea farmers in Njombe than Muheza may be due to market competition between Ikanga and Igombole private tea processing companies. In order to increase their chances of getting green tea leaves, these companies tend to compete by offering credits to farmers in the form of fertilizers and/or harvest tools, which could be repaid as green tea leaves. However, this market competition is missing in Muheza, limiting greatly the accessibility of credits for tea farming activities.

4.2 Factors affecting the performance of smallholder tea farmers across the two districts

We expected the performance of smallholder tea farmers to increase with age as the variable has been reported to be a proxy measure of household farming experience (Katundu *et al.* 2013). However, in the current study, the performance was significantly lowered by age of respondents (Table 2). This could be due to age-related decline in physical activity and functional fitness, further strengthening the need to motivate young and energetic people to participate in tea farming activities. Our results are in agreement with earlier studies (Simbua & Loconto 2010; Dube & Guveya 2014). Although the effect was not significant, gender was associated with lower performance of smallholder tea famers, clearly highlighting the negative influence of this explanatory variable on the overall tea production. This could be due to gender bias in land resource ownership especially in Sub Saharan Africa and

other rural areas, where only men are allowed to own land (The World Bank 2012; Boniphace *et al.* 2014). This result is in-line with previous work conducted elsewhere (e.g. Mumba *et al*. 2012; Katundu *et al.* 2013; Masuku 2014; Urassa 2015). The level of education was found to increase significantly the performance of smallholder tea farmers in our study area. Education has been widely regarded as the most valuable asset for rural communities (The World Bank 2008) and can contribute greatly to the increase in their crops production, as evidenced by various studies (Sebatta *et al.* 2014; Mutayoba & Ngaruko 2015; Urassa 2015).

The performance of smallholder tea farmers was considerably improved when larger number of household members participated in tea farming activities. A study by Mumba *et al*. (2012) on the profitability of smallholder dairy farming in Zambia reported similar results. For centuries, households have been used as a major source of labour for smallholder farmers (Mumba *et al.* 2012; Katundu *et al.* 2013; Perera 2014). Increasing household participants in tea farming might reduce the workload per person and therefore enhance their contributions in all activities related to tea production. However, to realize this, variables such as capital, fertilizer and knowledge must be taken into consideration simultaneously (Mwanyumba *et al.* 2010). Tea farming experience improved substantially the performance of smallholder farmers in our study sites (Table 2). Farming experience, which depend on the age of the farmer (Tanui *et al.* 2012; Samaraweera *et al.* 2013), number of years spent farming, number of extension services attended, etc play vital role in tea farming (Tanui *et al.* 2012). It can help farmers to handle different tea farming related challenges such as diseases, climate change, soil fertility decline, market price fluctuation, among others. Despite the influence of age on farming experience (Moobi & Oladele 2012); young and energetic people are still needed not only to accompany old farmers but also to learn from them. Although not significant, short distance from the tea farms to the market was associated with relatively higher performance of smallholder tea farmers. As distance to the market area decreases, farmers are motivated to cultivate more, knowing that they will get enough profit from their sales due to lower transportation costs. Our results agree with those reported by other researchers (Mumba *et al.* 2012; Sigei *et al.* 2013; Mukwevho & Anim 2014; Achandi & Mujawamariya 2016).

