



What Role for Remittances in Farm Inputs Expenditure among Paddy Farming Households? A Case Study of Kilombero Valley, Tanzania

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Authors' contributions

This work was carried out in collaboration between both authors. Author JM designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Author FS managed the literature searches and final proof reading of the draft paper. Both authors read and approved the final manuscript.

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ABSTRACT

Migration and remittance have a potential to enhance farm intensification through spending on essential farm inputs and thus apparently improving farm production for liquidity constrained rural farming households. This study was conducted to investigate the effect of remittance derived from rural out-migrants on the expenditure on farm inputs using paddy dominated farming households of Kilombero Valley, Tanzania, as a case study. A questionnaire was used to collect data among 309 randomly selected households. The tobit model that considers cornered observations was used to assess the effect of migration and remittances on input expenditure. A T test was conducted to compare differences in input spending between migratory and non migratory households. Results show that remittances overcome inputs market failure as it provides cash that rural households use to purchase essential farm inputs. However, the results based on the T test revealed that there is no significant difference in terms of spending on hired labour (as one of a farm input) between migratory and non migratory households. The positive income effects of remittances outweigh lost-labour effects. It is thus recommended that migration should be encouraged through the growth of economy and thus the link between rural and urban areas should be strengthened.

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1. INTRODUCTION

In Africa, rural households largely survive by subsistence farming. The future of farming however, depends on farm intensification as farm land expansion is limited due to rapid population growth and constraints in terms of available land resource. This has posed threat to households that rely on subsistence farming and with poor capacity to practise farm intensification through inputs use. However, there is increased recognition of rural households' modification of their income sources and economic activities [1-3], including diversification towards off-farm employments, which sometimes entails migration to urban areas. Rural-urban migration has not only been perceived as a response to macro forces that respond to rural surplus labour and urban quest for cheap labour as predicted in [4], but it is also a household strategy adopted to address rural economic vulnerability including those related to constraints in farm intensification.

For the study area, farm intensification in terms of inputs use is of crucial significance considering that the area is designated as a Ramsar site under UN convention on wetlands protection. Under the Ramsar convention, Kilombero as a wetland area of global significance should be protected and this should go in tandem with improving economic sustainability for the communities [5]. Since farming is the main livelihood activity and cultivated land is shrinking due to protection measures in the valley, more intensification though increased use of production improving inputs is an appropriate strategy to enhance livelihoods in Kilombero valley and protecting the wetlands. One of the approaches to farming intensification is adequate use of farm inputs. Nevertheless, rural households in the study area as elsewhere in sub-Saharan Africa are poor and face liquidity constraints that limit inputs purchase. Furthermore, the market for these inputs, e.g machinery, fertilizer and herbicides is poorly functioning in Tanzania in general and Kilombero Valley in particular. Lack of rural financial markets has been one of the major constraints in the adoption of intensification through adoption of new technologies and farm inputs elsewhere in developing countries [6-8]. A countrywide survey conducted in 2012/2013 in Tanzania shows that, the use of inputs including mechanised machines is very limited with only 6% of farmers reported using tractors [9].

It is undeniable that, diversification towards waged activities, off-farm employment and migration is an essential feature of rural livelihoods. Migration is an important aspect of livelihood diversification and constitutes a significant source of income [10]. Migrants' remittances in terms of cash not only help rural households to cope with risks farming [1,11], but also constitute a major source of income [12] and enable households to potentially increase their investment in agriculture including purchasing essential farm inputs. Remittances which show migrants' earnings sent from migration destinations to the origin have been found to contribute positively to farm productivity [13,14]. In this paper, we argue that, despite its positive remittance effect, migration poses a potential threat as it may deprive rural households of labour force in a context of labour demanding farming. By situating this study in a Tanzanian rural setting dominated by high labour demanding paddy farming which is fraught with limited input supply, examining desirable positive effects and labour withdrawing effects is imperative. In addition, if migration and hence remittance is of relevance for farm intensification, then it may be necessary to ensure a more welcoming environment for migrants in urban destinations.

