

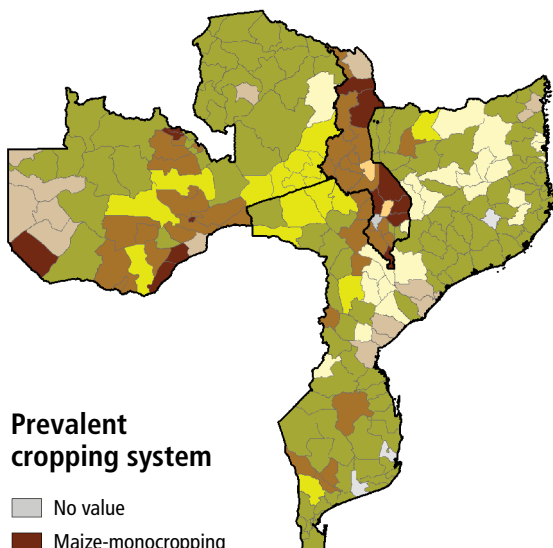


CLIMATE-SMART AGRICULTURE

Crop diversification increases productivity and stabilizes income of smallholders

In sub-Saharan Africa, crop diversification features prominently in many countries' climate change adaptation strategies. Through crop diversification, farming households can spread production and income risk over a wider range of crops, thus reducing livelihood vulnerability to weather or market shocks. Moreover, depending on the crop combination, crop diversification can produce agronomic benefits in terms of pest management and soil quality, among other things.

FIGURE 1. Maize monocropping and maize-staple are locally prevalent in Malawi, Mozambique and Zambia



**Prevalent
cropping system**

- No value
- Maize-monocropping
- Maize-legume
- Maize-staple
- Maize-cash
- Maize-legume-staple
- Maize-legume-cash crop
- Maize-legume-cash crop-staple

Source: FAO, Economic and Policy Analysis of Climate Change (EPIC) team.

KEY MESSAGES

- ▶ The selection of a high volatile or low productive cropping system increases smallholders' vulnerability and exposure to food insecurity.
- ▶ Policies supporting private agricultural input and output market development are critical for inducing adoption of more diverse, resilient, and profitable cropping systems.
- ▶ Parastatal institutions may encourage the adoption of maize monocropping systems reducing the local level of diversification.
- ▶ Land policies ensuring land-availability and security are critical for incentivizing the adoption of more productive and resilient systems.

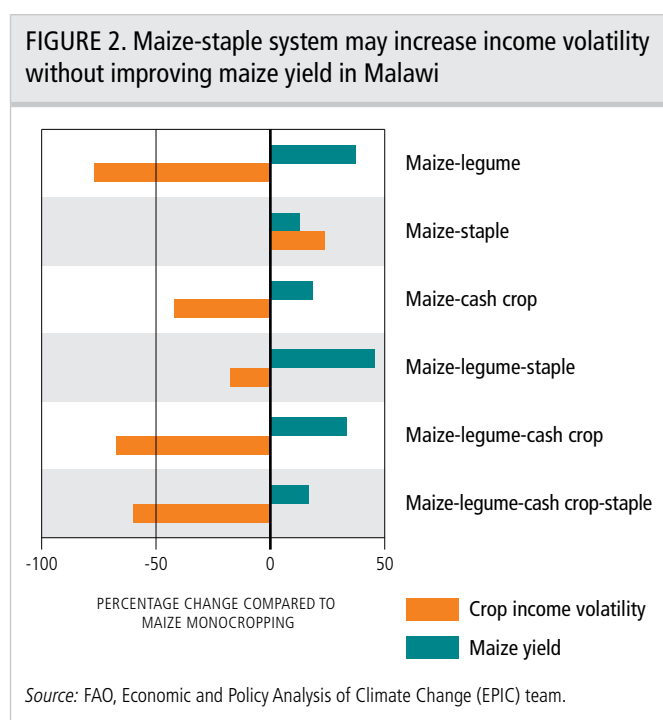
In Malawi, Zambia, and Mozambique the majority of farmers currently adopt one of seven different cropping systems, based on a combination of four categories of crops: dominate staple (maize), alternative staples, legumes and cash crops (Figure 1). Using these cropping systems, this brief explores two interrelated questions: 1) what are the effects of farmers' choice of a particular cropping system on maize productivity and income variability; 2) what specific policy options can maximize the beneficial impact of crop diversification.

Diversified cropping systems contribute to climate smart agricultural pillars

Compared to maize monocropping, the majority of cropping systems have neutral to positive effects on smallholder productivity, though the magnitude of the impact varies.

For example, in Malawi maize-legume systems are associated with 17–38 percent increase in maize yields, compared with maize monocropping. More diverse systems likely enable farmers to capture a combination of agronomic benefits in the soil, such as through phosphorus enhancement and nitrogen fixation, from a range of crops, which contribute to improved yields of maize.

In terms of resilience, which is measured as a reduction in crop income variability, more diversified systems, particularly those that incorporate legumes, significantly reduce crop income variability compared with maize monocropping. However, no single system decreases significantly crop income volatility in all countries, suggesting that this impact depends strongly on the agronomic attributes of the specific crop grown in different countries and on associated market structures (Figure 2).



Private and public market institutions pull farmers toward more diverse cropping systems

Adoption of more diverse cropping systems depends fundamentally on functional and competitive private input and output markets. In Zambia, for example, households residing in villages with more private grain buyers are significantly more likely to move away from maize monocropping and adopt more diverse, commercially oriented systems, including systems that feature legumes and cash crops.

The price farmers pay for maize and other seeds is also an important driver of adopting more diverse cropping systems. In Malawi, for example, increases in maize seed prices by 1 percent reduce the probability of adoption of maize-legume-staple system by 5 percent while increasing substantially the adoption of maize-legume. Higher maize price, therefore, push farmers away from more diverse cropping systems and stimulate the adoption of maize-legume systems.

Conversely, increasing proximity to parastatal marketing boards, which operate in Zambia and Malawi that predominantly provide output market subsidies for maize, encourages maize monocropping.

Land access and availability is a key driver of diversification

In all three countries and for all cropping systems, land size is a critical determinant of adopting more diverse cropping systems. Farmers that lack sufficient land often prioritize staple food production, at the expense of other crops. Tackling land fragmentation should be considered a central element of a broader crop diversification strategy.

Policy options to promote diversification

▲ Encourage private investment in markets.

Private investment in agricultural markets can be promoted in a variety of ways, including by improving the predictability of agricultural trade policy; promoting stable macro-economic conditions and increasing investments in rural infrastructure, including roads and electrification.

▲ Rethink public intervention.

Reforms to parastatal market boards, including expanding the types of crops purchased and decreasing the market presence of these institutions, will have beneficial effects on diversification. Input subsidy policies must also be closely examined in the context of a diversification policy agenda. Subsidies on maize seeds may distort maize seed prices, and inadvertently encourage smallholder farmers adopt maize monocropping systems.

▲ Reform land policies and strengthening land tenure.

Land policies reforms that limit speculative land acquisitions by people outside of the farming sector and that enable productive and successful smallholders to grow and consolidate land holdings are also important. Achieving these dual objectives boils down to creating more transparent and inclusive policies for acquiring and alienating land in smallholder areas.