East African Journal of Management and Business Studies
EAJMBS April– June 2025, Vol. 5, No. 2, pp. 15-24.
ISSN: 2799-2276 (Online). Published by G-Card
DOI: https://doi.org/10.46606/eajmbs2025v05i02.0071.

Assessment of Smallholder Farmers' Human Capital Development in Crop Farming and Post Harvesting Processing in Ileje District, Tanzania

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Abstract: This study employed the social learning theory to establish major sources of human capital development in agriculture among smallholder farmers in terms of crop farming and post-harvesting processing of crops at Ileje District, Tanzania. The study used the descriptive research design while a questionnaire was the tool for data collection from 364 respondents selected from among smallholder farmers in 10 selected wards in the District. Data analysis involved the descriptive approach. The study found that the major sources of human capital development in both crop farming and post-harvesting processing were parents and guardians, informal education, self-experience, agricultural extension services, and formal education, arranged from the best source to the least source. The study recommends that the government should include the agricultural curriculum in formal education and include other sources of human capital development by application of the social learning theory.

Keywords: Human capital development; smallholder farmers; agriculture; sources of human capital.

How to cite: Mtawa, H., Sospeter, B. and Ngereza, C. (2025). Assessment of Smallholder Farmers' Human Capital Development in Crop Farming and Post Harvesting Processing in Ileje District, Tanzania. East African Journal of Management and Business Studies 5(2),15-24.
DOI: https://doi.org/10.46606/eajmbs2025v05i02.0071.

Introduction

Across the globe, human capital has been used as a fundamental measure of economic and social growth (Kotsantonis & Serafeim, 2020). Human capital is the stock of knowledge, skills, attitude, experience and ability to work and health that people acquire in their life, allowing them to reach their full potential as contributing members of the society (Stromquist, 2019). Different nations apply efforts to develop human capital in economic activities like Agriculture (Kim, 2018). It is said to be a big

mistake when neglecting to have strong sources of human capital in the recent competitive World economy (Kim, 2018). In Pakistan, human capital development in agriculture led to agricultural transformation by 2018 and eventually economic development became easier (Pervez, 2018).

In Indonesia, strong source of human capital development on agriculture added value to agricultural development and finally contributed to economic growth (Bashir, 2018).

Efficient provision, use and management of human capital in agriculture are some of the basic conditions for the successful functioning of the agricultural sector and for ensuring food supply in Kazakhstan (Bazylevych *et al* 2016). Chowdhury and Hossain (2018) used Bangladesh data for 35 years to establish the relationship between the provision of human capital on agriculture and economic growth using an annual data series and concluded that there is a substantial positive relationship between human capital development in agriculture and economic growth. The human capital is formed as a result of investment in strong programs and sources of human capital development, which includes education, training and health systems. Kazakhstan is expected to increase its GDP by 3% in 2050 by modernization of production and good land use through having strong sources of human capital development to farmers (Bazylevych *et al.* 2016).

Similarly, the importance of human capital development on agriculture extends to African countries. For example, the impact of human capital on economic growth in Zambia was proven using the Johansen Cointegration test and Vector Correction Models on an annual time series integrating education and health expenditure (Hakooma & Sheshamani, 2017). In Nigeria, by 2018 the increased enrolment in primary schools increased agricultural performance and also reduced rural poverty by 0.7% and secondary schools enrolment increased and reduced rural poverty by 0.84% (Ewubare, 2018). As a way to create strong source of human capital for different economic activities, including agriculture and finally reduce poverty, some Sub-Saharan countries embarked in Free Primary Education (FPE) in different years, whereby Malawi in 1994, Uganda in 1997, Tanzania in 2001, Lesotho in 2000 and Kenya in 2003. After the introduction of free the primary education in Malawi, the GDP declined from US$220 in 1997 to US$170 in 2000 and agriculture remained stagnant while in 2003, 65% of the Malawi population were still under poverty as agriculture was not practically included in the formal curriculum (Kadzamira et al., 2018). This raises many unanswered questions to whether the education systems of African Countries are good sources of human capital on agriculture among farmers or not and what remain sources of human capital in Agriculture need to be well understood.

