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Constraints to commercialisation of smallholder agriculture in Tanintharyi division, Myanmar

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Abstract

Myanmar is a country in rapid economic and political transition, with opportunities emerging for its smallholders to benefit from current economic growth. However many smallholders are trapped in semi-subsistence agriculture, disconnected from markets. Commercialisation can increase farm incomes, and - through the multiplier effect - lead to wider pro-poor growth in the rural economy. However, there are many constraints to commercialisation that prevent this process from occurring. While literature on constraints confronting smallholders abounds internationally, there is a paucity of literature on the challenges confronting smallholders in Myanmar. This study investigates constraints to commercial farming in the townships (districts) of Myeik and Palaw in Myanmar's Tanintharyi Division. A representative two-stage sample of 259 rural households was drawn from these townships, and data relating to livelihoods and agricultural enterprises were gathered using a structured questionnaire. The most important determinants of commercialisation identified using Heckman regression were the household's land endowment, liquidity, land quality, and productive assets. Access to affordable financial services could boost household liquidity and investment in farm inputs, assets and improvements to land, so alleviating the most important constraints to commercial farming.

Keywords: Burma, commercial, market participation, rural credit, rural development, livelihoods, farming

1 Introduction

Commercialisation of Myanmar's agriculture sector offers both a pathway out of poverty for smallholders, and an opportunity for national economic development. Agriculture contributes 43 % of Myanmar's GDP, and is the main livelihood activity for nearly 70 % of the population (Haggblade *et al*., 2014). While empirical studies present mixed findings on the effect of the transition to commercial agriculture on smallholder household welfare (Carletto *et al*., 2017), agricultural growth is important and, some literature suggests, necessary for broad-based economic growth (Dethier & Effenberger, 2012). There is a historical precedent for the importance of agricultural growth in the development of Myanmar's regional neighbours, with agriculture key to the development pathways of Thailand, Vietnam, Indonesia, and Malaysia (Tun *et al*., 2015). Myanmar has a low agricultural productivity compared to its South East Asian neighbours (ibid), and is the poorest country in South East Asia, with 25.6 % of its population living below the national poverty line (Asian Development Bank, 2016). There is potential for agricultural growth to be a major driver of poverty reduction and economic growth in Myanmar.

A wide range of definitions of smallholder commercialisation exist in the literature. The consensus view tends to describe commercialisation as the process of transition from subsistence production toward an increasingly complex production and consumption system based on market engagement. While an increase in output market participation is the most obvious manifestation of this transition, this is driven by the increasing commercial orientation of the smallholder, where product choice and input use decisions are increasingly based on the principles of profit maximisation (Pingali & Rosegrant, 1995; von Braun, 1995; Jaleta *et al*., 2009; Abafita *et al*., 2016). Building upon this understanding of commercialisation, Tipraqsa & Schreinemachers (2009) conceptualise agricultural commercialisation as the process by which farm households are increasingly integrated into markets for seasonal inputs, equipment and machinery, land,

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labour, farm products, and food and non-food consumption markets. Despite the multidimensional nature of smallholder commercialisation, Leavy & Poulton (2008) observe that most definitions of agricultural commercialisation focus on participation in output markets and cash earnings.

Commercialisation of smallholder agriculture faces severe constraints. Literature documents a wide range of constraints across different countries and contexts, commonly citing issues such as high transaction costs, insecure land tenure, poor access to credit, and labour constraints (Zeller *et al*., 1998; Heltberg & Tarp, 2002; Wynne & Lyne, 2003; Pender & Alemu, 2007; Barrett, 2008; Ouma *et al*., 2010). While common themes emerge to the most important constraints, there are context-specific differences in their relative importance, and the degree to which they constrain commercialisation.

Policy makers, development practitioners, donors, and agribusiness organisations cannot be effective agents of agricultural and rural development without knowledge of the constraints confronting farmers. Low productivity (Tun *et al*., 2015) and high rates of poverty in rural Myanmar signal the presence of binding constraints to commercial farming, but there is very little information about the relative importance of these impediments. The objective of this study is to identify and rank constraints to commercial farming in Myanmar's Tanintharyi Division. Prioritising constraints to commercialisation will enable better informed and targeted development interventions and government policy in Tanintharyi Division, and across comparable regions of Myanmar.

