Position Paper

Increasing Resilience to Droughts in Viet Nam

The Role of Forests, Agroforestry, and Climate Smart Agriculture

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Viet Nam is vulnerable to drought

- The 2015-16 drought is the most severe that Viet Nam has experienced in at least 90 years.
- In the Central Highlands, South Central Coast, and Mekong Delta regions, 18 provinces have declared a state of emergency and 22 provinces have been seriously affected.
- Future projections indicate that the affected regions will be exposed to longer and possibly more frequent drought conditions and flooding due to climate change.

Climate resilience from forests and agriculture

- Natural forests provide ecosystem services that mitigate the impacts of droughts and floods. However, natural forest area has reduced drastically in recent decades due to competing land use pressures, primarily from agriculture.
- Increase in monoculture production in Viet Nam has made landscapes more vulnerable to climate change.
- Agroforestry, along with other climate smart agriculture practices can contribute to increasing farmers' incomes, improving watersheds, and protecting against agricultural drought and flood impacts.

Key Takeaways

- Targeted incentives are required to invest in climate smart agriculture (CSA) practices, including agroforestry, as well as to protect and regenerate natural forests. This will support farming households affected by droughts to recover as well as increase medium-and long-term agricultural and rural landscape resilience.
- Policy-makers are urged to address barriers that prevent rural communities and farmers from adopting drought resilient practices (i.e. access to drought-resistant varieties, lack of information, financial capital, and risk management tools).
- Achieving long-term objectives for landscape resilience requires addressing farmers' more short-term, immediate needs and strengthening existing capacities in monitoring land-use change.
- Public-private partnerships and inter-sectoral dialogue and planning are key factors of success.