Tanzania's specific literature offers relatively little insight in empirical studies on the relationship between remittance and household farm production, particularly with regard to the expenditure on farm inputs. Most migration studies [15,16] have been largely based on one aspect of migration, i.e. determinants, with limited discussion on related remittance effects. One of the few studies that attempted to examine the impact of off-farm employment (of which migration is part) on farm input by [17]¹ was based on a descriptive analysis and was conducted in the less agriculturally favourable semi-arid areas of central Tanzania. The present paper addresses this issue by focusing on one of the favourable agro-climatic regions of Tanzania dominated by subsistence paddy farming.

¹*In the study by Katega and Lifuliro (2014) the focus was on non-farm income which includes only non-farm self-employment income of which farm wages are not part. Farm wages have been used in a number studies on off-farm diversification, for example [18,19].*

The main purpose of this paper is to examine the effect of remittance on expenditure on farm inputs. The paper proceeds as follows. Section 2 is a theoretical discussion on the relationship between remittances and input expenditure/use. Section 3 outlines the methodology. This is followed by a section that presents the results. Section 5 draws the main conclusions of the paper.

2. LITERATURE REVIEW

There are two types of studies which discuss the relationship between migration/remittance and farm investment (i.e. input expenditure). Firstly, remittances available from migrating household members may offset input credit market failure. This is termed as income effect if migration is considered as an off-farm livelihood strategy as claimed by [20] and [21]. Remittance is the most pronounced direct positive income effect of migration on the areas of migrants' origin. Remittances have been found to increase income that indirectly enables migrant sending areas to overcome farm input constraints and other risks associated with farming. Thus, migration occurs as a response to household liquidity concerns and as an alternative source of income to ensure against risks of crop failure [22].

Other studies provide a more pessimistic view in which migration is conceived as having a labour withdrawal effect or a lost labour effect. This occurs when working household members move out of rural areas [23,24]. Apparently, households may hire labour to replace the labour loss to migration. However, in rural areas of Africa, migration is considered as an off-farm diversification strategy that may have an undesirable effect on household labour supply. The Lost labour effect is particularly relevant in this analysis due to the prevalence of labour demanding subsistence paddy farming in Kilombero valley. This particular migration effect is difficult to assess [25].

These theoretical views on the role of migrants on input including labour supply have resulted in a body of empirical debates. A study by [26] observed that in rural Pakistan, migrants are more likely to invest in their areas of origin than their non-migrants counterparts. Other studies [25,27,28] provide further evidence and support the new economics of labour migration model (NELM)- a common model employed in migratory studies. Based on NELM, migration is considered

as a family response to counteract the effect of farm input market failure. A study conducted in rural India by [29] found that remittance receiving households were using more modern agriculture technologies such as improved varieties of rice and improved transplanting techniques as compared to non-remittance households. In contrast, [30] noted a significant negative effect on farm efficiency among migrant households. In the same line of analysis [31] observed that migration is a severe strain on household male labour leading to a decline in agriculture production and inadequate land improvements in rural Africa. In another study conducted in Burundi, [32] found that migration did not increase intensification in banana and legume production as it affected fertilizer use negatively. The findings by [32]. were consistent with another cross country study conducted in Central America by [14], in which increased economic migration was found not to lead to dramatic changes in tendency to use chemical soil amendments, hired labor or to purchase mechanized agricultural equipments.

Therefore, there is no conclusive evidence to support the hypothesis that remittances have an effect on farm investment. However, it may seem that, in some cases the negative lost labour effect of migration may be offset by overall income gain from remittances. In fact, [33] concluded that the net negative labour effect outweighs the positive income effect of migration among maize growing migrant households. This paper employs a setting of rural paddy farming community to extend the literature and examine the effect of remittance which may apparently be context specific.

3. METHODOLOGY

3.1 Description of the Study Area

The study area, Kilombero Valley, is located in the Tanzanian South western region of Morogoro, about 300 km away from the commercial city of Dar es Salaam. The area has an annual rainfall of 1,200-2,600 mm between November-April [34] and is usually flooded during the heavy rain season of March-April. The area is 11,600 km² and it is dominated by subsistence paddy producing households [35]. The valley is a major rice producing area, supplying 9% of all rice produced in Tanzania [36]. The area is also characterised by having positive net migration as there has been increasing agro-pastoralist migration over recent years leading to increased pressure on cultivated land [37].