Methods used to gather household data, to measure agricultural commercialisation, and to identify and rank constraints to commercialisation are described in Section 2 of the paper. Descriptive statistics on households and farms relevant to the analysis are presented in Section 3. Section 4 applies regression techniques to identify and rank constraints to commercial farming, and discusses the results of this analysis. Conclusions are drawn in Section 5.

2 Research methods

2.1 Study area and sampling design

The study was conducted in the townships (districts) of Myeik and Palaw in Tanintharyi Division, Myanmar's southernmost region. Household data were gathered using a stratified multistage sampling technique. Seven study sites (strata), with boundaries based on village tracts (sub-township administrative units), were selected to capture variation in household enterprises, topography, ethnicity, and proximity to urban centres. World Vision Myanmar (WVM) staff listed the villages (primary sampling units) in each stratum and obtained census estimates of their populations. Together the seven strata accounted for 34 distinct villages, with an estimated population of approximately 39,000 people in 4,900 households. Two villages were sampled from each stratum with replacement and with probability proportionate to size, where size was measured by the estimated number of households in each village. WVM staff then visited the 14 sample villages, and, with the help of local village authorities, listed all households in each village. Households were then selected randomly without replacement at a constant rate of 12 % from each sample village, yielding a total sample of 259 households. This design produced a self-weighting sample of households in each study site.

2.2 Data collection

Structured interviews were used to collect information from selected households. Prior to commencing fieldwork, the questionnaire was checked for sensitive questions, and approved for implementation by both WVM, and a representative of the Myanmar Ministry of Social Development. WVM staff obtained prior permission from local village authorities to work in each selected village. Village authorities helped to identify the selected households, and guided enumerators to these households. Enumerators administered the questionnaire in local languages (Burman and Karen), but recorded the data provided by respondents in English. Responses were recorded on tablets using SurveyCTO software, allowing researchers to monitor data quality during fieldwork.

2.3 Measuring agricultural commercialisation

This study constructed a multidimensional measure of commercialisation using Principal Components Analysis (PCA). PCA was used to combine indicators of smallholder engagement in output, input, and labour markets into a single, linear index. The analysis also included a dummy variable indicating whether or not the household's primary source of income was from farming; a useful indicator in the context of this study, as households pursue a mix of farm and non-farm livelihoods.

2.4 Quantifying the constraints to commercialisation

Significant determinants of commercialisation were identified and ranked by estimating the following regression model:

$$Y_i = \beta_0 + \beta_2 X_i + \varepsilon_i \quad (1)$$

where Y_i is the score computed for the ith household on the index of commercialisation, X is a vector of observed household and farm characteristics affecting Y_i, and ε captures random error assumed to be N.D.$\approx$ $(0,\delta^2)$ and uncorrelated with X and Y. Parameters of this model estimated using OLS regression can be biased and inconsistent as the error term may not be independent of X and Y. This endogeneity problem stems from selection bias as many of the rural households sampled do not farm, and the decision to farm may be influenced by variables relevant to the OLS model - some of which were not observed and therefore omitted from the model. In this case, ε may well capture the effects of variables that are correlated with the dependent and independent variables.

Heckman (1979) suggested a two-step approach to account for endogeneity in this selection bias situation. In the first step, the decision to farm is modelled as a maximum likelihood probit function:

$$I_i = \alpha_0 + \alpha_1 Z_i + \mu_i \quad (2)$$

where I_i is a dummy variable that scores 1 if the i^{th} household is a farm household, and 0 otherwise, Z is a vector of observed household and personal attributes affecting the decision to farm, and μ is an error term. The sample data showed that all farm households, defined as rural households that had grown a crop or raised livestock during the year preceding the survey, sold farm products and therefore were, to some extent, commercial farmers. The variables used to explain participation in farming activities included household labour endowments, ethnicity, proximity to services, access to non-farm sources of income (wage labour, remittances and business enterprises), and the age, gender and educational status of the household's de facto decision-maker. The estimated probit model correctly classified 70 % of farm and non-farm households correctly and its Pearson's Chi-square statistic (258.2 with 248 DF) indicated a good fit with the data.