Similarly, in Tanzania several efforts have been made to create sources of human capital in Agriculture. From 1961 to 1967, Tanzania took steps to abolish the colonial education system dominated by segregation and inequalities so that many Tanzanians could be educated. During the socialist era from 1967 to 1990, Tanzania introduced Education for Self-Reliance (Yusuph, 2019). The Education for Self-Reliance in Primary and secondary schools was replaced by the Education and Training Policy of 2014 (Mashala, 2019). However, the majority of ex-primary schools and ex-secondary schools leavers are employed in agriculture in Tanzania; for example, in 2015, among Tanzanians involved in agriculture, 20% had no primary education, 64% had primary education, 15% had secondary education and only 1% had tertiary education (Bashasha, 2015). Hence, most of farmers have primary education, where Agriculture subject has been not compulsory over several years and few families afford colleges and universities with agricultural programs (Damayanti, 2021).

Despite the government's efforts to build strong source of human capital on agriculture, the level of human capital development in Tanzania remains questionable, characterized by low and uneven attainment. According to the World Bank assessment, both the Human Capital Wealth (HCW) and Human Capital Index (HCI) per capita appear to be low in Tanzania. Tanzania's performance is estimated to be 0.40, suggesting that today's children and youth may only reach 40% of their maximum production potential as adults due to educational and health disadvantages (Wodon *et al.,* 2019). The data on human capital value, according to the report, confirms that Tanzania has to invest more in its people and build strong sources of

human capital on agriculture. The same report suggests several policy options for expanding human capital investments, including improving health-care availability and quality, improving children's nutrition, education quality, gender equality and workforce skills (Lee *et al*., 2019).

Several studies have contributed to knowledge on agriculture (Masenya *et al.,* 2018; Yusuph, 2019; Ruben *et al.,* 2018; Damayanti, 2021; Delesalle, 2021). However, there is still scant information on major sources of human capital on agriculture among smallholder farmers in Tanzania and this study sought to fills this information gap.

Literature Review

This section gives details on the pre-existing studies and theories. It consists of a discussion on the theory underpinning the study and the empirical literature review.

Theoretical Framework

Bandura's Social Learning theory is adopted to underpin this study in understanding the sources of human capital development for Agricultural activities. According to Okorley *et al.,* (2024), the father of the social learning theory is Albert Bandura, who proposed the theory in 1957. According to Bandura (1977), learning occurs in five stages: observation, attention, retention, reproduction and motivation. He argued that learning is a process that involves observing and imitating the behaviour of others. Therefore. Social Learning Theory views learning as occurring by observing other people and the outcome of their behaviours. Other people's behaviour influences our learning by serving as a guide (Model). Therefore, small holder farmers are expected to learn from extension workers or their fellow successful farmers through social interaction in transforming Agriculture. The theory contributes to this study by pointing on the effective sources of human capital on agriculture to involve practical features. The sources of human capital like parents, fellow farmers and extension officers are important in respect of this theory.

Empirical Review

The mainstream empirical literature on human capital development from different parts of the world indicate that there are different methods of human capital development applied to equip farmers to acquire agricultural knowledge. In Pakistan, for example, formal education system was reported to be the source of agricultural knowledge to farmers (Pervez, 2018). A study by Bazylevych *et al* (2016) in Kazakhstan analyzed the efficiency of use of human capital in agriculture. The findings show that formal education and training increased labour supply due to the strengthening of the labour force.

In African countries, the human capital development through educational sources is embraced. Ewubare, (2018) studied the effect of enrolment in primary and secondary schools in Nigeria and poverty reduction through economic activities. It was observed that the increase in enrolment in primary schools reduced poverty by 0.697% while that of secondary school reduced poverty by 0.84%. The reduction in poverty was a result of increased performance of agriculture through the use of educated people from primary and secondary schools (Ewubare, 2018). For this aspect primary and secondary education was good sources of agricultural knowledge.

A study by Timothy *et al.* (2022) found that farmers in Nzega area of Tabora region in Tanzania had acquired knowledge and skills of irrigation technology and the source of knowledge was not obtained through formal education but mostly through informal training.