Contrary to our expectation, access to extension services had lowered significantly the performance of smallholder tea farmers in our study area. This might be due to inability of the farmers to understand well various skills provided by extension officers, low implementation of these skills at the tea farm level or lack of qualified extension officers. Extension services should be given higher consideration in tea farming operations, due to their significant influence on agricultural performance as reported by earlier studies carried out in Kenya (Onduru *et al.* 2012; Tanui *et al.* 2012) and Tanzania (Boniphace *et al*. 2014). Therefore, there is an urgent need to improve the provision and implementation of these services across our study sites, particularly in Muheza, where tea production is considerably low. In our study area, respondents with tea membership have been experiencing significantly lower performance, which is in agreement with the result of Xaba & Masuku (2013). Due to weakness and inactiveness of tea associations in solving farming challenges, as it has been reported also by URT (2008), farmers seem to have lost faith on them. However, it is necessary to improve their performance and then encourage farmers to join them. These associations are the central point for them to receive and share information (Oni *et al.* 2010; Makorere 2014). Access to credits has been linked with an increase in smallholders' tea production (Kalunda 2014); however, the opposite was observed in our current study, where access to credits was associated with a significant negative effect on tea production (Table 2). This might be due to poor management of credits by famers, using them on other socio-economic activities rather than tea farming. Currently, to overcome this, most of the private tea processing companies especially in Njombe have started to provide non-money credits e.g. fertilizers. However, so far, the expansion of microfinance and credit institutions is still poor in rural areas of Tanzania (OECD 2013; NBS 2014), limiting majority of smallholder famers in these areas to access credits. Furthermore; high interest rate, lack of collateral and repayment terms are among the factors that challenges farmers in accessing credits from few available financial services (The World Bank 2008; URT 2013; OECD 2013; Boniphace *et al.* 2014).

5. Conclusions and policy recommendations

Our findings indicated that level of education, number of household members who assist in tea farming activities, tea farming experience and distance from the tea farm to the market centers can improve the performance of smallholder tea farmers and therefore, boost their tea production and household earnings. In contrast, variables such as age, tea membership, gender as well as access to extension and credit services were associated with lower performance of smallholder tea farmers. Understanding factors affecting the performance of smallholder tea farmers is important since tea sub-sector is the main source of their livelihoods. In Tanzania, commercialization of small scale farming is currently being implemented using various policies and/or programmes i.e. Tanzania Development Vision 2025 (TDV 2025), KILIMO KWANZA (Agriculture First), Southern Agricultural Growth Corridor of Tanzania (SAGCOT) and Big Results Now (BRN). To support these government initiatives, especially to smallholder tea farmers in Muheza and Njombe Districts, we make the following recommendations based on our research findings;

a. Government and Non-Governmental Organizations (NGOs) tea programmes should be well coordinated to develop a broader, holistic approach that can effectively address challenges facing smallholder farmers across Tanzania's tea producing areas.
b. To increase smallholders' tea production and ensure the sustainability of the tea sub-sector, young and energetic population should be encouraged to participate in tea farming activities by attracting them with farming related incentives like subsidies, reasonable farm gate price and credits/loans, among others.
c. Education and extension provision efforts should be strengthened and implemented to equip smallholder farmers with tea farming knowledge, enabling them to withstand various challenges in the tea sub-sector.
d. To reduce transportation costs, tea market centers should be built closer to smallholder farms and the conditions of the roads to these centers should be improved.
e. Government and NGOs should redouble their efforts to expand access to credits and educate smallholder farmers on the proper way of using these credits to improve their tea production.
f. Because tea associations are platforms where smallholder farmers can share tea farming information, strengthening these associations and encouraging farmers to join them is incredibly vital.

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Professional Biographies

Robert Gasper Munishi was born at Dar-es-Salaam city, Tanzania on 21st March 1988. He received a bachelor degree in rural development at *Sokoine University of Agriculture* (Morogoro city, Tanzania) in 2011. In 2015, Robert was awarded a full scholarship by the Chinese Government (China Scholarship Council/CSC) to undertake a 3-year (2015-2018) masters' program in agricultural economics and management at *Fujian Agriculture and Forestry University* (FAFU) (Fuzhou city, Fujian province, China). Before joining FAFU, he served as Team Leader at Vodacom Telecommunication Company (Tanzania) from 2012 to 2015. Moreover, Robert has extensive research experience that covers a wide range of topics on sustainable agriculture, poverty eradication and rural development, as he worked as a research assistant in various private and public institutions in Tanzania.