The predicted values of $(\hat{I})$ are then used to estimate the Inverse Mills Ratio:

$$\lambda_i = \phi(\hat{I}) \,/\, \Phi(\hat{I}) \quad (3)$$

where ϕ and Φ are the density and cumulative distribution of a standard normal variate. The Inverse Mills Ratio measures the probability that a household decides to farm over the cumulative probability of the household's decision. It is therefore a monotone decreasing function of the probability that a potential farm household is selected into the sample of farm households. In the second step, λ is included in the OLS model to account for endogeneity introduced by selection bias:

$$Y_i = \beta_0 + \beta_2 X_i + \beta_3 \lambda_i + \varepsilon_i \quad (4)$$

If sample selection bias exists, the OLS regression estimate for β_3 will be statistically significant and the coefficients estimated for the other explanatory variables in the model will be consistent. On the other hand, if selection bias is not present, λ will not be statistically significant and may therefore be excluded from the model.

Table 1: *Household, farm and farmer characteristics for 142 farming households sampled in the Myeik and Palaw study area, 2018.*

Household (HH), farm and farmer characteristics	
HH gross income (Kyat '000*)	2,315
HH gross farm income (Kyat '000)	1,426
Farming is the largest source of HH income (%)	62
Female-headed HH (%)	32
HH in minority ethnic groups (%)	39
Age of HH decision-maker (years)	50
Education of decision-maker (years schooling)	4.2
Time to travel to a clinic (hours)	0.4
HH size (number of resident members)	5.18
Expenditure on purchased farm inputs in 2017†	497
Value of farm fixed and moveable assets owned†	396
Area farmed (hectares)	2.44
Workers employed on farm in peak of season	1.67
HH that borrowed or used credit to finance inputs (%)	30
HH heads who recall the extension officers name (%)	18
HH that participated in local agricultural training in the past year (%)	(11)
HH that acquired land through purchase (%)	43

Note: Sample estimates in parentheses have a CV greater than 20 % and are therefore unreliable. *1 USD ≈ 1,400 Myanmar Kyat in 2018; † in Kyat '000

3 Descriptive statistics

Descriptive statistics relevant to the analysis are presented Table 1. These statistics relate only to the subset of 142 households that produced (and sold) farm products. Average farm household gross income was 2,315,000 Kyat in 2017 excluding petty wages earned by resident household members in local villages. While these households all engage in some level of agricultural production, off farm income comprises almost half of the average gross household income. Only 62 % of farm households reported farming as their largest source of income. Average farm size is small at 2.44 hectares, with low levels of investment in productive assets per farm (396,000 Kyat).

4 Constraints to agricultural commercialisation

The results of the Principal Components Analysis are shown in Table 2. Bartlett's Sphericity Test is highly significant. This shows that the indicators of commercialisation are sufficiently related to extract principal components. The first principal component (PC1) explained most (54 %) of the variation in the four indicators of commercialisation, and was the only component with an eigen value greater than unity. The loadings attributed to each of these indicators in PC1 all carry positive signs, implying that an increase in one indicator is accompanied by increases in the other three. Moreover, the loadings are all of similar magnitude, showing that the indicators of commercialisation make contributions of similar size to the component score. The first principal component was therefore interpreted as a positive index measuring commercialisation. Figure 1 presents the distribution of component (index) scores computed for farm households. The distribution is approximately normally distributed, with some evidence of a minimum scale required for market entry.

Table 2: *Principal component results.*

Indicators of commercialisation	*Loadings of the indicators in* PC_1
Household gross farm income	0.779
Expenditure on purchased farm inputs	0.796
Farming is the largest source of household income	0.615
Number of workers employed on farm in peak of season	0.719
Bartlett's Test of Sphericity X^2	101.353***
Eigen value	2.136
Percentage variance accounted for by PC_1	53.398

OLS regression was used to identify and rank significant determinants of commercial farming amongst the sample households. Economic theory and empirical findings highlight key constraints to smallholder commercialisation. Farm and institutional constraints include land endowments and land tenure (Fenwick & Lyne, 1999; Randela *et al*., 2008), farm equipment (Barrett, 2008), liquidity (Fenwick & Lyne, 1999; Mauro *et al*., 2010), training and extension, (Woldeyohanes *et al*., 2017), and aspects of remoteness and infrastructure that heighten transaction costs (Mauro *et al*., 2010). Important household and personal attributes include labour endowments (Fenwick & Lyne, 1999; Randela *et al*., 2008), education, age, and gender (Randela *et al*., 2008; Olwande *et al*., 2015; Woldeyohanes *et al*., 2017), and ethnicity (Mmbando *et al*., 2015). Table 3 presents and defines explanatory variables used to measure hypothesised constraints to commercial farming.

