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Abstract:	A focus of agricultural development is climate smart agricultural technologies and practices (CSA). Development practitioners invest in scaling these to have wider impact. Ineffective targeting stymies CSA's contribution to poverty reduction by excluding many of the poor and/or including those for whom agriculture is not a pathway out of poverty. We propose the need to recognise differentiated livelihood pathways within smallholder agriculture, linked to farmers' differential capacity to engage in climate risk management. A farmer and livelihoods typology provides a framework to improved targeting of CSA and to identifying where alternative interventions, such as social protection, are more appropriate.

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Abstract

A focus of agricultural development is climate smart agricultural technologies and practices (CSA). Development practitioners invest in scaling these to have wider impact. Ineffective targeting stymies CSA's contribution to poverty reduction by excluding many of the poor and/or including those for whom agriculture is not a pathway out of poverty. We propose the need to recognise differentiated livelihood pathways within smallholder agriculture, linked to farmers' differential capacity to engage in climate risk management. A farmer and livelihoods typology provides a framework to improved targeting of CSA and to identifying where alternative interventions, such as social protection, are more appropriate.

Introduction: farmer typologies and livelihood pathways

Much agricultural research seeks to reduce the impacts of climate-related risk and to foster resilience in the face of climate variability and other stochastic drivers of change (Lipper et al., 2014). A major focus of recent agricultural research is the generation of climate smart agricultural technologies and practices (CSA). These include stress-adapted crop germplasm, conservation agriculture and agroforestry. Agricultural research has long been critiqued for being too 'supply driven'. Nevertheless, there have been advances over the last two-three decades in terms of shifting from a transfer-of-technology model to a farmer participatory one that better matches technologies and practices with farmers' needs, capacity and aspirations.

Development practitioners are investing much time and effort in exploring how best to scale CSA in order to have wider impact. It is important that these efforts target appropriate types of farmers. Failure to contextualize development interventions in relation to specific target groups may undermine the contribution of agricultural research to a reduction of rural poverty. Ill targeted interventions carry the danger of excluding poorer groups of farmers, benefiting groups of already better off farmers, or of failing altogether. Therefore, appropriate targeting requires a deeper understanding of differentiation in farming communities. While there can be a simple duality between smallholders and larger-scale farmers, in reality there is often considerable heterogeneity within these two categories.

Focusing on smallholder farming, given that this is where the poorest farmers are situated, farm households may be distinguished based on their asset endowment, coupled with characteristics pertinent to their livelihood strategies. These features shape the livelihood pathways farmers' may pursue in the context of rural change. Livelihood outcomes (and households' resulting ability to maintain livelihood security) are a product of the livelihood strategies a household can generate. What livelihood pathways are open to a given

household will be shaped by household characteristics (e.g. dependency ratios, labour constraints), coupled with the interaction between available assets (financial, social, human, etc.), and the policy, economic and institutional environment that frames opportunities. This poses challenges for development practitioners; for example Collier and Dercon (2014) argue that agricultural production, particularly in the case of Africa, will have to increase hugely along with labor productivity; the latter will lead to fewer people engaged in agriculture.

Development in Practice published an article by Dorward et al. (2009) in which the authors proposed the following typology, later encompassed by DFID in its *Conceptual Framework on Agriculture* (DFID, 2015):

- 'Hanging in' – farmers maintain current levels of wealth and welfare, in the face of the threats of stresses and shocks.
- 'Stepping up' – farmers make investments to increase production and income through intensification, diversification and/or expansion.
- 'Stepping out' – farmers accumulate assets which enable them to move into different activities that lead to higher and/or more stable returns. This often involves increased off-farm employment or an exit from agriculture.

Dorward et al. (2009) note that the above typology can help different stakeholders, including agricultural researchers, understand better farmers' aspirations in terms of the (often) longer-term strategies linked to 'stepping out' as compared to the short- to medium-term opportunities and constraints linked to 'hanging in' and 'stepping up' activities. This understanding is also critical in order to avoid the danger of romanticizing agriculture and failing to recognize its limited ability to support higher incomes with improved standards of living for small farmers ('hanging in'/'stepping up') along with many farmers' desire to exit agriculture all together ('stepping up'/'stepping out'). A key feature of this typology is that the processes are not linear; instead, they represent the circumstances of a household at a given point in time.

It may be the case that for extremely poor farmers, 'hanging in' represents little more than a persistence of poverty, through a continuation of the structural conditions underpinning inter-generational poverty (Hulme and Shepherd, 2003). These particularly vulnerable farmers may be unable to move beyond this status quo. Given the potential for negative impact from shocks for farmers who are merely 'hanging in', Mushongah and Scoones (2012) add 'dropping out' (destitution and deleterious coping strategies) to the typology proposed by Dorward et al. (2009).