3.2 Data Collection and Sampling

Data for this study was collected in the first quarter of 2014 using a household survey and key informants interviews. Because migration is considered as part of production and consumption decisions of a household as predicted in the NELM model, the survey has gathered data on all aspects of household farm production and income. The sampling was based on the villages, which are the lowest administrative units in Tanzania. The dominance of paddy farming was the main selection criterion. The selection of these villages was further made to reflect two important attributes: accessibility and/or remoteness, on the one hand, and endowment with farm land resource, on the other. Three of the selected villages, Malinyi, Mngeta and Lupilo were regarded as more remote and land endowed, whereas Lumemo and Mngeta are land constrained and accessible villages. Theoretically, these two attributes were expected to influence both migration and use of farm inputs. The sampling intensity for each village was 5%. The random sample was then adopted to select 309 paddy farming households. These were households that had farm under paddy cultivation in 2012/13 and 2013/14 farming seasons, since the measure of input was based on these years. About 95% of households in Kilombero Valley engaged in paddy farming. For further details on village level sampling process see [38].

3.3 Variables

This paper intends to examine relationship between remittance and input expenditure. Regression models best fit this kind of analysis. The selected regression model should consider the censoring of the main dependent variable, which is expenditure on input per hectare.

The dependent variable is censored because some of the households (70 out of 309) reported non use of the inputs in the 2013/13 season, leading to zero observations for some respondents. The use of ordinary least squared (OLS) regression in this kind of analysis would have led to biased and inconsistency estimation [39]. The alternative relevant econometric models of choice for the analysis involving censored dependent variables are the Tobit and the Two part model (TPM). The decision to use the former model was motivated by the assumption that the decision to use input and the

decision about the amount of input to use are determined by same processes.

$$Y_i^* = \beta_0 + \beta_n X_i + \varepsilon_i$$

But, $Y_i = \{ Y^* \text{ if } Y^* > 0 \}$ and $\{ 0 \text{ if } Y^* < 0 \}$

Y_i^* is a latent variable for the i^{th} household. X represents a vector of independent variables that are expected to influence the dependent variable. The β_n are the parameters assessed and ε is the error term which is assumed to be normally distributed, with a zero mean and constant variance. For different values of independent variables the equation becomes

$$Y_i^* = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \dots + \beta_n X_{in} + \varepsilon \dots$$

The dependent variable is farm input expenditure per hectare. Three main inputs were considered: labour, machinery and herbicides. Herbicides were chosen because other related inputs such as seeds and fertilizers were used to be subsidised by the old National Agriculture Voucher Scheme (NAIVS)² and rarely used in Kilombero Valley. Hence, input expenditure was measured by total expenses per hectare (Tshs/ha) in 2013/14 season.

The main predictor variable was remittance. This was a dummy variable that considered whether a household had received a remittance in the year before the survey or during the 2013/14 farming season. Prior to remittance assessment, the survey considered migration, i.e. whether a particular household had a member who was away for more than one year before the survey. In essence, this is referred to in literature as circular migration.

A number of income sources were also included as controls, including non-farm self-employment (NFSE) income farm wage (FW) income and non-farm wage employment (NFW) income. NFSE income was measured by including net profit from other local income earning activities (except migration income) together with income from the sale of farm products. FW income is based on annual accumulation of income from working on other farms or plantations. The last

² This was a public provisioning scheme initiated in the 2008/2009 in which the government subsidised some essential inputs (seeds and fertilizers) for maize and rice smallholder farmers in agricultural productive regions. In this scheme, the government contributed 50 percent of the cost of a selected input [40].

income category, non-farm wage income was computed from annual wages for the household head who has a regular salary. We also include access to credit in the 2013/2014 season as this was expected to have an influence on expenditure on input.