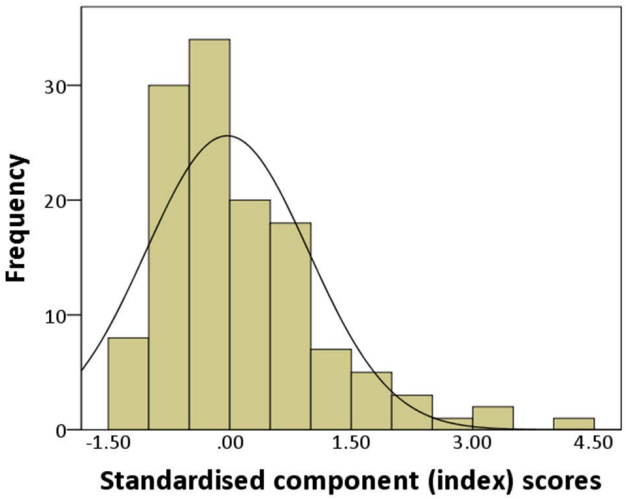

Fig. 1: *Distribution of principal component (index) scores (n=142):*

Table 4 presents and compares the unstandardised regression coefficients estimated for the OLS and Heckman models. Both the OLS model and the Heckman model are statistically significant at the 1 % level of probability and both have R2 values of 58 %, indicating each is a good fit with the cross-section data. The Inverse Mills Ratio is not statistically significant, implying that the OLS estimators are not affected by selection bias (Heckman, 1979). Variance Inflation Factors (VIFs) for the OLS model range between 1.1 and 1.7 indicating the absence of severe multicollinearity (Kleinbaum *et al*., 1988). For these reasons, the OLS results presented in Table 4 were accepted for interpretation. Table 4 also presents the standardised regression coefficients estimated for the OLS model, as these indicate the relative importance of its statistically significant explanatory variables. Within the subset of statistically significant explanatory variables, land had the strongest impact on the level of commercial farming, followed by liquidity, land quality, productive assets, ethnicity, land tenure security, and the household's labour endowment. Education, age and gender of the household head were not significant determinants of commercial farming. Nor were exposure to agricultural extension services or training, or travel time to amenities and services.

The area of land operated has a highly significant impact on commercialisation, suggesting that households with larger land endowments produce and sell more output, leading to higher levels of integration with labour, input and product markets, and increased farm income. Land endowment consistently appears as an important constraint in similar studies, across countries as diverse as Tanzania (Mmbando

Table 3: *Variables explaining the level of commercial farming.*

Explanatory variable	*Variable definition*	*Expected impact*
Land	Log (1 + acres farmed per adult equivalent (AE*))	+
Equipment	Log (1 + replacement cost of all farm equipment per AE) (Kyat)	+
Liquidity	Log (1 + household income per AE) (Kyat)	+
Labour	Resident adults per AE	+
Education	Years of schooling completed by the farmer	+
Age	Farmer's age in years	+
Gender	= 0 if male, 1 if female	−
Extension	= 1 if the farmer knew the extension officer's name, 0 otherwise	+
Training	= 1 if a household member participated in agricultural training in the past year, 0 otherwise	+
Ethnicity	= 0 for Bamar, 1 if ethnic minority	−
Services	Travel time to closest clinic (hours)	−
Upland	= 1 if household farms rubber or cashew, 0 otherwise	−
Tenure	= 1 if household purchased land, 0 otherwise	+

* 1AE = (Adults + 0.5(Children + Elderly)) $^{0.9}$

Table 4: *Estimated OLS and Heckman regression models.*

	Estimated regression coefficients				
Explanatory impact	*OLS unstandardised*	*Heckman unstandardised*	*OLS standardised*	*Rank*	*VIFs*
(Intercept)	-2.275***	−1.869***			
Land	1.991***	1.991***	0.529	1	1.711
Equipment	0.075**	0.077***	0.176	4	1.311
Liquidity	0.203***	0.216***	0.273	2	1.241
Labour	0.535*	0.400	0.121	7	1.111
Education	0.038	0.031	0.096		1.381
Age	−0.001	−0.003	−0.018		1.349
Gender	−0.114	−0.121	−0.053		1.160
Extension	0.183	0.203	0.069		1.246
Training	0.146	0.146	0.046		1.224
Ethnicity	−0.307**	−0.510**	−0.151	5	1.294
Services	−0.164	−0.131	−0.055		1.195
Upland	−0.403***	−0.419***	−0.196	3	1.388
Tenure	0.270**	0.253*	0.134	6	1.138
IMills (λ)		−0.162			

Note: ***, **, * show statistical significance at the 1 %, 5 %, and 10 % level of probability, respectively.

et al., 2015), Kenya (Alene *et al*., 2008), Ethiopia (Abafita *et al*., 2016; Woldeyohanes *et al*., 2017) and Bolivia (Larochelle & Alwang, 2015).