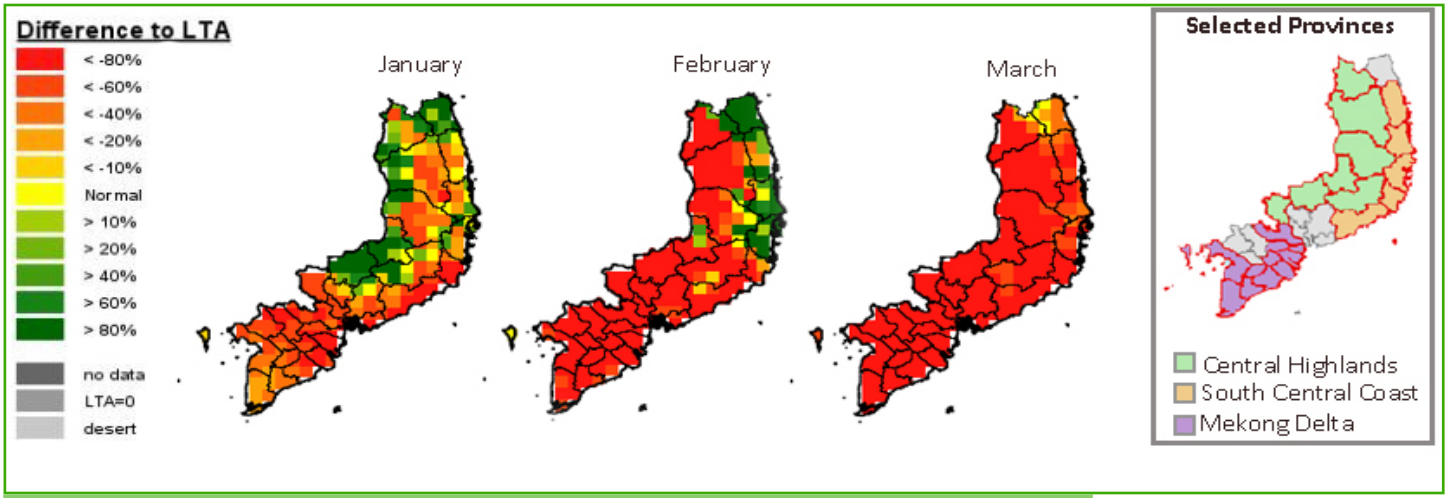

Figure 1. Precipitation Anomaly as Compared to Long Term Average, Jan-Mar 2016

The 2015-16 drought is one of the most severe on record

The 2015-16 drought has been the most prolonged drought that Viet Nam has endured in over 90 years. As of 6 June 2016, eighteen provinces had declared a state of emergency with over 80% of the country's provinces affected. Nearly four hundred thousand households in the Central Highlands, South Central Coast, and Mekong Delta required urgent relief to obtain clean household and drinking water.[1] Agricultural production in all affected regions has been reduced, in many areas considerably, due to lack of water supply for irrigation (see Figure 1 for precipitation anomaly)[2]. In the Mekong Delta, further agricultural damage resulted from the earliest and most extensive saltwater intrusion into agricultural areas recorded.[3] As a result, food security for poor households has worsened, particularly in the Central Highlands and South Central Coast where poverty rates are high.[4]

Progressive climate change will increase droughts

The variability and intensity of droughts is expected to increase with climate change - however, droughts in Viet Nam is not a new phenomenon. El Niño-related droughts in 1997-1998, 2002-2003 and 2009-2010 affected millions of people and led to hundreds of millions of dollars in economic loss[5], particularly affecting agriculture. Government responses such as the 2006 National Action Program to Combat Desertification, which substantially increased tree cover, showed that Viet Nam is capable of large-scale climate action. Despite such achievements, Viet Nam has become more susceptible to drought and other climate change impacts due to reduction in areas with diversified production systems and native forests. Regions suffering from the 2015-16 drought will likely be more frequently exposed to drought conditions in the future due to climate change. Climate models project that droughts may last longer in the Central Highlands and become more frequent and severe in other regions.[6] In the Central Highlands and South Central Coast, annual precipitation is expected to increase moderately, with a wetter rainy season and longer dry season, which is expected to extend and intensify into April and May (see Figure 2).

By 2030, the Mekong Delta is expected to see greater rainfall variability with a delayed rainy season and 20% less annual rainfall, on average, than in the 1980s.[7,8] Low lands, such as the Mekong Delta, will be affected by sea level rise, which is projected to rise by around 30 cm by 2050[9], increasing salinity and reducing yields of irrigated rice in the dry season. In addition to the delayed rainy seasons, increased upstream development of dams and diversions in the Mekong River system may further reduce fresh water flows.

These projections highlight the need to increase resilience to future droughts and floods in Viet Nam. This position paper provides a specific angle to the discussions addressing immediate needs for drought-affected farmers. It underlines the importance of integrating agroforestry, forest management, and climate smart agriculture as a central policy response. It points out a critical gap in ecosystems management in response to drought. Yet, ecosystems management needs to be taken alongside water policy and emergency assistance as a necessary component of drought and climate impact management for forests and agriculture.