Tanzania took moves between 1961 and 1967 to dismantle the colonial education system, which was dominated by racial segregation and inequities, to educate as many Tanzanians as possible. Its goal was to ensure that many Tanzanians received primary and secondary education (Yusuph, 2019). During the socialist era, from 1967 to 1990, education for Self-Reliance was introduced in Tanzania in which Agriculture was incorporated into the curricula and practically taught in formal education. Most Tanzanians were educated to adopt positive attitude toward agriculture and agricultural technologies as part of Education for Self-Reliance (ESR) program. From the 1990s to 2014, the education system followed free market policies; private schools were allowed to operate and education for Self-Reliance came to an end (Yusuph, 2019). Since 2015, free primary and secondary education has existed with less emphasis on agriculture as a result of the 2014 Education and Training Policy (Orodho, 2014).

Sources of Human Capital Development for the Post harvesting processing are found to be important. Swai (2017) conducted a study on Sunflower processing firm in Dodoma City and found that there was no strong source of human capital on processing hence, lack of skills and experience among owners and managers of agro-processing firms for sunflower hindered their adaptability to new technology. Therefore, even if financial resources are supplied, there can be failure in processing products due to lower education among people who will act on such financial resources.

Mkuna *et al. (*2021) conducted a study in Dar - es – salaam on the existing relationship between education level of owners of SME and their decision to participate in agro-processing activities. The study found a positive relationship. For this reason, a strong source of human capital on post harvesting processing is important for one to adopt and interpret different agro-processing processes.

Similarly, the study of Mwambungu (2019) in Kagera Region at Karagwe and Biharamulo Districts evidenced a strong relationship between credits from financial institutions and agribusiness SME's performance and an increased profit. But the effect of financial resources on agribusiness firms' growth depended on human capital among actors on agricultural businesses. This literature implies that there should be a strong source of human capital development on crop farming and post harvesting processing of agricultural products.

Damayanti (2021) used secondary data only from 2000 to 2019 to conduct a study on the relationship between human capital and agriculture. The results show that investments in education and health improved the agricultural performance in Tanzania and human capital development increased the employment in the agricultural sector. However, according to Delesalle (2021) report, agriculture in Tanzania is still underdeveloped due to lack of adequate investment in training and education on agricultural advisory services to small holder farmers. Furthermore, Agriculture's contribution to GDP is likewise reported to have decreased from 27.3 percent in 2006 to 14.6 percent in 2016 (Masenya*, et al.* 2018). Despite the new development in social learning theory, both theory and empirical literature are preoccupied with a leader- follower or manager- subordinate relationship which facilitate social learning and the farmer to farmer or extension officers to farmers learning process has received little attention in the empirical literature. This perplexing ambiguity has created various unsolved concerns, making the current study critical in determining the significant source of human capital development in agriculture among farmers in Tanzania.

Methodology

This section presents the research methodology used in the study. It addresses the research design, study population, sampling technique, data collection methods, variable measurement, data analysis techniques, study's validity and reliability and ethical issues.

Design

The study applied the descriptive research design, which fitted in describing the distribution of population of smallholder farmers in their sources of human capital development by using frequency and percentage tables. The descriptive design was applied because it allowed data collection that meets the objectives and time duration of the study.

Population and Sampling

The study was carried out in Ileje District, Songwe Region located in southern highland of Tanzania, whereby ten (10) wards mostly involved in Agriculture were purposely selected out of eighteen (18) wards of Ileje District. The place fitted the study because over 80% of the population are smallholder farmers who rely on subsistence farming instead of intensive farming (Ruben, 2018).

The sample size was determined by the Cochran (1963) formula ($n=\frac{\left(Z\alpha_{/2}\right)^2(\sigma^2)}{E^2}$) fiting for large and unknown populations, where by n = sample size; σ = estimated standard population of smallholders farmers' with household income (>50%) generated by farming in the area of study for the past three years; *E* = maximum error (Nanjundeswaraswamy & Divakar, 2021). By assuming a confidence interval of 95% for the estimated population proportion and the

maximum error of 5%, the final sample was calculated to be 385 smallholder farmers while only 364 returned the questionnaires.

