

## Article

# Mainstreaming Climate Change Adaptation into Rural Development Plans in Vietnam—How to Build Resilience at the Interface of Policy and Practice

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**Abstract:** The interconnectedness between climate change and development has generated an increasing interest amongst development organisations to integrate adaptation into government rural development plans in a way that effectively increases resilience at a local level. However, the nature of climate change resilience is widely debated in the literature, and there is a knowledge gap regarding the best way to address adaptation at the interface with development objectives as part of mainstreaming. This paper aims to address this knowledge gap via a case study of a community-based, Climate-Smart Agriculture (CSA) project in Vietnam. A case study approach was applied with fieldwork at one project site, complemented by semi-structured interviews with government stakeholders, key experts, and project leaders of related projects. The analysis identifies five key factors that enhance rural resilience in a smallholder agricultural context: (i) engaging local governments as partners, (ii) considering broader landscape issues such as markets, (iii) providing farmers with support to facilitate adoption of CSA practices, (iv) fostering community capacity building, and (v) promoting adaptive management and scenario planning to deal with uncertainty. The paper concludes that resilience is multidimensional and not solely in line with any one of the approaches dominant in the literature.

**Keywords:** climate change adaptation; resilience; adaptive capacity; mainstreaming; climate-smart agriculture; climate-smart villages



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## 1. Introduction

Climate change will significantly impact rural communities in developing countries by threatening food security and agricultural incomes [1–3]. Making up nearly half the world's population and living in predominantly developing countries, low-income rural land users are widely considered to be disproportionately vulnerable to climate change and in need of strategies for adaptation [1,2,4,5]. In addition to their reliance on climate sensitive agriculture and natural resource-based livelihoods, rural communities are also subject to multiple non-climate stressors related to underdevelopment, such as limited access to information and resources, reduced capacity and support for decision making, limited access to services and investment, and social and political marginalisation [1,2,6]. These factors hinder the ability of communities to deal with the pressures of climate change, as well as wider global economic changes [7]. Thus, underdevelopment increases vulnerability to climate change and increases the potential impact of climate change, which together pose a major challenge for the realisation of development goals as set by national governments, and following from the United Nations' Sustainable Development Goals [4,8].

Due to the interconnectedness of climate change and rural development, the Intergovernmental Panel on Climate Change (IPCC) and a body of academic literature call

for climate change adaptation measures to be integrated into existing and newly formulated policy agendas and plans for policy implementation, a process called mainstreaming [2,4,6,9,10]. In theory, mainstreaming should generate rural development policies and implementation plans in which the consequences of climate change are anticipated, and adjustments to existing plans that do not explicitly consider climate risks can be made [11]. Additionally, Rosenzweig et al. [12] state that, as part of a systemic approach to food systems, climate adaptation and mitigation practices should include improvement of livelihoods and lead to socio-economic benefits. Mainstreaming can therefore take advantage of synergies between climate adaptation and rural development in a variety of ways, and there is growing interest amongst other, non-governmental development agencies to contribute to mainstreaming by drawing out lessons learned from pilot projects and feeding these lessons into national and sub-national development agendas [6,13]. Ayers et al. [6] assert that the goal of governments and non-governmental development agencies together should be to enable government mainstreaming and support national ownership of the development process.

However, mainstreaming has its detractors. Critics have pointed out that existing development practices have a history and a routine that is characterised by project-based approaches with discrete, local activities in ‘vulnerability hotspots’, and they have a short time span of one or several years [14]. Climate change adaptation and mitigation plans, however, typically are formulated on a national or international scale, for example, a country’s National Adaptation Programme of Action (NAPA). Mainstreaming from project-level to national level thus requires aligning shorter-term solutions for a particular area with long-term and geographically large-scale climate adaptation goals.