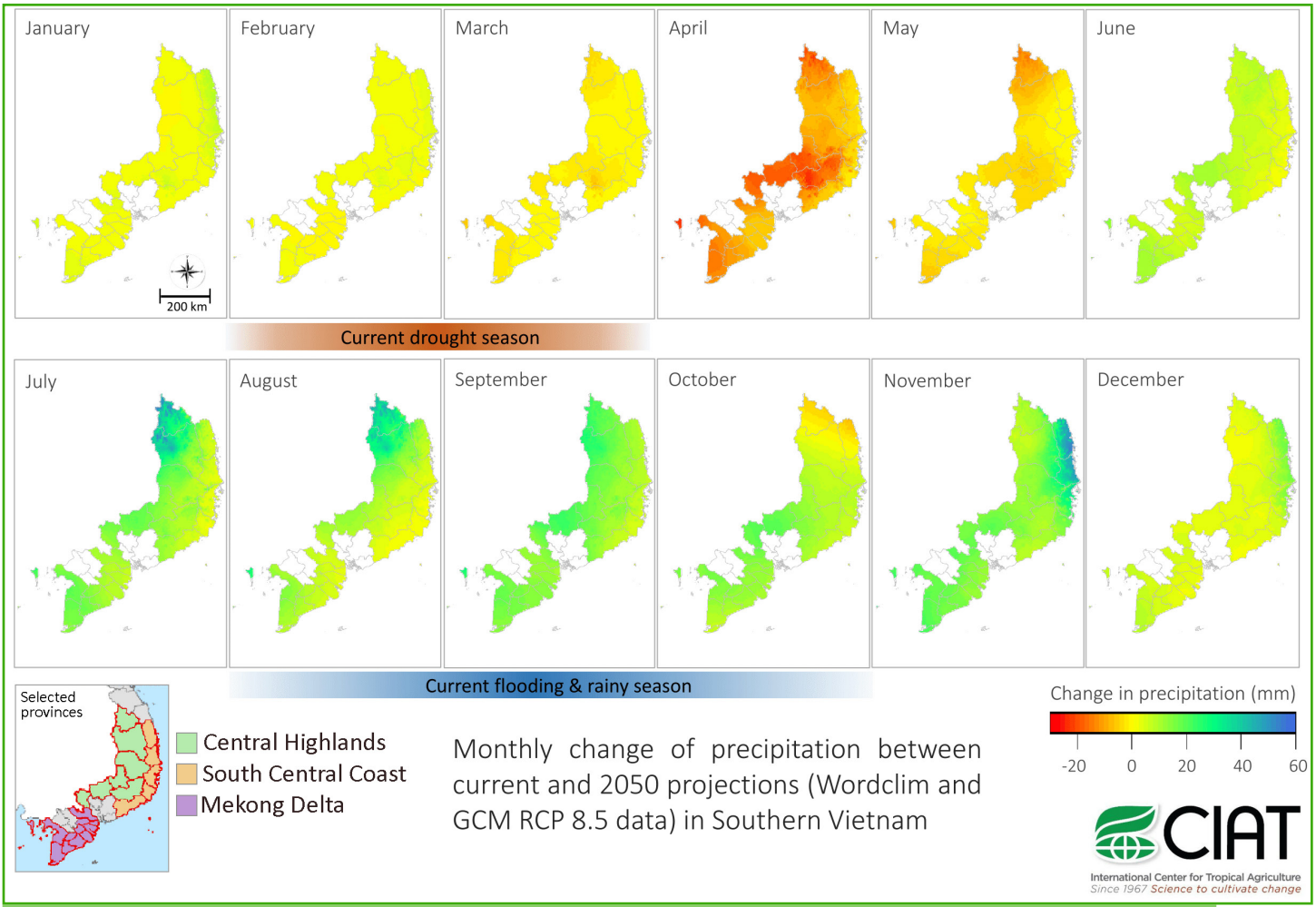

Figure 2: This figure shows the shifts in both dry and rainy seasons by 2050 based on Worldclim and GCM RCP 8.5 data for the 22 provinces that were seriously affected in the 2015-16 drought. The red bar labeled "current drought season" represents the current perceived drought season based on workshop results with farmers. The image shows that drought conditions will become more severe in April and May and extend the dry season for several months[10].

