

■ PROGRAM ON ESCAPING THE MIDDLE – INCOME TRAP: CHAINS FOR CHANGE

HOW CAN GOVERNMENT AGENCIES INCENTIVIZE AGRICULTURAL TECHNOLOGY ADOPTION?

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ABSTRACT

Smallholder farmers in the Philippines face compounding climate risks, including rising temperatures, erratic rainfall, and intensifying tropical cyclones. These challenges exacerbate poverty and food insecurity, necessitating innovative responses. However, the adoption of climate-resilient agricultural technologies remains low due to high transition costs, localized weather patterns, aging farmers, and concerns over potential short-term losses. What will it take for smallholder farmers to embrace transformative technologies and break the cycle of vulnerability? To address this “technology transition,” this policy brief explores the role of government interventions in incentivizing the adoption of agronomic and biological innovations. Key strategies include government-subsidized technology trials, public-private partnerships to facilitate risk-free testing, and the integration of technologies into agricultural support packages. Additionally, crop insurance emerges as an indispensable tool, offering a safety net against unpredictable disasters. However, the current system requires significant reforms to improve timeliness, adequacy, and accessibility of claims processing. The convergence of government agencies,

private sector, and civil society is crucial to developing scalable technologies that help overcome these transition barriers and build resilience against escalating risks.

SIMULTANEOUS AGRICULTURE-RELATED RISKS

Smallholder farmers, particularly in developing countries like the Philippines, face multiple risks, including those related to weather and climate. Temperature has increased from 0.68°C to 1.3°C in the last 65 years, increasing at an average rate of 0.1°C per decade (PAGASA 2018). Precipitation has also changed, where rainfall intensity has increased, including extreme rainfall events. In 2023 alone, amid extreme heat events, the Philippines experienced 11 tropical cyclones, which has been the lowest record ever since 2010 from an average of 20 calamities (UNOCHA 2024). The damage to crops was estimated at ₱9.496 billion (Serquiña 2024), and income fell from ₱20,000 to ₱10,000, driving farmers into deeper poverty than ever (Beltran and Win 2023). These conditions are expected to continue and exacerbate in the coming years, with temperatures projected to rise by 0.9°C to 2.3°C

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by mid-century, depending on greenhouse gas emissions scenarios (PAGASA 2018). In addition, rainfall patterns will become more erratic, with some regions experiencing more frequent extreme rainfall events and others facing prolonged dry spells (PAGASA, n.d.). The intensity of tropical cyclones is also expected to increase, leading to more severe storms, floods, and landslides, further impacting agriculture and the livelihoods of smallholder farmers (PAGASA 2018; Climate Change Commission, n.d.). Moreover, the rising sea levels, which have already increased by 5.7–7.0 millimeters per year in certain areas of the Philippines, will continue to exacerbate the risks of storm surges and flooding, posing additional threats to farming communities and coastal infrastructures (PAGASA 2018).

Smallholders are thus compelled to manage their risks, including enrolling in crop insurance and adopting weather- and climate-proof technology like planting flood-resistant crop varieties or purchasing greenhouses. Some of the proposed technologies are biological in nature, like adopting new varieties, while some are agronomic, such as engaging in novel farm management practices. However, even if a new technology is available or if other farmers are using it, the majority of smallholders usually hesitate to adopt it. There could be numerous reasons for this behavior. One, farming is not homogenous and is subject to random effects, so the same technology that worked in one place may not work in the same manner in another place (Sunding and Zilberman 2001). Weather conditions have become more localized, such that a barangay (community) might experience rain while those adjacent to it remain dry. Two, most of the farmers are aging, where the average age of Filipino farmers is 57 years old (Empeño 2024), which makes them less excited about new technologies, especially if these are digital. Three, the proposed technology per se may be costly or risky to adopt. Four, the technology may be palatable, but if transitioning to it will result in transition or gestation costs like temporary dips in yield or an increase in cost, then these discourage adoption.

The fourth reason is a serious impediment to technology adoption, especially for subsistence farmers whose main concern is “safety first” (Scott 1976), where stability of income—the here and now—is more important than long run productivity and profit. This leads to situations where technology may be available and helpful in the long run, but smallholders are not willing to pay for the transition cost. Since the cost is temporary but the implications are long-term and concern food availability, food prices, and

rural poverty, there is room for proactive and strategic government interventions, which will be discussed in this policy brief.

We have conducted case studies on agriculture technology demonstration projects where the technologies aim to increase yield or reduce the cost of production (biological) or to improve farm management (agronomic). The relevant lessons from those case studies, along with pertinent literature, serve as references for this policy brief. The next section will discuss main ideas about how governments should intervene during this “technology transition challenge,” while the last section discusses efforts that government agencies can undertake in partnership with the private sector, civil society, and academic institutions to address other challenges concerning agriculture-related risks. On top of these is the much-needed crop insurance, which would ensure payments to farmers if hit by calamities. This would secure their resources and allow them to plan ahead, including the use of new technologies.