We specified the area cultivated (ha) in the model as a large plot of cultivated land may entail more input expenditure. Because of the rain-fed nature of farming, cropping risks and shocks due to the weather is a constant threat to paddy productivity in Kilombero. Hence crop shock (a severe crop loss in 2012/13) was taken into consideration. Location differences between villages were controlled by including a dummy variable for household location in Mangula/Lumemo. These villages are in more land constrained area, something which may imply more intensification and thus increased spending on inputs. Following [41,1], the number of years of schooling of the head was included to control household endowment with human capital.

4. RESULTS AND DISCUSSION

4.1 Households' Inputs Expenditure Based on Migratory/ Remittance Status

The information on migratory status and type of input expenditure is crucial for a detailed discussion on the overall effect of remittances on input expenditure. Table 1 shows the total number of migratory households and a comparison between expenditure on herbicides, machinery, labour and households migratory status. A T test was then conducted to compare mean differences between households with migration members (with 95% of migratory households reported receiving remittances) and households without migration history (non-migratory). It is generally noted that remittance receiving households seem to have higher input spending than non remittance (non-migratory) households. This means that migration may have a positive income effect and offset the labour lost effect often mentioned in the literature. It should however be noted that no firm conclusion of the positive effect of remittance is stated here. The estimation model in section 4.2 will draw more conclusive results on the relative importance of remittance. There were notable differences in terms of expenditure on the different types of farm input between households with and those without a migratory member.

Table 1 shows that there is a slight significant difference in terms of spending on labour cost between migratory and non-migratory households. Similar findings were reported among banana and legume producing community in Burundi by [32]. However, the difference is not of statistical significance. This finding is particularly intriguing because it shows that, despite the labour loss, migratory households do not spend much on hiring replacement labour. One may think that this labour loss is offset by more spending on inputs, particularly herbicides by migratory households as shown in Table 1 (with statistical difference $P= 0.007$). This should be considered with a caveat. Although households in Kilombero valley cannot choose between using herbicides or human labour for weeding, still for intensive labour demanding paddy farming there are activities like harvesting that make human labour indispensable. In this case there is a lost labour effect as migration deprives households of highly needed human labour, which may have an implication for productivity. This lost labour effect may not be unique to internal migration (within one country), but there is evidence from Rural Bukina Faso [28] in which it is a salient feature of continental and intercontinental migration.

Expenditure on machinery is statistically different ($P=0.025$) with migratory household spending comparably higher. This emphasises the value of remittance [13]. For the case of households in this study, machinery and human labour are hardly substitutive. This implies that remittances have significant role in farm investment regardless of household labour supply.

The findings in this particular section highlight the need to consider both income effect and labour in examining the relationship between remittances and farm input. In areas with intensive labour demanding farming such as Kilombero some of the input including human labour cannot be replaced.

4.2 The Role of Remittances on Paddy Farm Inputs

The results of model estimation on the role of remittances on farm inputs are presented in Table 2. The estimates are based on marginal effects. Remittance was positive and significant at a 5% significance level. This implies that households receiving remittances have increased probability of spending on paddy farm

inputs as compared to non-remittance households. These findings complement a bulk of literature on the positive effect of remittances on farm investment [42,43] and particularly on the effect of input expenditure [44,32]. There are two plausible explanations for this. First, as a result of lack of input credit market for essential paddy input like herbicides, remittances provide cash for spending on farm inputs. It is important to note that in agricultural productive areas, other inputs such as seeds and fertilizer have been subsidised in Tanzania by NAIVS scheme. However, for paddy farmers in Kilombero Valley, these inputs are not as important as herbicides which is not subsidised. Secondly, the positive role of remittances may imply that the labour lost to migration is replaced by hired labour as a result of remittances. In essence, the amount remitted by migrants is essentially geared to hire labour and purchase other necessary farm inputs.

On the other hand, other control variables behaved largely as expected. For example, the education of household head was positive and significant ($P = .05$), which means that education

is associated with higher input spending. Education raises income, as it increases the chances of employment, and hence more income may be diverted to input expenditure. Similarly, educations raise awareness of best farming practices including those associated with input spending and use. Access to credit as found elsewhere in literature [32] has a positive influence on input expenditure. It is important to note that there are no formal institutions for credit market in the study area; hence households basically rely on unreliable informal borrowing mechanisms through self-help groups.