The drought's impacts on agricultural livelihoods

Extensive crop damage has been incurred to perennials such as coffee and pepper in the Central Highlands and to rice and fruit trees in the Mekong Delta.[11, 12] The accumulated damage is being felt nationwide and beyond as the Mekong Delta is the main agricultural producer of rice, fish, shrimp, and fruit in Viet Nam and an important exporting region.[13]

Salinity intrusion in the Mekong Delta

Saltwater intrusion in the Mekong Delta is an annual occurrence but its extent has been exacerbated by upstream water diversions and reduced rainfall. While farmers have historically adapted to intrusion by modifying planting schedules and crops, recent increases in intrusion have inflicted heavy damage to both commercial and smallholder farms. In the 2015-16 winter season, saltwater intrusion began two months earlier than average, and extended twice as far – up to 70 kilometers inland – than average, damaging rice, fruit trees, and shrimp farms.[14] For example, it devastated more than 50,000 hectares of paddy rice in each Kien Giang and Ca Mau provinces.[15] In addition, Ca Mau province lost 52,000 hectares of farmed shrimp.[16]

Central Highlands and South Central Coast

The Central Highlands and South Central Coast both have endured crop losses, mainly as a result of extensive water shortages, as illustrated in Figure 3. Reservoir water capacity in Ninh Thuan, Binh Thuan and Gia Lai provinces reached dangerously low levels – some were only at 30 to 50% capacity as of March 2016.[17] In North Central Coast, limited water supply has induced the hydropower plant to operate far under the maximum capacity resulting in low electricity and irrigation outputs and risk of damage to the plant machinery.[18] This has exacerbated existing problems of food shortage, particularly among the poor.

The Central Highlands and South Central Coast have comparatively high concentrations of poor households, which are three times more likely to suffer from food shortages than the national average. [19, 20] Furthermore, women and children are the most affected. Women tend to eat last and less and children may stay home from school to fetch water over long distances and to earn additional income. [21]

The losses in perennial crops are especially problematic for poor households in the Central Highlands and South Central Coast. Dak Lak province alone lost more than 60,000 hectares of perennials such as coffee and pepper[22], which can take up to three years to yield after replanting. In addition, about 4,000 animals died as a result of the drought, which also require substantial resources to replace.[23] Thus, poor households in these areas require not only immediate emergency assistance, but also continuous support to cope with the long-term damages from the drought.

Forests and trees: buffers against droughts

Drought-inflicted damage in the Central Highlands, South Central Coast, and Mekong Delta highlights how vulnerable these regions are to climate change related impacts. Natural, diversified forests and agroforests provide ecosystem services that can reduce agricultural vulnerability to droughts, as well as floods in several ways. These include:

- Decreased erosion, which can preserve soil quality and reduce crop loss[24,25]
- Maintained or improved water infiltration into soil, and water storage capacity[26,27,28]
- Decreased sedimentation and improved water quality[29]
- Reduced local flash flooding[30]
- Coastal protection, soil build up, and reduced coastal erosion from mangrove forests[31]
- Carbon sequestration by forests, agroforestry and mangroves, which mitigates global climate change and potentially provides supplemental income from carbon payments[32]

The Central Highlands, South Central Coast, and Mekong Delta have all seen expansion of monoculture practices coupled with deforestation of natural forests. Although plantation cover more than tripled nation-wide between 1995 and 2010, overall forest quality has worsened: evergreen broadleaf forest area declined by 20% and mangrove forest by nearly 30% during the same time frame.[33] Similarly in other regions such as the North Central Coast, logged over forests dominate the landscape with a tendency from locals to convert forests into acacia plantation.[34] As a result, many areas lack the broad protective environmental services that diversified forests and agroforestry landscapes provide. Plantations for pulp and paper production have comparatively little biodiversity, low carbon stocks, and limited water and soil protection potential.[35, 36, 37]

Coffee monoculture plantations in the Central Highlands are an example of how landscapes have become more vulnerable to drought because of loss of natural buffers. In this region, high coffee prices have driven expansion of coffee plantations, often into the forest. [38, 39] Monoculture practices render land less productive than surrounding