Sources of Data
The study mainly used primary data from the field through a questionnaire.

Statistical Treatment of Data
Descriptive statistics method of data analysis was used to analyse data. The Statistical Package for Social Sciences (SPSS) version 26.0 IBM software program was used to compute the descriptive statistics into meaningful forms.

Ethical Considerations
This study addressed all ethical issues and followed the research procedures. The research permits were obtained from relevant authorities, including the Permanent Secretary of the President's Office Regional Administration and Local Governments, then from the Regional Secretary of Songwe Region, and finally from the District Executive Director and the District Commissioner of Ileje District. Confidentiality was highly maintained and plagiarism check was done to ensure the originality of the work.

Findings and Discussion
This section provides findings with detailed discussion in relation to previous studies and the theories.

Demographic Characteristics
The study included the respondents with diverse demographic characteristics in terms of gender, marital status, age and education level as presented in Table 1.

Table 1: Demographic Characteristics of Respondents (n=364)

Demographic Characteristics		Responses of Respondents	
		Frequency (F)	Percent (%)
Gender of Respondents	Male	273	75
	Female	91	25
Marital Status of Respondents	Single	18	4.9
	Married	309	84.9
	Divorced	15	4.1
	Widow/widower	22	6.1
Age of Respondents	18 – 35 (Youth)	138	37.9
	36 – 60 (Adults)	168	46.1
	Above 60 (Elders)	58	16
Education Level of Respondents	Primary	255	70.1
	Secondary	84	23.1
	Certificate	11	03.1
	Diploma	11	03.1
	Bachelor +	2	0.6

The study included the respondents with diverse demographic characteristics in terms of gender, marital status, age and education level as presented in Table 1. For the case of Gender, most of the respondents were males (75%). Regarding marital status, most of the respondents were married (84.9%). For the case of age, a bigger portion of the respondents were aged between 36 and 60 (46.1%) followed by those aged between 18 and 35 (37.9%). Based on education level, most of the respondents had primary education (70.1%) followed by those who had secondary education (23.1%).

Research Question 1: What are the sources of human capital development in terms of crop farming?

In response to this research question, farmers were asked to respond to the predetermined sources of human capital development across different measures of human capital, which are knowledge, skills, attitude and experience. In this context, the farmers were asked to identify sources of their knowledge, skills, attitude and experience in crop farming as presented in Table 2 (p. 20). The Table shows different sources of human capital development in terms crop farming among farmers but differ in their level of contribution as pin pointed by respondents. These sources of human capital in crop farming the among farmers are discussed in respect of their acceptance level by the respondents, starting with the most accepted to the least accepted.

Parents and Guardians

Parents and guardians was accepted by 29.7% of respondents to be the source of crop farming knowledge, by 30.2% as the source of crop farming skills, by 49.7% as source of good crop farming attitude and by 48.9% as source of experiences. Parents and guardians was the mostly supported source of human capital on crop farming among small holder farmers.

The findings imply that parents and guardians remain the source of passing crop farming knowledge, skills, attitude and experience across generations. These results relate with those in literature and theory; for example, a study by Damayanti (2021) confirmed that most of smallholder farmers get human capital in Tanzania informally which is related to parents and guardians. In addition, Fidelugwuowo (2021) found that the major source of agricultural information and knowledge among farmers was friends and co-workers.

Table 2: Sources of Human Capital in terms of Crop Farming (n=364)

Sources of HCD	Knowledge	Skills	Attitude	Experience
Formal Education	10.5%	9.7%	01.1%	01.6%
Agricultural Extension Services	11.8%	10.7%	10.9%	09.8%
Self-Experience	19.9%	17.9%	09.7%	10.2%
Parents and Guardians	29.7%	30.2%	49.7%	48.9%
Informal Education	25.8%	29.9%	27.7%	26.9%
Vocational Education	02.3%	01.6%	01.5%	02.6%
Total	**100%**	**100%**	**100%**	**100%**

This relates with the findings of the current study whereas agricultural knowledge, skills, experience and attitude were found to come from parents and guardians in social settings, which is nearly the same as friends and co-workers, which are also socially passing agricultural knowledge and skills to others. The results are relevant to social learning theory whereby parents and guardians remain the model for young farmers to learn from.