Household liquidity per adult equivalent is the second-most important determinant of commercial farming. This result was anticipated as households in the study area have low incomes, poor access to credit, and more than 70 % of the farm households sampled cited liquidity constraints as their most important perceived constraint. Inadequate cash flow constrains investment in farm inputs (Fenwick & Lyne, 1999; Mauro *et al*., 2010), leading to suboptimal yields and reduced surpluses for sale. In addition to the impact of liquidity on seasonal input purchases, households with higher levels of income are more capable of saving to invest in productive assets, fixed improvements or additional land, so easing two other highly significant constraints.

The 'Upland' variable has a strong negative impact on commercialisation, showing that levels of commercialisation

are lower amongst farm households that operate on steep, non-irrigated land - other factors, like land size, held constant. This third-most important determinant of commercialisation stresses the relevance of land quality when considering farm size.

As was anticipated, the level of commercialisation of the farm household increases in response to growth in the value of farm equipment per adult equivalent. This relationship is well established in the literature (Leavy & Poulton, 2008; Pender & Alemu, 2007), with ownership of movable and fixed assets linked to higher levels of production and greater surpluses available for sale. Mmbando *et al* (2015) contend that policies to support smallholder asset accumulation would increase smallholder productivity and market participation, while Barrett (2008) argues that barriers to market participation often depend on timely access to productive assets and technologies, which usually requires improved access to finance. Ownership of productive assets is highly dependent on household liquidity and access to affordable term loans to finance their purchase. Addressing rural finance constraints would boost household liquidity and promote asset accumulation.

Farm households belonging to the minority Karen ethnic group are less commercialised than Burman farm households. Karen households residing within the study area tend to live in ethnically homogenous villages in the hills, further away from urban centres than most Burman villages. Travel time, however, is not a significant determinant of commercialisation as the regression coefficient estimated for 'Services' is not significantly different from zero. The importance of ethnicity appears to stem from observed differences in livelihood strategies pursued by Karen and Burman households, and these differences may reflect cultural or language barriers confronting ethnic minorities in largely Burman markets.

Households are unlikely to purchase land if they lack confidence in the breadth and duration of their property rights to the land. Land acquired in non-market transactions may not inspire the same level of confidence, especially in a region characterised by a history of dispossession (Baver *et al*., 2013; Mark, 2016). In this case, the positive and statistically significant regression coefficient estimated for 'Tenure' shows that levels of commercialisation are higher amongst farm households that have more secure land tenure. It is widely accepted that secure land tenure incentivises investment in agriculture (Place *et al*., 1994).

The regression coefficient estimated for 'Labour', although positive and significant at the 10 % level of probability, ranks the availability of family labour as less important than any other significant determinant of commercialisation. Literature suggests that sufficient family labour is a prerequisite for smallholder production (Alwang & Siegel, 1999), and empirical studies frequently identify household labour as an important determinant of market participation (Alene *et al*., 2008; Mmbando *et al*., 2015).

Although 'Education' does not have a statistically significant impact on commercialisation, the regression coefficient estimated for this variable has a t-value greater than unity suggesting that formal schooling has a positive but weak impact on commercialisation. A similar finding was reported by Alene *et al* (2008) in a study of market participation by smallholders in Kenya. Other studies find that education has a positive and significant impact on market participation (Mmbando *et al*., 2015; Olwande *et al*., 2015). The availability of non-farm employment opportunities may explain the weak impact of education in this study, as better educated adults tend to work off-farm, so reducing variability in the years of schooling measured for farmers.

The variables measuring agricultural extension and training did not have statistically significant regression coefficients. Quality extension is often identified as the most important factor contributing to the adoption of new technology, which leads to increased commercialisation (Mariano *et al*., 2012). The regression results do not imply that extension and training are unimportant, but rather that currently available extension and training services available do not significantly increase the commercialisation of smallholders. This raises concerns about the quality of available agricultural extension and training.