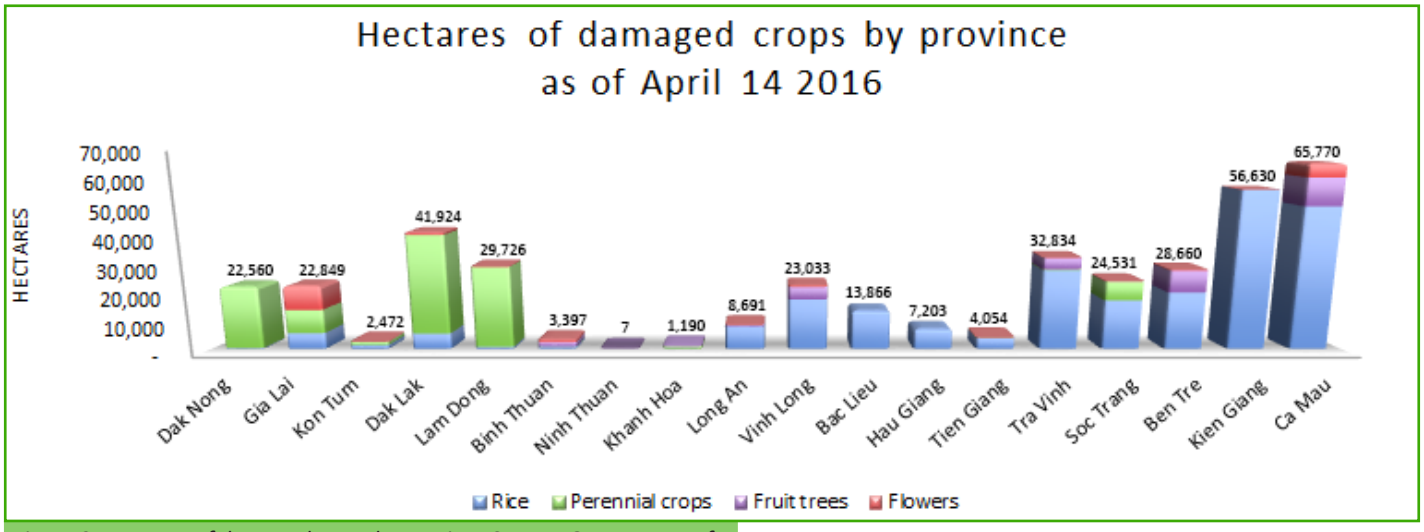

Figure 3: Hectares of damaged crops by province Source: Government of Vietnam Drought Status (2016)

areas, motivating farmers to deforest land for new coffee growing areas. As up to 30% of coffee plantations are expected to be replanted in the next five years, it is expected that without regulatory changes, coffee monoculture may result in further illegal deforestation – and in coffee plantations that are themselves more vulnerable to drought, flood, and climate change impacts due to the loss of buffers that forested landscapes provide.

Harnessing ecosystems to manage drought: forests, agroforestry, and climate smart agriculture

Effective drought management is necessary to protect and improve agricultural livelihoods and food security. This requires several strategies to be coordinated and implemented (see Figure 4). Appropriate climate smart agriculture (CSA) practices which increase resilience, improve productivity and reduce GHG emissions should be identified and promoted. Additionally, agroforestry should play an important role along with improved forest management. The combination of these three strategies would reinforce and complement each other to provide optimum ecosystem benefits at farm and landscape levels.[40]

Natural protection can be a cost-effective measure against climate change impacts but requires time and investment. For example, watershed health has been shown to be enhanced by planting multistory trees on sloping land coupled with reduced forest encroachment.[41] In North Central Coast, depending on the climate scenarios, a projection by a hydrological model shows that regenerating degraded forests can mitigate drought and flood impact by stabilizing river flows compared to a landuse scenario of conversion of degraded forests to monoculture plantations.[42] In Ha Tinh province households that practiced agroforestry reported faster economic recovery after natural disasters compared to those that did not.[43] Yet, farmers were found to face barriers to tree planting such as lack of knowledge and skills and financial capital, among others.[44]

Many farmers are already aware of basic CSA practices such as selecting drought tolerant varieties, mulching, inter-planting, and planting shade trees. However, adoption of many practices is limited by investment costs for smallholders, lack of information, and short-term tradeoffs, such as delayed income from new crops and systems. In some areas such as the Mekong Delta, transition to CSA is also limited by agricultural policies promoting intensified rice production.