Informal Education

Informal education under this context involves a well-organized learning out of formal education systems from primary schools to tertiary levels. Informal education was the second supported source human capital in crop farming among farmers whereby 25.8% of respondents commented that informal education is a source of crop farming knowledge, and 29.9% commented that it is the source of crop farming skills. Furthermore, 27.7% supposed that the informal education is the source of crop farming attitude and 26.9% pinpointed that crop farming experience among farmers comes from informal education.

These results imply that informal education has reasonable contribution to farmers' crop farming knowledge, skills, attitude and experience. A study by Damayanti (2021) found that most of smallholder farmers get human capital in Tanzania informally due to time and expenses involved in formal education. Similarly, Finnaly and Swai (2017) found that sunflower producers did not acquire production knowledge and skills through formal education but through informally organized training in social groups. Hence Social learning theory could fit to intensify agriculture in this context.

Self-Experience

In this context self-experience was supported to be the source of human capital development among farmers in terms of crop farming. Table 2 shows that 19.9% of the respondents supported that self-experience is the source of crop farming knowledge and 17.9% supported that self-experience is the source of crop farming skills. In addition, 09.7% of the respondents pointed that self-experience is a source of crop farming attitude and 10.2% supported self-experience to be contributing to crop farming experience. The literature shows that after the introduction of free primary education in Malawi, agricultural sectors remained stagnant and in 2003, 65% of the Malawi population was still under poverty (Kadzamira *et al.,* 2018). In addition, Tamako *et al.,(*2022) found that self-experience improved food accessibility among farmers in Iringa due to improved farming. Hence, self-experience matters a lot as source of human capital development in crop farming.

Agricultural Extension Services

Agricultural extension services was supported by 11.8% of all respondents to be the source of knowledge in crop farming. Furthermore,

10.7% of all the respondents supported that extension service is the source of crop farming skills while 10.9% supported that it imparts good crop farming attitude; finally 09.8% of all respondents supported extension service to be the source of crop farming experience among small holder farmers. These results imply that agricultural extension service is among sources of human capital in terms knowledge, skills, attitude and experience. According to Ndimbo *et al.,* (2023), there is limited number of public extension service agents in Tanzania. These lead to lower contribution of extension services to farming knowledge, skills, attitudes and experiences. In addition, Nord et al. (2022) added that there was disconnection between extension services provided to farmers and the real requirement of leguminous crops in the Southern Highlands of Tanzania, where extension recommendations did not take into account the varieties, fertilizer or plant spacing used by farmers and this acted as a barrier to sustainable intensification of smallholder farming. In respect of the social learning theory, demonstration farms and successful farmers can be models to intensify agriculture in Tanzania.

Formal Education

Formal education was supported to be contributing to crop farming knowledge of which 10.5% of respondents supported the point. Formal education was found to cause less effect in imparting crop farming skills whereby only 9.7% supported it. In addition, formal education was less supported to create positive attitude by only 01.1% of the respondents and experience by only 01.6%. The results relate with those of Timothy *et al.,* (2022) who found that farmers in Nzega area of Tabora region had acquired knowledge and skills of irrigation technology through training not through formal education. This can be a result of abolition of education for self-reliance, which even made agriculture to be given less emphasis in the formal education system of Tanzania (Yusuph, 2019).

In general, small holder farmers of Ileje District get agricultural knowledge, skills, attitude and experience from different sources of human capital development, including parents and guardians, informal education, self-experience, extension services and formal education.

Research Question 2: What are the sources of human capital development in terms of Post Harvesting Processing?

The study intended to determine sources of human capital in post harvesting processing as seen in table 3, which shows various sources of human capital development as identified by the respondents. These sources are presented and discussed in respect of their level of acceptance.

Parents and Guardians

Findings show that 50.7% of the respondents supposed that parents and guardians are sources of post harvesting processing knowledge and 54.5% supported the same as the source of post harvesting processing skills.