The age and gender of the de facto household decision-maker were not significant determinants of commercialisation. With regard to age, arguments have been made for both a positive and a negative impact, and there is little consistency in empirical findings (Lapar *et al*., 2003; Randela *et al*., 2008; Mmbando *et al*., 2015; Woldeyohanes *et al*., 2017). Gender is generally found to be significant (Lapar *et al*., 2003; Woldeyohanes *et al*., 2017), with male headed households more likely to participate in the market, but results vary between regions and products. The results of this study suggest that, within the Tanintharyi context, market participation is not gender specific.

Travel time imposes a transaction cost on buyers and sellers. Studies conducted by Mmbando *et al*. (2015) and Martey *et al*.(2017) find that increasing distance from urban centres reduces farmer participation in markets. Descriptive evidence gathered in this study and presented in Table 1 shows that farm households in Myeik and Palaw have good access to services (measured by the travel time to the nearest clinic), and the regression results confirm that location does not impact travel time to urban centres.

5 Conclusions

This study suggests that constraints to commercial farming faced by smallholders in Tanintharyi Division are significant, and that interventions to address these constraints would promote poverty alleviation and rural development. Interventions addressing the most binding constraints are more likely to be effective in achieving smallholder commercialisation and development outcomes.

Lack of liquidity is one of the main constraints to commercial farming in Tanintharyi. Smallholders, who dominate agricultural production in Myanmar, are too poor to save and reinvest adequately in their farm enterprises, particularly with regard to productive assets that have long payback periods. This problem is compounded by a lack of affordable formal credit. Other than the limited services provided by the Myanmar Agricultural Development Bank (MADB), which provides seasonal inputs loans for paddy farmers, farmers typically resort to loans from relatives and friends, or moneylenders at high interest rates. The problems of low liquidity and lack of credit constrain the accumulation of productive assets and investment in production, leading to low levels of commercialisation and low household income. This reinforcing feedback leads to a low-level equilibrium trap. These important constraining factors of liquidity, access to credit, and ownership of productive assets are strongly interrelated.

In his analysis of these poverty traps, Barrett (2008) recommends interventions to build up assets and break down barriers to finance. Extending access to affordable formal credit is a key solution to the major constraints farm households face, directly addressing the liquidity problem, and enabling farmers to accumulate productive assets and land. Access for farmers to term loans to finance farm equipment, machinery and fixed improvements is essential. Affordable credit is unlikely to come from traditional private banks due to the low returns in servicing the rural poor, especially under Myanmar's current restrictive finance legislation. Microfinance institutions could have a major role to play in promoting the commercialisation of farm households. At present, MADB is perhaps best placed to address these challenges due to its wide national reach. MADB could provide a much-needed service by extending its lending beyond its current clientele of paddy farmers to include small-scale producers of all agricultural products.

Land constraints are a major challenge to commercialisation of smallholders. The study area is fortunate in having an active land market, which helps to alleviate land constraints through voluntary sale and lease agreements. The Government of Myanmar has made progress on formalising land tenure with the passing of the 2012 Farmland Law, but government land policy must be careful to reinforce, rather than disrupt, existing land markets. Policy must engender confidence in land holders that they possess a secure, durable bundle of rights over the land. While land area was by far the most important constraint to commercialisation, interventions urging involuntary amalgamation of small farms are not recommended due to concerns around the welfare of very small scale farmers and renewed land disputes that are likely to collapse voluntary rental and sale transactions. Landless households have, on average, lower incomes than farm households. Slow progress towards allocative efficiency through well-functioning land markets, particularly land rental markets, will gradually shift land to more commercialised farmers without dispossessing smallholders or escalating distress sales.

The study areas' current extension services and agricultural training have low outreach and no significant impact on the level of commercialisation of farmers. Farmers frequently identify lack of information as a challenge, indicating a need for effective extension and training. The few government and NGO extension service providers operating within Tanintharyi Division may already be aware that both the quality and scale of their services are lacking. The relatively good telecommunications network in the region, and high rates of mobile phone ownership present new opportunities for low cost information dissemination to farmers from government agencies and NGOs.

Lastly, the study highlights inequalities related to geography. The results show that Karen households farming poor quality land in the hills are disadvantaged relative to Burman farmers, whose villages are often located in the lowlands where flood irrigation can be practised. These spatial inequalities should be understood by agencies implementing agricultural development activities in the region. Overall, the results lend support to interventions aimed at integrating Karen into agricultural markets, and improving levels of inter-ethnic cooperation in the region.

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Conflict of interest

Authors state they have no conflict of interests.

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