Recommendations: Identify effective incentives for improved practices

Developing climate resilient landscapes requires a policy and planning framework that aligns short-term economic incentives with long-term objectives. For instance, forest regeneration programs will not be effective unless the short-term incentives for encroachment are also addressed. In this context, while the particular consequences of drought in the Central Highlands, South Central Coast and Mekong Delta differ, the institutional changes needed to shape incentives are likely similar. Table 1 provides examples of technical solutions to increase resilience to drought, highlighting important trade-offs that farmers face regarding the long-term benefits and short-term constraints. It also presents policy options to support farmers in dealing with such trade-offs. In this context, systematic cost-benefit analysis (CBA) at the local scale has an important role to play in evaluating both private and societal returns from practices to be supported.

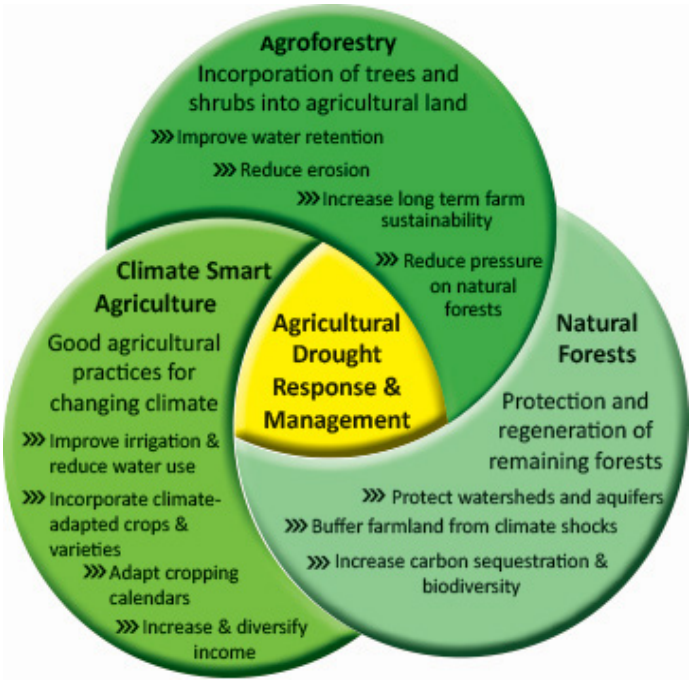

Figure 4: An Integrated Approach to Building Drought Resilience. Agroforestry is an important component of Climate Smart Agriculture; in this case, we place additional emphasis on agroforestry practices to highlight the services of trees and their connection with natural forest areas.