Table 3: Sources of Human Capital in terms of Post Harvesting Processing (n=364)

	Human Capital Factors/Indicators			
Sources of HCD	**Knowledge**	**Skills**	**Attitude**	**Experience**
Formal Education	02.2%	00%	00%	00%
Agricultural Extension Services	20.1%	15.9%	18.5%	17.4%
Self-Experience	16.4%	15.9%	09.2%	18.2%
Parents and Guardians	50.7%	54.5%	62.3%	55.3%
Informal Education	06.8%	10.6%	07.7%	05.3%
Vocational Education	03.8%	03.0%	02.3%	03.8%
Total	**100%**	**100%**	**100%**	**100%**

Furthermore, 62.3% of the respondents considered good post harvesting processing attitude coming from parents and guardians and 55.3% supported that parents and guardians are the sources of post harvesting processing experience among small holder farmers. These findings imply that parents and guardians are the key source of post harvesting processing knowledge, skills, attitude and experience among the small holder farmers at Ileje District.

These findings directly relate with the social learning theory, which contends that people learn from others in the social environment (Okorley *et al.,* 2024), For this reason, most of

the farmers in Ileje District socially received knowledge, skills, attitudes and experiences of post harvesting processing from guardians and parents socially as suggested by the social learning theory. In this context, social learning theory can be applied in Agricultural intensification by having role model farmers for other farmers to learn socially so as to foster farmer to farmer human capital transfer.

The findings relate with that of Fidelugwuowo (2021), who found that major source of agricultural information and knowledge among farmers was from friends and co-workers who are of the same vein as parents and guardians as learning is done socially. Similarly, Nord et al. (2022) found that social transfer of agricultural human capital among farmers worked better in social groups and brought good results. In addition, Fredriksen, (2023) found that the provision of free primary and secondary formal education has not largely contributed to agricultural transformation as compared to unregulated informal knowledge transfer which works better.

Agricultural Extension Services

Agriculture extension services was the secondly supported source of human capital, whereby 20.1% of all respondents accepted that it is the source of post harvesting processing knowledge and 15.9% supported that post harvesting processing skills come from agricultural extension service while 18.5% of the respondents commented that post harvesting processing attitude among farmers comes from the agricultural extension service; finally 17.4% of the respondents supported that post harvesting processing experience among farmers comes from the agricultural extension services. These results imply that agricultural extension services are the source of post harvesting processing knowledge, skills, attitude and experience among small holder farmers of Ileje District. The social learning theory can be applied by extension officers by creating demonstration units and train few role model farmers and other farmers can learn from demonstration units and from role model farmers to fasten human capital development in the post harvesting processing activities.

The findings conform to those of Ndimbo *et al.* (2023), who found that in Tanzania, there is limited number of public extension service agents, something which forces most smallholder farmers to opt for ICTs as an alternative source of agricultural information and knowledge. The current study shows reasonable contribution of extension services. The results contradict with those of Nord *et al.,* (2022), who found that there was disconnections between extension services provided to farmers and the real requirement of leguminous crops in the Southern Highlands of Tanzania, where extension recommendations did not take into account the varieties, fertilizer or plant spacing used. However, the current results are based on post harvesting processing activities, where the extension services have great contribution to farmers.

The rest of sources of human capital development in terms of Post Harvesting Processing included formal education, self-experience, informal education and vocational education, which were minimally cited by the respondents.

Conclusion and Recommendation

Conclusions

This study achieved its objective of determining the major sources of human capital development among smallholder farmers in Ileje District and each research question was well addressed. Regarding sources of human capital development in crop farming, parents and guardians, informal education, self-experience, agricultural extension services and formal education, arranged from the best source to the least source, were recognized as existing sources. Regarding sources human capital development in post harvesting processing among farmers, the key sources were mainly two: parents and guardians and agricultural extension service. Other minor sources includes Self-Experience, Informal Education, vocational education and formal education.

Recommendations

Based on the conclusions, the study recommends that the ministries responsible for education and agriculture in Tanzania should include the agricultural curriculum in formal education, making agriculture a compulsory subject. In addition, the identified sources of human capital development should be strengthened by government interventions through creating good models, where other farmers can learn through the basis of the social learning theory.

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