Abubakari Said Mgelwa was born in Arumeru District, Arusha city Tanzania on the 4th of September 1987. He received a Bachelor of Science in Wildlife Management from *Sokoine University of Agriculture* (Morogoro, Tanzania) in 2012. A year later, he was awarded Erasmus Mundus Scholarship by the European Union to pursue a 2-year master's program and graduated with multiple degrees i.e. master of biology from *Vrije Universiteit Brussel* (Brussels, Belgium); master of science in biology of organisms and ecology from *Université Libre de Bruxelles* (Brussels, Belgium) and master of science in tropical biodiversity and ecosystems from *Università degli Studi di Firenze* (Florence, Italy) in 2015. He is currently working as a member of the academic staff in the College of Natural Resources Management and Tourism at Mwalimu Julius K. Nyerere University of Agriculture and Technology (MJNUAT) in Musoma Region, Tanzania (2015 – present) and as a Ph.D. student, majoring in ecology, at *Fujian Agriculture and Forestry University* in Fuzhou, China (2016–2019). His research interest focuses on understanding the effects of environmental pollution and other disturbances on our terrestrial and aquatic ecosystems and he has co-authored more than 5 scientific articles in peer reviewed journals.

Xi Guan was born at Hefei city, China on 11st February 1978. He is currently working as Associate Professor in the College of Economics at Fujian Agriculture and Forestry University (China). He received his Ph.D. in agricultural economics and management from *Nanjing Agricultural University* (Nanjing city, Jiangsu province, China). His research interest focuses on tea industry in China and other countries. Also, Xi has published many peer-reviewed papers and he is a reviewer of two tea science journals i.e. *Journal of Tea Science* and *Acta Tea Sinica*.