How, then, can development agencies mainstream adaptation in a way that aligns with government objectives and effectively builds resilience at a local level? There is an ongoing debate in the literature concerning the nature of climate change resilience, and consequently the best way to address adaptation at the interface with development objectives. From our reading of the literature, presented more extensively in the next section, the concept of resilience has evolved over time, which offers several distinct and contrasting approaches. The conventional view that emerged in the early 20th century and was adopted by the disaster risk reduction community, sees climate issues as external natural events, where the sources of risk are based within nature and outside of society [15,16]. The aim is to resist disturbance and change, and to conserve existing structures and functions [17]. This ‘techno-scientific’ or ‘climate-proofing’ discourse, still prevalent today, frames climate change as a problem requiring scientific expertise and technical solutions to address specific climate risks [18].

Community-based adaptation projects adopt an opposite discourse to the top-down approach of climate-proofing by giving pre-eminence to local communities [5]. This approach views local communities as having the skills, experience, and local knowledge to effectively increase their own resilience to climate change [5]. Consequently, action should take place at the community level and identify and implement participatory activities that strengthen the capacity of local people to adapt.

Other authors posit that focusing solely on the local level overlooks the influence of the broader institutional context, and view climate change as one of many other off-farm stresses on communities [19,20]. This perspective aims to increase resilience to climate change by addressing the underlying development-related drivers of vulnerability linked to wider economic, political, and social forces, strengthening the ability of institutions to adapt.

A fourth approach frames climate change issues as social-ecological resilience. This school of thought states that resilience is not simply about resisting change, but also about the ability of a system to develop with change and transform into something new [17]. The key component of social-ecological resilience is building ‘adaptive capacity’, which emphasises developing the ability of local people to self-organise, learn and innovate, and be flexible in order to be able to make decisions that evolve and improve with newly

emerging conditions and information. This is a continuous process of adaptation that enables communities to manage the uncertainty that is inherent in climate change [21].

The existence of different approaches may, at first hand, seem to complicate the mainstreaming of climate change adaptation in development. Policy makers may prefer unambiguous scientific advice that easily translates into policies. The interaction between science and policy, however, is a continuous dialogue rather than a one-off moment of solicited advice. Against this background, the aim of this paper is to determine key factors of adaptation mainstreaming that effectively lead to resilience building in rural communities. We also contribute to the debate on resilience by exploring whether these four approaches are distinct and independent, or whether they can overlap and build upon each other. The four approaches are reviewed through a case study on a Climate-Smart Agriculture (CSA) project in Vietnam, whose framework the government is considering for mainstreaming into the country's national rural development program. We also take into consideration key informant accounts from a sister CSA project site in Vietnam, as the activities implemented in each site are a different mix of the four resilience approaches and have achieved different outcomes. We begin by providing a brief review of the literature on the dominant approaches to climate change resilience and outlining the study sites and framework of the two CSA projects in Vietnam. The paper then presents an assessment of five key factors of adaptation mainstreaming identified as fostering resilience, evaluates how they align with national and sub-national governmental priorities for adaptation and development, and discusses how the findings contribute to the ongoing debate on the nature of resilience.

## 2. Approaches to Resilience

The climate-proofing approach to resilience posits that adaptation will be the resulting outcome if appropriate technical measures to boost agricultural productivity against specific climate risks can be identified and implemented [22]. Projects that follow this approach tend to be top-down and follow a linear pathway from conception and baseline measurements, to the implementation of interventions that are generally technological solutions presented in the form of lists or inventories, and finally conclude with post-hoc monitoring and evaluation [21,23]. However, the critique of the climate-proofing approach is its failure to address the complexity of the institutional context within which communities operate and the underlying factors that make people vulnerable [16,24,25]. Problems are dealt with as if they were unique and separate from wider political and socio-economic issues [23]. While technology has an important role to play in adaptation, a climate-proofing mindset tends to limit the range of solutions that can be envisaged by downplaying the importance of other factors. Historically, these projects have had limited success [8,19].

