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Farm diversification and climate change: implications for food security in northern Namibia

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Background

Risk is inherent in small-scale rain-fed agricultural production. Farmers have to contend with seasonal weather uncertainties, the threat of pests and diseases, post-harvest losses, among other risks. These risks are now being exacerbated by the effects of a changing climate, which is expected to increase poverty incidences in most developing countries.

Diversification in farming has been shown to increase resilience in the livelihoods of the rural poor, in the face of the changing climate. Most studies assessing diversification at the farm level either focus on crop or livestock diversification as separate enterprises. In northern Namibia, both crop and livestock farming are practiced extensively. It is important then to understand the barriers to diversification in each, as well as the contribution of each to food security. The study adds to the literature by assessing the joint determinants to diversification in both livestock and crop farming. Further, it also evaluates how the extent of diversification in each, contributes to food security.

Methods

Technology choice: A framed experiment

Diversifying into different livestock types can be informed by the crop types a household farms and vice versa, implying path dependency. The two decisions can also be jointly determined by similar factors. Thus the seemingly unrelated regression model fits this type of problem and is used to analyse joint determinants to crop and livestock diversification. However, given that the dependent variables indicating the extent of diversification are indices and only continuous up to an upper limit censoring, each of the two equations are re-estimated using a Tobit model and the results compared with those from the SUREG model.

Farmers in our sample may have self-selected into different levels of crop and livestock diversification, based on observable (e.g. income, extension access etc.) and unobservable (e.g. personal ambition, managerial ability etc.) conditions. For a genuine claim to the effect of diversification, we need to correct for this non-randomness in the diversification decisions. Thus following other similar studies (Asfaw, Pallante and Palma, 2018; Kassie et al., 2015), we adopt the control function approach, also called the two stage residual inclusion (2SRI) method (Terza, Basu, and Rathouz, 2008) to correct for the endogeneity and estimate the true effect of crop and livestock diversification on household food security outcomes.

Results

Determinants of diversification

Past exposure to climate shocks significantly affects both crop and livestock diversification. Farmers who experienced both crop and livestock shocks within the past ten years (excluding previous two year) were found to have diversified more in the respective enterprise. Access to crop and livestock management information, in the context of climate change, was found to significantly explain crop and livestock diversification, respectfully. More educated household heads diversified more while female headed households were found to diversify less in both enterprises.

Effect of diversification on food security

Adopters of improved seeds were found to achieve higher yields, compared to non-adopters. Both crop and livestock diversification have significant effects on food security outcomes. Households highly diversified in the crops enterprise had higher per capita food consumption, while those who had diversified highly in the livestock enterprise scored higher on dietary diversity. High diversification in either crop or livestock enterprise led to high food security outcomes, irrespective of which enterprise a household is more diversified in.

Conclusion and policy implications

The study has identified provision of climate information on management of both crops and livestock in northern Namibia as a key driver of adaptation through adoption of improved technology and diversification to hedge against climate-induced risks. Policy should thus prioritize availing comprehensive climate information to farmers for decision making in their farming enterprises.

High diversification in either crop and livestock leads to higher food security outcomes, with high diversification in resulting to the highest outcomes. There is therefore a need to consider these two enterprises simultaneously when designing policies geared towards improving resilience to climate shocks and ensuring food security for the rural populations.