THE ROLES OF THE GOVERNMENT IN MANAGING TECHNOLOGICAL TRANSITION COSTS AND RISKS

Governments cannot make risks and costs of innovations disappear for smallholder farmers, but they can internalize their effects if the reasons for the risk and cost transfer are a matter of public policy (e.g., food security, rural poverty). Technologies that address systemic challenges like food security or rural poverty are considered public goods because their benefits extend beyond individual farmers and contribute to societal welfare. For example, government-funded trials and demonstration farms would fall under public goods, as they are accessible to all farmers and contribute to collective benefits.

Not all risks and costs should be internalized. The ones that the smallholder farmers can manage themselves should be addressed through market instruments and not absorbed by public policies. Testing whether a technology would work is a cost and risk that requires the concerted effort of stakeholders, particularly the government. There is a huge chance that the technology would not be tried if there are no incentives to do so and if the risks and costs remain with the farmers during the trial period. Technologies that can be commercialized and provide individual benefits to farmers could be subsidized by the government, but the cost of adoption

should eventually shift to individual farmers or private enterprises once the technology proves its value.

It is important for the government to orchestrate the “trialability” of the technology by providing the technology for free at the beginning so that it could be tested by the farmers. If the technology is developed by the private sector, efforts can be made by the government to partner with the private sector so the farmers can test the technology at no cost to them. The government can also include the technology in the bundle of services that it provides to farmers. For instance, the government could include a private-sector-developed decision-support tool (e.g., localized, granular weather forecast received via short messaging system) in the package of interventions that it provides to smallholders and their organizations. Under the foreign-assisted or regular programs of the Department of Agriculture (DA), for instance, farmers’ enrollment in a decision support tool trial could be a condition for the receipt of farm machines and business development services. The DA can also work with government banks like the Land Bank of the Philippines and the Development Bank of the Philippines so together they can undertake an initiative where the technical assistance grant for the testing of a technology can be provided along with a commitment to provide loan funds if the technology works and would be used by the farmers or farmers’ group. This effort can be undertaken by trying other technologies, like using specific seed varieties developed by public and private research agencies.

If the technology requires the use of land for testing, and no private plots are offered by farmers, local governments can be enticed to use public lands in specific localities for demonstration farms. This scheme would address concerns about farmers’ limited plots for testing and trying a new technology. Government agencies like the DA, Department of Agrarian Reform (DAR), and Department of Trade and Industry (DTI) can also engage in matching grant-type projects to address the risks and costs of technology transition. These efforts can be expanded to address other risks along the value chain, as farmers often face multiple, simultaneous challenges — such as market and climate risks. Adopting an integrated approach in technology testing projects would allow for better support systems that help farmers manage these interconnected vulnerabilities.

Given the expected weather- and climate-related challenges, both the government and the private sector need to develop, test, and commercialize technologies that would enable farmers to use them. If government agencies like the DA, DAR, and DTI can develop schemes for these technologies to be tested by smallholders, then the private sector could be enticed to continue their pursuit of innovations. Hence, if these three agencies also work together, and not in silos, the technologies that would be developed will be interoperable. That is something currently amiss in the landscape of available technologies that were reviewed by the Philippine Institute for Development Studies (2024).

NOW MORE THAN EVER: CROP INSURANCE NEEDS TO BE PURSUED

While incentives for technology testing and adoption are crucial for improving agricultural productivity, they alone are not enough to fully protect smallholder farmers from the unpredictable impacts of weather- and climate-related risks. This is where crop insurance becomes essential. Crop insurance is a risk management tool designed to mitigate the financial impact of natural disasters and other agricultural risks on farmers. The Philippine Crop Insurance Corporation (PCIC), a government entity, is the primary provider of crop insurance, offering coverage for rice, corn, high-value commercial crops, livestock, non-crop agricultural assets, and fisheries. Their mandate is to protect farmers, particularly marginalized ones, from the economic consequences of climate variability and other hazards. It also serves as a safety net for farmers, ensuring that they can recover from unpredictable and often devastating events that would otherwise leave them financially vulnerable (Reyes et al. 2015).