Two control variables are worth being discussed. These are non-farm self employment income and farm wage income, which had a positive and negative connection with input expenditure respectively. Whereas income gain from non-farm self-employment contributes to more spending on inputs, farm wage income has a less intuitive effect as it leads to declined input expenditure. This means that the lost labour effect partly highlighted in migratory households presented in subsection 4.1 is also prominent

Table 1. Input expenditure by household migratory status

Type of farm input expenditure	Migrant households (n= 213) (a)		Non-migrant households (n=96) (b)		T-test means difference
	Mean	S.D	Mean	S.D	
Expenditure on herbicides	15,720	16,439.6	16,749	17,333	2.660***
Expenditure on hired labour	9,822	1,199	9,238	12,706	-0.460
Expenditure on Machinery	76,475	40,567	48,112.5	49723	2.231**
Total input expenditure	79,345	64,447	68,760	57,131	1.841**

*Notes: all values are in Tanzanian shillings (Tshs). 1 USD was equal to 1,635Tshs during time of data collection, S.D=standard deviation. Number in brackets represents P-values. *, **, *** represents $P < 0.1$; $P < 0.05$; $P < 0.001$ respectively*

Table 2. Effect of remittance on farm input expenditure-tobit estimation

Variable	Estimate	Standard error	Probability
Household size	26575.4	9903	0.007
Crop shock	-59655.2	41008	0.146
Education of Household's head	15123	6878.7	0.028
Access to credit	90778.8	41141	0.027
Remittance	900778	46585	0.053
Cultivated area	30024.06	5222.8	0.000
Group membership	25183.3	12699	0.047
Non-farm wage income	-0.9859	0.0301	0.603
Non-farm self employment income	0.0220	0.01124	0.050
Farm wage income	-0.9859	0.4015	0.014
Mang'ula/Lumemo	124806	40266	0.002
Total observations	309		
Left-censored observations	70		
Uncensored observations	239		

even in local farm labour activities. The implication here is that, the income effect and the lost labour effect are also shaped by the nature of labour works that household members are involved in. It is important to emphasise an aspect of lost labour effect, i.e. migration is more common when there is income shortage, at the peak of the farming season. Surely, this pattern of movement should affect household labour supply. Lastly, the locational factor also matters when it comes to input spending. The dummy, household location in Mangula/Lumemo is positive and significant at 1%. This indicates that there is possibility of more spending in input for households that are located in these two villages, located in an area with land constraint, making more intensification in terms of more input use necessary. But positive value for Lumemo/Mangula dummy may also imply income from off-farm activities, which may provide more cash to be diverted to input expenditure. Thus it is not surprising that these villages have also been found to be generally less poor in terms of income [38].

It can be concluded that, remittance increases input spending for households in Kilombero Valley. The argument of income effect prevails as the loss to migration is offset by the remittance sent to migratory households. However, there is no direct link between remittance and farm input expenditure. There is a potential problem of endogeneity in the model, since other income sources accrued by households are likely to determine migration and hence remittances.

5. CONCLUSION

This paper has examined the effect of migration on farm investment with a particular emphasis on the farm inputs effect. The econometric results based on the Tobit model have revealed the positive effect of migration on input spending. The role of migration and remittance on farm investment is crucial in Kilombero Valley. Ever increasing migration affects investment in farming. This was noted in the study area which has intensive and labour demanding paddy farming. Given the limited sample, the results can only apply in a context of intensive crop farming coupled with general labour scarcity in a rural setting of developing countries. It is necessary to develop strategies that strengthen the link between rural and urban areas and create a good environment for seasonal migrants seeking employment in urban areas, particularly

during the more labour demanding off-farm season. This is important since migration during the peak of farming season reduces the labour force. Migration should ensure the smooth movement of rural migrants and hence a stable remittance flow that is diverted to farm investment. This is relevant considering the lack of essential inputs such as herbicides.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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