Table 1: Suggested Policy Options for Increasing Drought Resilience

Scale		Solutions	Long Term Benefits	Short Term Considerations and Constraints	Policy Options
Central Highlands & South Central Coast	Farm Scale	• **Farm level adoption of agroforestry** • **Use of drought-resistant crops and varieties**	• Increased soil water infiltration, reduced soil erosion • Diversified farmer incomes • Efficient water use	• Potentially high Initial investment costs • Returns to investment delayed or income gap during the establishment stage (for some practices) • Knowledge gap for farmers adopting new crops, varieties, and practices • Access to drought-resistant varieties	• Develop new funding sources to assist with initial costs and delayed returns (e.g. PFES, carbon finance) • Involve private-sector to provide drought-resistant varieties • Supply appropriate planting materials (tree and crop seedlings and seeds) to farmers forced to replant due to drought
	Landscape Scale	• **Reforestation with diverse, indigenous, and water-efficient species** • **Reduce deforestation through incentive programs**	• Increased buffering function against drought, storms, and floods • Watershed protection • Increased biodiversity and carbon sequestration	• Monoculture often economically preferred over conserving forest/reforestation in the short-term • Land degradation renders existing farmland less productive, leading to forest encroachment • Ineffective enforcement can lead to illegal agricultural expansion into natural forest land	• Incentivize farmers to invest in existing farmland (e.g. tree intercrops) rather than deforest new lands (e.g. define clearer land titles • Develop new funding sources, such as PFES, to incentivize farmers to plant multi-purpose trees and maintain existing forests • Strengthen monitoring capacities of deforestation (e.g. through real-time monitoring with remote sensing and stakeholders' engagement) to improve law enforcement
Mekong Delta	Farm Scale	• **Transition to diversified CSA crops such as fruit trees in areas less suitable for rice production** • **Use new generation drought- and/or salt-tolerant crops**	• Increased incomes from higher-value and diversified crops • Efficient water use • Reduced risk from moderate salt intrusion	• Current policies promote 3-season and intensive rice monoculture • High switching costs • Access to drought-/salt tolerant varieties • Environmental impacts of some practices (shrimp farming)	• Adjust policies to promote agricultural diversification and a shift towards high price/quality rice • Develop markets for diverse products • Assist with the costs of switching to drought and salt-resistant crops , such as sweet potatoes or fruit trees.
	Landscape Scale	• **CSA-based water management and water use policies** • **Mangrove protection and management**	• Improve water use efficiency • Greater drought and flood resilience • Mangroves reduce coastal erosion	• Regional coordination is complex and involves many stakeholders • Upstream households have little incentive to conserve water	• Develop efficient ground and surface water management and groundwater pumping regulations • Continue and expand existing successful efforts to protect mangrove, and regulate pressures on mangroves, such as shrimp farming

Source: Authors adaptation based on CGIAR Centers Assessment Reports for the Central Highlands and the Mekong Delta.[47,48] This list is not exhaustive but rather intended to be entry points for policy developments that contribute to agricultural livelihood and ecosystem resilience through Climate Smart Agriculture and forest protections.

Financing options for the recommended incentive programs are in the early stages and need to be further developed. Programs such as the World Bank's Sustainable Agriculture Transformation Project or Payments for Forest Ecosystem Services should be leveraged to ensure that short-term economic constraints do not jeopardize long-term goals.[48, 49] New and underutilized funding from government and the private sector should be channeled to support a transition towards CSA and agroforestry, as well as to protect and regenerate natural forests. Under this scenario, adequate water pricing could be an effective tool to incentivize and finance improved practices.

Carbon is becoming a new commodity that can provide additional incentives and benefits through market and non-market mechanisms, to local communities that sequester carbon through forest management or adoption of good agricultural practices. Additionally, the private sector should be involved to address constraints that farmers face in moving towards more profitable and ecologically beneficial farms. For instance, this could include, mechanisms to incentivize downstream actors such as large buyers of agricultural products to invest in the resilience of their own supply chains.

At the institutional level, the strengthening of existing policies might be considered. Clear and well-enforced land titles can reduce encroachment and increase investment in new practices. This however needs to be based on a well-functioning, transparent and more participative monitoring system. In this context, new technologies such as real-time remote-sensing can facilitate the work of local authorities and allow their early intervention.

Viet Nam's farmers, government, institutions, and international organizations have great potential to move towards such a transition. The key challenge is to harmonize objectives, plans and interventions related to agriculture, forest, climate change and all associated land use activities. Likewise, the underlying economic and financial incentives need to be aligned. It calls for closer dialogue across sectors and institutions to build integrated approaches to drought and climate change resilience, and harmonize land use planning. By incentivizing protection of natural forests, expansion of agroforestry, and adoption of CSA practices, the drought-stricken Central Highlands, South Central Coast, and Mekong Delta can recover faster from the recent drought and simultaneously reduce the economic and ecological impacts of future droughts.

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