Farmers' different livelihood pathways are embedded in a wider socio-economic context. This includes the spatial location and social networks that facilitate livelihoods collaboration,

market availability, and an institutional environment that may or may not act as enabling. Thus 'stepping up' links to agricultural and wider growth that help raise incomes, create jobs and lower food prices, 'stepping out' is linked to expansion in the non-farm economy and connectivity to markets, and 'hanging in' involves productive activities that are a 'holding strategy' when wider opportunities are not present (DFID, 2015:10).

Understanding constraints and opportunities associated with different farmers' livelihood pathways helps researchers and development practitioners to acknowledge "*inconvenient truths about the structure of smallholder agriculture and variations in potential between different agricultural environments*"(Harris and Orr 2014). By implication, this can facilitate better targeting of CSA, coupled with the ability to identify when other types of development interventions may be more appropriate. We, however, see the danger that a missionary zeal to promote CSA is encouraging development practitioners to target CSA at types of farmers for whom agriculture *per se* is unlikely to represent a pathway out of poverty. We argue that there is an urgent need to recognize more comprehensively the heterogeneity of farmer households, and the different livelihood strategies available to them, if the development community is to avoid this mistake. We also emphasize the importance of factoring in gender dimensions, in terms of differential up-take and impact of CSA on male and female farmers within specific livelihood pathways. We part base our arguments on our experiences working in Guatemala.

Western highlands, Guatemala

Rural poverty and food insecurity are endemic in Guatemala. The country has the highest level of child undernutrition in the western hemisphere and the fourth highest in the world (WFP, 2014). IFAD (2011) has calculated that approximately 70% of the impoverished population lives in rural areas where poverty is highly concentrated among indigenous groups. These indigenous groups comprise 38% of the total population, who live mainly in the Western highlands. Historically they have suffered from discrimination, which has led to structural exclusion, social inequality and violence (Steinberg and Taylor, 2008). With significant gender inequality across Guatemala, including gender-based violence (DI, 2015), for indigenous women in the Western Highlands, inequality and exclusion is particularly acute.

Alongside other countries in Mesoamerica, Guatemala is a "hotspot" for tropical climate change (World Bank, 2011). The potential for more intense rainfall over shorter periods carries the possibility of increases in the frequency and/or intensity of both flooding and drought conditions. This exacerbates the potential detrimental impact on agricultural production in the Western highlands given existing levels of land and resource degradation, coupled with farmer vulnerability to shocks. Hence the significance of interventions to enable farmers to both mitigate and adapt to climate change, but also the need for these interventions to be appropriate to the life circumstances of different groups of farmers.

Subsistence maize farming predominates in the Western Highlands with cultivation being largely on deforested hill-slopes. There is also some production of higher value crops such as coffee and vegetables. For 70% of households, the main occupation of at least one household member is agriculture, and for 22% it is farm labour (Angeles et al., 2014). Recent research in the Western Highlands has shown that land availability is 0.06 ha per person (Hellin et al., 2017). This contributes to considerable food insecurity: farm households produce enough maize (the main staple crop) for under seven months of consumption per year, and have to purchase maize to make up the deficit.

To cope with food insecurity and impoverishment associated with subsistence agriculture, many farmers, particularly men, are obliged to work off-farm. This involves part-time wage labourers to make up shortfalls of staples and cash requirements for household goods, as well as to pay for inputs for the agricultural production process itself on their meagre landholdings. For able-bodied younger men, off-farm working includes migration to harvest coffee in Mexico or low wage (and often illegal) employment in the USA. This has led to a significant number of *de facto* female-headed households. However migration has done little to strengthen women's gender roles and relations, feeding into significant vulnerabilities for female-headed households, given gender inequalities with respect to access to land and resources (Taylor et al., 2006).

Development involves decreasing livelihood vulnerability and increasing livelihood productivity (and incomes) along with changes in livelihood activities (Dorward 2009). A significant challenge is how to create a "*permanent disruption of individuals' initial conditions or of the parameters of systems that trap people in chronic poverty*" (Barrett and Constas 2014) or in Chambers' (1989: 5) words the "*ratchet effect*" needed for households to move from one asset threshold and livelihood pathway to another. Ideally, new agricultural technologies, including those, seek to tackle these poverty traps, hence, allowing farmers to pursue alternative livelihood pathways, ones that lead to greater prosperity while also building resilience.

Harris and Orr (2014) argue that crop production could be a pathway from poverty where smallholders are able to increase farm size or where markets stimulate crop diversification, commercialization and increased farm profitability. The authors add though that "*for most smallholders, however, small farm size and limited access to markets mean that returns from improved technology are too small for crop production alone to lift them above the poverty line*" (Harris and Orr, 2014). In a recent paper Harris (2018)analyzes household and farm data from 11,789 households in 15 countries in sub-Saharan Africa. His conclusions support his earlier thesis that for many farmers, small farm size means that the gains from adopting improved technologies are not a pathway out of poverty. Hence, for those farmers 'hanging in' and in danger of 'dropping out' it may be the case that CSA does not offer a

pathway out of poverty being at best a contribution to basic food security. The situation in the Western highlands seems to support this thesis and has major implications for identifying and targeting appropriate pathways leading to rural poverty reduction.

