**Hans H. Ruthenberg-Graduierten-Förderpreis 2023/**

**Hans H. Ruthenberg Award for Graduates 2023**

Eleanor Gardner "Forest Incomes: A Means to Achieve Aspirations and Move out of Poverty?", University of Bonn, 2022

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## Summary

Food insecurity has been on the rise in sub-Saharan Africa since 2017, aggravated by global crises such as the Covid-19 pandemic, with almost a quarter of the population undernourished in 2021 (FAO, 2022). At the individual level, poverty is a primary driver, eroding access to sufficient and nutritious diets. Of the world's poor, roughly 63% (305 million people) live in rural areas of sub-Saharan Africa and are mostly reliant on subsistence agriculture (UNDP and OPHI, 2022; Di Nucci et al., 2020).

In this context, it is common for rural households to supplement their income by extracting forest resources to sell or directly consume as fuelwood, medicines or wild foods (Walelign, 2013). There are three purposes of forest incomes for poor households proposed in the literature: i) meeting daily subsistence needs, ii) functioning as a safety net in times of shocks, and iii) enabling a 'pathway out of poverty' (Cavendish, 2002; Angelsen and Wunder, 2003). A 'pathway out of poverty' can be defined as the accumulation of capital in order to implement a strategy of either 'stepping-out' (diversifying into other activities) or 'stepping-up' (intensification or specialisation of existing activities) (Babulo et al., 2009). While the current consumption and safety net theories are well evidenced, empirical evidence of forest income enabling households to move out of poverty is inconclusive.

In the absence of sustainable management and with high demand for arable land, tree cover has rapidly declined. According to Global Forest Watch (2022), Tanzania, Namibia and Kenya have respectively lost 11%, 32% and 14% of their total tree cover between 2000 and 2021. In addition to an unprecedented loss of ecosystem services and biodiversity, this risks the food security of the most vulnerable on two fronts: the loss of forests' direct provisioning of foods and daily necessities and the loss of sources of investment for farms and livelihoods.

This thesis aims to provide robust evidence on whether informal forest incomes provide a 'pathway out of poverty' in Tanzania, Namibia and Kenya, and based on this, make policy recommendations to support sustainable livelihood strategies. To the best of my knowledge, the thesis is novel 1) in its use of aspirations as 'forward-oriented motivators' (Bernard et al., 2012) to overcome the limits of cross-sectional data and identify whether forest income is used for long-term investments and 2) in its application of censored regression models to model 'aspiration-investment' relationships.

To investigate whether forest incomes enable aspirational farmers to invest in their farms as a 'pathway out of poverty', the theoretical framework (Figure 1) sets out three hypotheses which must hold: HI) higher aspirations lead to greater investment in crops and livestock. Alternatively, a medium gap between current status and aspirations could be optimal because a low gap does not provide incentives and a high gap leads to frustration (Ray, 2006); H2) higher aspirations (or a medium aspirations gap) lead to a higher share of forest income in total income; H3) a higher share of forest income in total income raises investment in crops and livestock. Due to the endogenous nature of aspirations (Dalton et al., 2014), a lasting positive effect could prevail: if farm investment increases revenues, this could raise household aspirations. On the other band, a poverty trap could occur whereby fundamentally low returns from forest products reduce capacity to invest (negative H3), in turn lowering future aspirations and increasing dependence on forest income (negative H2).

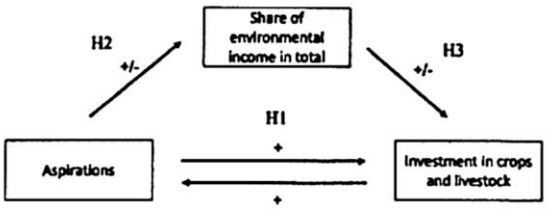


*Figure 1 Theoretical framework, three hypotheses for a 'pathway out of poverty'.*

The thesis uses cross-sectional household survey data collected in 2019 by the 'Future Rural Africa' Collaborative Research Centre. 2,228 households were surveyed across Kenya (Baringo County), Namibia (Zambezi region) and Tanzania (Morogoro and Iringa regions) via multi-stage random sampling. Samples included areas both inside and outside conservation areas. To gauge aspirations, individuals bad been asked to evaluate their household's current level of assets and social status on a ladder scaled from 1-10, where they aspire to be on the same scale in 5 years' time and to indicate the relative importance they attach to assets and social status by placing beans in different bowls. An aspirations index was constructed following Bernard and Taffesse (2014), as well as an aspirations gap following Janzen et al. (2014). Tue data also included the number and value of forest products harvested by each household annually, based on market prices. Forest products included wood for building materials, fuelwood, wild vegetables and root tubers, fruits, grass, herbs/herbal medicines, honey, insects, mushrooms and palm oil. Total farm expenditure was calculated as a sum of crop and livestock income. Further independent variables were constructed, including an asset index via multiple factor analysis, an index of tropical livestock units owned, socioeconomic variables (educational attainment, age, household dependency ratio), indexes for five related psychological variables and dummies indicating severe shocks to the household, whether the household had been able to save in the past month and various forms of property rights. Natural logarithms were taken to reduce skewness and kurtosis in several cases.

The econometric models were run separately for each of the three countries. To investigate Hl and H3, aspirations, the share of forest income in total income and control variables were regressed on farm expenditure using:

1) Standard OLS regression.

2) Two-stage least squares (2SLS) regression with mother's and father's education as instrumental variables to control for simultaneity (endogeneity) between aspirations and farm expenditure.
3) Tobit regression, which allows a significant proportion of farm investment observations to equal zero and assumes the decision to farm and how much to invest in the farm are taken simultaneously, driven by the same variables.
4) Cragg regression, which also allows a significant proportion of farm investment observations to equal zero but assumes two 'hurdles', representing the participation decision in farming and the 'consumption' decision of how much to spend on inputs respectively. It is more flexible than the Tobit model, allowing different variables to drive the two decisions.