The PCIC is a government-owned and controlled corporation (GOCC) under the DA. It offers a range of agricultural insurance programs, including crop, livestock, fisheries, and non-crop agricultural asset insurance. Despite these offerings, many farmers have expressed dissatisfaction with the PCIC’s services, pointing out several critical issues that hinder the effective use of these programs. A major concern among farmers is the delayed processing and release of insurance claims. Given the nature of agriculture, where farmers are heavily dependent on seasonal cycles, delays in claims processing can have a significant impact on their ability to recover and continue operations (DA Press Office 2024). This can create a cycle of financial

instability, leaving farmers unable to address immediate needs like purchasing inputs or repairing infrastructure. Moreover, the insurance coverage provided by the PCIC is often seen as insufficient to fully compensate for the losses incurred. Farmers frequently report that the compensation received does not adequately reflect the financial damage they face after a disaster, leaving them with a gap that is difficult to bridge. The disparity between the coverage offered and the actual costs of recovery can undermine the confidence that farmers have in the program's ability to help them in times of crisis.

The complexity of the application process is another significant barrier. Farmers often find the procedures for applying for insurance and filing claims to be overly bureaucratic, requiring multiple documents, forms, and steps that can be challenging to navigate, especially for those with limited literacy or technical skills. This complexity not only discourages farmers from applying but also prolongs the time it takes to receive assistance, further exacerbating the negative effects of disasters. In addition, a lack of awareness and education about the insurance programs is prevalent among the farming community. Many farmers are either unaware of the insurance products available to them or do not fully understand how to access these services. This lack of awareness leads to low participation rates and underutilization of the programs, meaning that the very farmers who need protection the most are often left unprotected (Rivas 2020). Without targeted outreach, training, and education, many farmers miss out on opportunities to safeguard their livelihoods against the unpredictable risks they face.

While there is a clamor for index-based insurance, there remains no responsive public or private program. This is influenced by several factors. First, there is limited data infrastructure, with insufficient access to historical weather data and crop yield statistics, hindering the creation of reliable insurance products (Cajucom 2021). Additionally, the high costs and complexity of developing such insurance products, including the need for advanced technology and modeling, are factors in as amongst the significant barriers (Cajucom 2021). Moreover, the absence of reinsurers makes it difficult to spread risk sustainably and effectively (Hidalgo 2017). Hence, this translates into low farmer awareness of index-based insurance, contributing to its limited demand. The government can address these challenges by creating a favorable regulatory environment, engaging in public-private partnerships as mentioned, offering subsidies,

and investing in education and capacity building for stakeholders.

International models from India, Kenya, and Ethiopia provide valuable insights into scaling up index-based insurance and ensuring better protection for farmers. In India, the government offers weather-based crop insurance with significant subsidies to make premiums affordable (Miranda and Farrin 2012). Kenya's successful implementation of index-based livestock insurance (IBLI) has protected pastoralists from droughts, supported by the government and private insurers (Smith Watts 2019). Ethiopia's pilot program, which includes weather insurance for smallholder farmers, also highlights the role of government, private insurers, and international donors in strengthening data infrastructure and increasing farmer participation (Gebretsadik and Tesfay 2023).

It is important for the government to enhance the performance of PCIC and to incentivize other players to provide crop insurance, including index-based insurance, to smallholder farmers. Preventive efforts such as using decision support tools and planting better varieties are important, but given the prognosis on upcoming climatic events, having dependable crop insurance services is crucial. Government agencies, particularly the DA, should work with the private sector, donor agencies, civil society, and financial institutions to enable private insurers to develop new and better services.

CONCLUSIONS

The Philippine agriculture sector is under growing pressure from intensifying climate risks and systemic vulnerabilities that threaten both productivity and the livelihoods of smallholder farmers. Agri-technological innovation offers a promising path forward, but adoption remains stale due to the perceived and real risks of transition, limited financial buffers, and institutional constraints. Government agencies have an important role in facilitating this shift, not by replacing the private sector, but by enabling it and protecting farmers from the volatility that undermines innovation. Strategic policies that prioritize technology trialability, insurance reform, and agency coordination can ensure that this infusion becomes sustainable, rather than another burden on already-vulnerable communities.

POLICY RECOMMENDATIONS

We propose the following actions to address the challenges highlighted throughout this brief. These are aligned with existing literature and grounded in both policy realities and models:

1. Subsidize technology trials and demonstrations for smallholder farmers through government funding and partnerships with the private sector. By absorbing the initial risk and cost, the government can make technologies more accessible for testing and build farmer confidence in innovation (Sunding and Zilberman 2001; Miranda and Farrin 2012);
2. Improve the performance of crop insurance services by reforming the PCIC, improving claims processing systems, and ensuring coverage adequacy. This will help protect farmers from climate shocks while encouraging long-term investments in productivity (DA Press Office 2024; Rivas 2020), and;
3. Promote interagency coordination and technological interoperability among DA, DAR, DTI, and local governments to reduce fragmentation. Coordinated programs improve efficiency, reduce duplication, and encourage the private sector to design scalable solutions for farmers (Briones et al. 2023; PAGASA, n.d.).

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