Pathways out of poverty in the Western highlands, Guatemala

The first author is currently working in the Western highlands of Guatemala as part of the United States Agency for International Development (USAID) supported *Buena Milpa* project. The project has sought to avoid a technology-driven approach, instead taking into account the design of CSA based on farmers' needs and livelihood pathways. Work has focused on soil and water conservation, farmers' access to markets, maize productivity and farm diversification. The experience has been a sobering one and has led to much reflection on the different pathways out of poverty that are available to farmers, given significant livelihood constraints, and the role that CSA can play in these processes under the circumstances.

The challenge is to know when CSA is the best type of development intervention and when alternative approaches would be preferable. Based on a sample of almost 5,000 farm households *Buena Milpa* researchers have identified six types of farm households in the Western highlands based largely on land availability and the share of land used for coffee or maize (Lopez-Ridaura et al. in preperation). The types are: i) specialized maize-based (SM); ii) diversified maize-based (DM); iii) specialized coffee (SC); iv) diversified coffee (DC); v) non-crop (NC); and vi) households diversified with other crops (DO).

SM households make up 32% of the sample and the median arable land available per household is 0.33 ha. DM comprise 29% of the sample, median arable land availability is 0.70 ha and farmers grow maize, beans and vegetables. In terms of coffee producers, SC households make up 17% of the sample with mean land availability of just under 0.60 ha per household while DC households comprise 9% of the sample, have greater land availability (median of just under 2.0 ha per household) and grow coffee, other crops as well as having small ruminants. NC households make up 2.5 % and have a meagre 0.04 ha of land per household. DO households comprise 11% of the sample with access to a median of 0.40 ha per household (Lopez-Ridaura et al. in preperation). Project research suggests that DM, SC and DC farm households are relatively food secure and that programs to enhance food security should focus on NC, DO and SM households.

We posit that in the case of farmers firmly established within strategies of 'stepping up' and/or 'stepping out' i.e. DM, SC and DC households, CSA will facilitate further movement along these livelihood trajectories. There is, of course, always the danger that extreme weather event can stimulate greater poverty, particularly for those categories of farmers for whom poverty is a seasonal phenomenon. These farmers would benefit from climate risk

management strategies that enable them to intensify agricultural production and market access and shield them from the danger of a reverse of the 'stepping up' trajectory.

The extremely poor farmers with meagre landholdings are in a poverty trap. These farmers, both male and female, are 'hanging in' and in danger of 'dropping out'. They comprise many of the NC, DO and SM households where median land availability per household ranges from 0.04 to 0.40 ha. They are the types of farmers for whom CSA *per se* does not offer a pathway out of poverty and for whom any increase in agricultural production and productivity will at best contribute to basic food security needs. In these cases, social protection interventions may be most appropriate, including for those female-headed households who are amongst the extreme poor, and who face additional livelihood constraints due to gender inequalities. Social protection programs aim to protect extremely poor households through social assistance (cash or in-kind transfers), social insurance (cover against designated contingencies), or labour market programs (e.g. unemployment benefits) (FAO, 2015).

There is evidence that suggests that well targeted social protection has positive impact on livelihood strategies and productivity improvement (Fisher et al. 2017). In the Western highlands, social protection may be the most viable option to facilitate certain farmer households to move from 'hanging in' to 'stepping up' and 'stepping out'. Moreover, as Asfaw (2017) demonstrate in an African context, social protection can have a mitigating impact on the negative impact of weather shocks, and by implication have the potential to be a valuable *ex ante* strategy to help the poor adapt to climate variability.

As agricultural researchers seeking to secure development impact, we recognise the challenge of accepting that in some cases our CSA-relevant research is unlikely to lead to poverty reduction. However, we also strongly believe that it is incumbent on us as professionals to recognize when other development approaches, e.g. social protection, are more relevant to the needs of certain groups of farmers. Of course, there are limitations in any typology proposed for agricultural households, and limits to the extent to which a livelihoods typology can encompass the dynamic nature of farmers' livelihood strategies and of how farmers respond to climate risk over time. Nevertheless having a framework to facilitate better understanding of differentiation within agricultural communities is a first step towards appropriately targeted and tailored CSA interventions. Development practitioners have long experience of targeting CSA based on varied agro-ecological conditions. Targeting would be more effective were these same practitioners more willing to factor in socio-economic conditions, and to be more cognizant of the different pathways out of poverty available to different types of farm households. Improved targeting will ensure that CSA makes a greater contribution to poverty reduction as part of climate risk management.

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