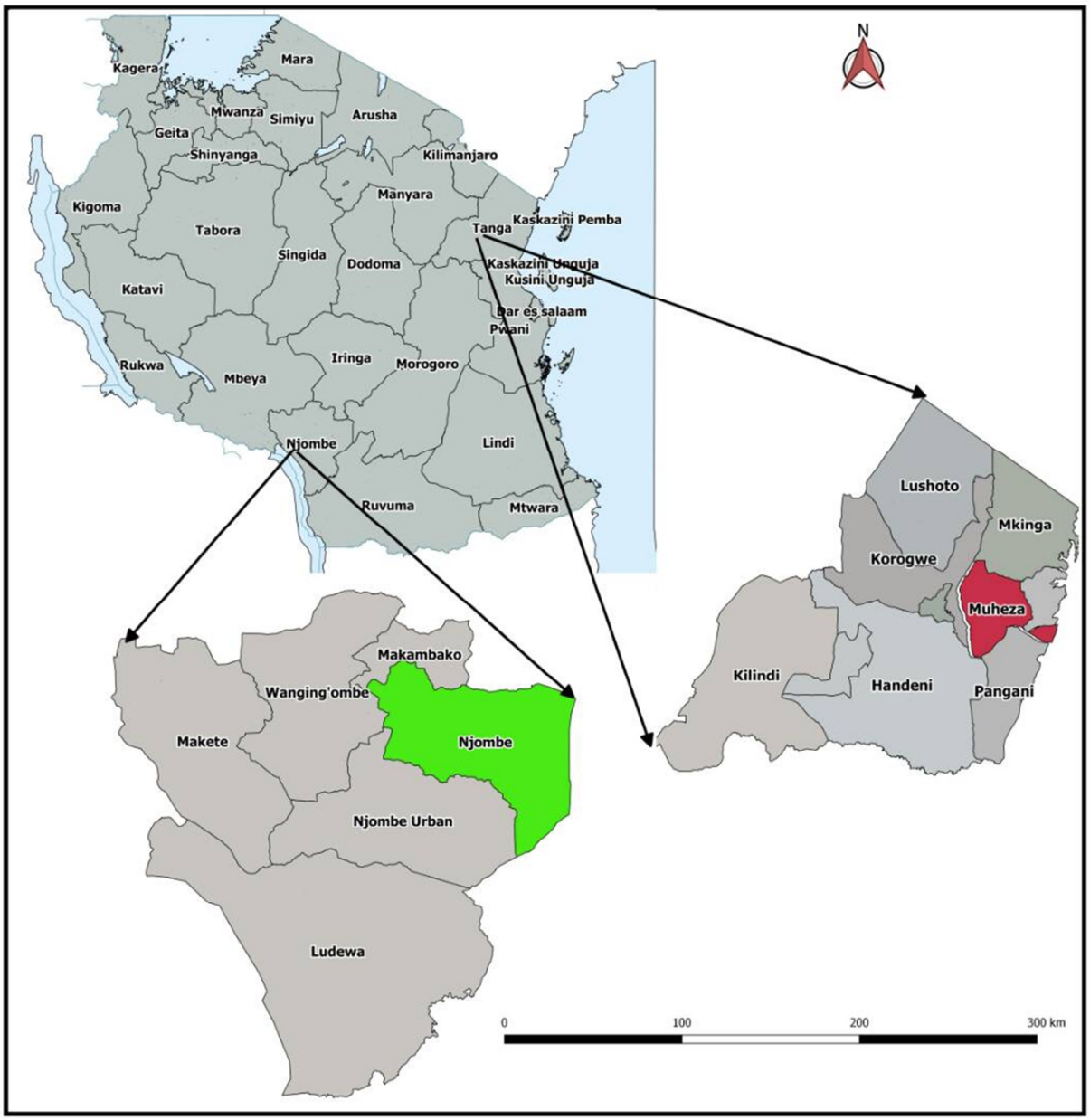

Figure 1:Location of study sites; Njombe (green coloured) and Muheza (red coloured)

Table 1: Socio-economic and demographic characteristics of smallholder tea farmers in the study area

Variable	Muheza District		Njombe District	
	Frequency	Percent (%)	Frequency	Percent (%)
Age (years)				
16-25	38	23.8	19	11.9
26-35	39	24.4	63	39.4
36-46	22	13.8	31	19.4
47-55	41	25.6	40	25.0
>56	20	12.5	7	4.4
Total	**160**	**100.0**	**160**	**100.0**
Gender				
Male	124	77.5	104	65.0
Female	36	22.5	56	35.0
Total	**160**	**100.0**	**160**	**100.0**
Marital status				
Married	133	83.1	131	81.9
Divorced	3	1.9	2	1.3
Widowed	19	11.9	25	15.6
Never Married	5	3.1	2	1.3
Total	**160**	**100.0**	**160**	**100.0**
Level of education				
Informal education	16	10.0	50	31.1
Primary education	133	83.1	98	61.3
Secondary education	6	3.8	7	4.4
College/University	4	2.5	5	3.1
Postal education	1	.6	0	0
Total	**160**	**100.0**	**160**	**100.0**
Membership status				
Yes	97	60.6	37	23.1
No	63	39.4	123	76.9
Total	**160**	**100.0**	**160**	**100.0**
Access to extension/ training services				
Yes	37	23.1	146	91.3
No	123	76.9	14	8.8
Total	**160**	**100.0**	**160**	**100.0**
Access to credits for tea farming activities				
Yes	27	16.9	146	91.3
No	133	83.1	14	8.8
Total	**160**	**100.0**	**160**	**100.0**

* Average age (in years) was 39.38 and 37.69 for Muheza and Njombe study sites, respectively

Table 2:Factors affecting the performance of smallholder tea farmers in Muheza and Njombe Districts

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	365.388	49.021		7.454	.000
Age	-1.968	.668	-.225	-2.944	**0.003*** **
Gender	-13.014	12.150	-.054	-1.071	0.285
Level of education	18.199	9.117	.102	1.996	**0.047** **
Number of household members who assist in tea farming activities	12.504	5.475	.117	2.284	**0.023** **
Tea farming experience	2.345	.812	.224	2.887	**0.004*** **
Distance (in km) from the tea farm to the collection center (market)	3.881	7.210	.027	.538	0.591
Status of tea membership	-72.030	11.556	-.323	-6.233	**0.000*** **
Access to extension/ training services	-29.298	13.687	-.132	-2.141	**0.033** **
Access to credits for tea farming activities	-50.699	13.669	-.230	-3.709	**0.000*** **

a. Response variable: **Performance** (**Quantity × Price**)
b. ***, ****, and ***** indicate significance level at $p \leq 0.1$, $p \leq 0.05$, and $p \leq 0.01$ respectively