To investigate H2, aspirations were regressed on the share of forest income in total income. Among additional control variables were assets, to account for lower dependence on forest incomes as wealth increases, and an interaction term between assets and aspirations, to account for a weaker effect of aspirations on forest incomes as wealth opens up alternative means to invest (e.g., off-farm income, credit). Similarly, the following regressions were run:

1) Standard OLS regression.
2) Tobit regression, which allows a significant proportion of households to have zero forest income and assumes the decisions to harvest forest products and by how much are driven by the same variables.
3) Cragg regression, which also allows a significant proportion of households to have no forest income but assumes the participation and consumption decisions are driven by different variables.

To enable comparisons with OLS coefficients, average marginal effects (AMEs) were taken for the results of the Tobit models and the second hurdle of the Cragg models. The above models were repeated with various alternative forms of aspirations (index/gap/gap squared, separate or joint asset and social status aspirations) as well as versions of the modcls which account for heteroskedasticity where necessary. Akaike and Bayesian Information Criteria (AIC, BIC) were used to compare goodness of fit.

The censored regression models show a clear improved goodness of fit (lower AICs and BICs) and more plausible results over standard OLS in all cases, showing OLS leads to bias when a high proportion observations on the dependent variables equal zero. The Cragg model further exhibits better fit than the Tobit model, suggesting that the factors determining the participation and consumption decisions differ. Also worth noting, the best fit specifications of aspirations were linear: no evidence was found of lower expenditure under low or high aspiration gaps.

Starting with H1, the results show that higher aspirations increase the likelihood of households participating in farming in all three countries, other variables constant. However, in Tanzania and Kenya higher aspirations translated into lower farm expenditure among those already farming, suggesting a diversified portfolio of activities ('stepping-out') could be a more effective strategy to achieve aspirations. This is potentially thanks to a higher availability of off-farm employment and/or returns to labour compared to Namibia, where the effect was positive.

Regarding H3, a higher share of forest income in total income has an insignificant effect on participation in farming in Kenya and Namibia and negative in Tanzania, while among existing farming households, a very small positive effect on expenditure was found across all three

countries. Only in Tanzania was the effect non-negligible: a 1% rise in the share led to 0.14% greater farm expenditure.

Accordingly, results from H2 suggest the incentive is too small for aspirational households to increase their share of forest income in total income in Kenya and Namibia, while the increase in Tanzania is very small. It is also notable that in Kenya and Namibia, wealthier households rely slightly less on forest products, in line with previous studies, and assets also dampen the impact of aspirations on the share of forest income in total income, in line with predictions that credit and savings open up alternative means to achieve aspirations.

Interestingly, the 2SLS regression shows aspirations to be exogenous variables in a Durbin-Wu-Watson test. While at first glance surprising, a possible explanation is that external constraints prevent farm expenditure from translating into higher farm profits and aspired-for levels of assets and social status.

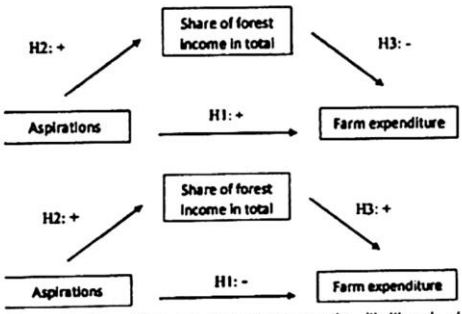


*Figure 2 The effect of aspirations on the likelihood of farming/harvesting forest products and on the magnitudes involved in Tanzania.*

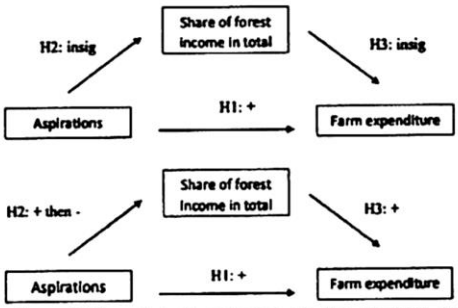


*Figure 3 The effect of aspirations on the likelihood of farming/harvesting forest products and on the magnitudes involved in Namibia.*

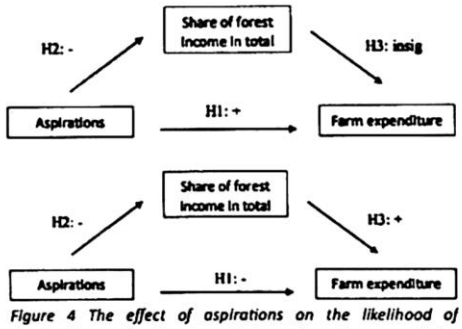


*Figure 4 The effect of aspirations on the likelihood of farming/harvesting forest products and on the magnitudes involved in Kenya.*

In conclusion, the results points to a nuanced role for forest incomes. The case for a substantial 'pathway out of poverty' is weak in the informal sector, while there is also no evidence of a dependency cycle or poverty trap based on aspirations failure in any country. This emphasises the need for other instruments to improve farmers' ability to invest and accumulate capital when credit or savings arc not available. The thesis also stresses that conserving forest resources in a manner inclusive of local populations remains crucial for food security, given the findings that the poorest households are the most reliant on forest income for their daily needs. Finally, the thesis uncovers the importance of aspirations in motivating households to adopt ‘stepping up’ (specialisation) and ‘stepping out’ (diversification) strategies to move out of poverty, showing sustainable livelihoods can be supported by addressing the psychological as well as external constraints imposed by poverty.