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CLIMATE-SMART AGRICULTURE

Drought adaptation practices and profits in Sri Lanka's rice sector: what is the missing link?

It is projected that climate change will affect rainfall patterns in South Asia and will contribute to a decline in water availability for rice cultivation in the region. In Sri Lanka, where rice is both the staple food and the primary crop grown by farmers, reductions in water availability for rice cultivation has serious impacts on farmers' welfare and national food security.

The Overarching Agricultural Policy in Sri Lanka recognizes the importance of adapting and building resilience to climate change in order to achieve national development and food security objectives. A key policy thrust of the agricultural policy framework is to address emerging climate change impacts by supporting the adoption of suitable agricultural strategies and practices by farmers. Understanding how potential climate adaptation practices affect farm systems and farmers' welfare is an important first step in translating this policy objective into effective actions.

Practices to support adaptation to drought in Sri Lanka

In the Sri Lankan rice systems, there is a variety of practices that are promoted to help reduce the sensitivity of crop systems to water stress, and to foster improved household welfare. When and where these practices can be usefully adopted varies, depending on field type (upland or lowland), and season (*maha* or *yala*). Importantly, these practices also vary in terms of the relative intensities of land, labour, capital and knowledge they require to implement, and the potential risks they may entail to household welfare.

Eleven practices were empirically evaluated, disaggregating the practice between field type and season (*yala* and *maha*) when appropriate (Table 1). These practices were selected because they are included in climate adaptation policy frameworks in Sri Lanka and are adopted by a sufficient number of farmers in Anurādhapura District to carry out an empirical analysis.

KEY MESSAGES

- Multiple farm practices are effective at reducing the sensitivity of crop production to water stress.
- However, few of these farm practices improve farmers' income, due to market weaknesses and high opportunity costs of farm labour.
- The promotion of better practices should be bundled with complementary support to market institutions, such as appropriate mechanization services, value chain support for other field crops, and input supply systems.

Many practices reduce sensitivity to water stress, but income generation is not automatic

The effects of the practices were assessed along three dimensions: 1) water stress sensitivity, which measures the impact of the practice on reducing crop loss due to wilting; 2) the value of crops harvested, which measures the farm level impacts; and 3) household income, which helps account for the opportunity costs to land, labour, and capital of adopting the practices.

Of the 11 practices considered, four are found to significantly reduce sensitivity to water stress. Famers using short-duration seeds on lowland fields during *yala* are about 5 percent less likely to experience production loss due to wilting than non-adopters. Diversification into other field crops reduces sensitivity to water stress by 10 percent on lowlands during *yala*. All else equal, having agroforestry trees on lowland fields during *yala* reduce the water stress sensitivity by 7 percent, relative to fields without these tree. Finally, practicing improved crop residue retention in the *maha* lowland fields, which entails retaining residues for at least five years and

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enhancing decomposition rates by adding water or urea, decreases water sensitivity of about 15.5 percent.

Despite these benefits, only three of the practices has a positive impact on the value of crops harvested, and only one of these also reduces water stress sensitivity. More importantly, none of the practices considered simultaneously reduce water stress sensitivity and improve household income at the same time.

Making adaptation practices profitable requires holistic actions

The inability of adaptation benefits from these practice to produce profitable outcomes for farmers is a key challenge facing Sri Lanka's agriculture sector. The reasons for this vary by practice. In some cases, the high levels of labour intensity associated with the practice create significant opportunity costs for farmers.

This is a challenge in Sri Lanka where earning off-farm income is common. In other cases, such as with other field crops, thin and non-competitive markets help to explain why planting crops that are less sensitive to water stress does not lead to a significant improvement in crop or household income. Moreover, households typically prioritize their labour allocations to rice cultivation, and therefore do not dedicate sufficient time to the cultivation of other field crops, resulting in lower yields.

TABLE 1. Many farm practices reduce water stress sensitivity, but are not significantly more profitable

SEASON	FIELD	FARM PRACTICES	WATER STRESS SENSITIVITY	IMPACT ON TOTAL VALUE OF HARVEST	IMPACT ON GROSS HOUSEHOLD INCOME
Maha	LOWLAND	SHORT DURATION RICE SEEDS			
		IMPROVED RESIDUE RETENTION	+	+	
	UPLAND	CULTIVATING MAIZE			
		AGROFORESTRY TREES			
		SOIL EROSION BARRIERS			
Yala	LOWLAND	OTHER CROPS IN THE FIELD	+	−	
		SHORT DURATION RICE SEEDS	+		
		AGROFORESTRY TREES	+		
		IMPROVED RESIDUE RETENTION		+	+
	UPLAND	SOIL EROSION BARRIERS		+	
		AGROFORESTRY TREES			

Non-significant results

\+ Beneficial relationship

− Adverse relationship

Source: Authors' own elaboration.

The results suggest that research and extension services must develop farm practices and technologies that function well under emerging climate risks, while being cognizant of the market and labour constraints farmers face. This will require a holistic approach, where the promotion of better practices is bundled with complementary support to market institutions, such as appropriate mechanization services, value chain support for other field crops, and input supply systems. In this way, farmer friendly packages of technologies that support climate risk reduction and lead to more profitable farm-level outcomes can be developed.

CONTACTS

Economic and Policy Analysis of Climate Change (EPIC)
Agrifood Economics - Economic and Social Development
epic@fao.org | www.fao.org/climatechange/epic

Food and Agriculture Organization of the United Nations
Rome, Italy

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