Community-based adaptation projects, on the other hand, consider vulnerability to climate change to be driven by local, context-specific socio-economic factors as well as physical climate risks [26]. Participatory processes with communities are the foundation of community-based adaptation, so as to ensure that interventions meet local needs and wants, and are based on cultural norms [26]. Although more comprehensive than climate-proofing, community-based adaptation projects also face criticism. Dodman and Mitlin [5] point out that such projects have a partial understanding of community processes. The predominant local focus tends to overlook wider institutional issues that determine the vulnerability and opportunities of smallholder farmers.

Another strand of literature places more focus on reducing the core determinants of vulnerability related to off-farm factors and the broader complexity of farming systems, such as markets [7,19,20]. Additionally, these studies have demonstrated that technological interventions are more likely to be successful if they are linked to cross-scale institutions and structures that place the responsibility with local organisations [7,19]. This perspective aims to reduce vulnerability to climate change by addressing the underlying drivers of vulnerability, involving multiple institutional actors, and strengthening the ability of local people and organisations to adapt.

In social-ecological resilience, adaptation is considered a process rather than an outcome [7,23]. Uncertainty is often a significant obstacle to action, as it is a challenge to predict climate impacts and implement technological interventions that address them. Therefore, techniques are needed to deal with uncertain information and promote anticipatory learning [21,23,27,28]. Scenario planning and adaptive management are two such tools to deal with uncertainty [21,29,30]. Scenarios are used to envision a range of potential futures, and the ways they may unfold, in order to plan adaptive responses [23,29,30]. Adaptive management involves having deliberative spaces for learning where stakeholders can go through iterative cycles of reflecting and testing solutions in order to continuously learn about complex situations [21]. Concretely for farmers, this involves an understanding of how they have responded to past climatic impacts, explicitly considering the decisions they have taken, determining what strategies were most and least effective and why, and formulating plans for action [21]. This is not trial and error, but instead developing the ability to learn from mistakes, generate experience of dealing with change, and the skill to innovate. These tools are dynamic, flexible, and continuous processes that build the agency of local people and enable them to use their experience to enhance their adaptive capacity and keep their options open.

### 3. Materials and Methods

#### 3.1. Case Study

The government of Vietnam is currently preparing to integrate climate change adaptation into its cornerstone rural development program, the National Target Program on New Rural Development (NTP-NRD), launched by the Ministry of Agriculture and Rural Development in 2009. Now that the NTP-NRD has completed its first 10-year plan, which primarily focused on physical infrastructure and income generation, the government is committed to intensifying support for sustainable development and to actively respond to climate change. Identified as one of the top three risks facing agricultural livelihoods in the country and as critical for rural development, climate change will be integrated in the form of adaptation and mitigation targets. In the current stage of planning, the government of Vietnam is actively seeking recommendations on the mainstreaming process and is open to engaging in discussions regarding lessons learned from local CSA initiatives. The Climate Change, Agriculture, and Food Security (CCAFS) program is an international and interdisciplinary Consultative Group for International Agricultural Research (CGIAR) program that seeks to address the challenge of transforming agricultural systems to support food security under climate change. One of their initiatives is the Climate-Smart Village (CSV) project launched in 2011 across the tropics, and in 2015 in Southeast Asia (SEA). The CSV is an agricultural research for development approach [31]. CSVs follows the principles of CSA, to sustainably increase agricultural productivity and incomes, adapt and increase resilience to climate change impacts, and reduce greenhouse gas emissions [32]. They are intended to ‘serve as models of climate-resilient communities and field laboratories of climate-smart agriculture’ that ‘ensure food security, promote adaptation and build resilience to climatic stresses’ [33,34].

The CSV framework consists of eight sequential steps (Figure 1) [34]. The ‘CSA options’ during the time of implementation in SEA were comprised of four complementary components: (i) climate-smart Technologies and Practices (T&P) that are adapted to the local agroecology and respond to climate risks and farmer needs, (ii) Climate Information Services (CIS) such as weather forecasts and climate-informed agro-advisories, (iii) Village Development and adaptation Plans, and (iv) integrating farmer Local Knowledge [33].



**Figure 1.** The 8-step framework for setting up a Climate-Smart Village. Figure adapted from [34].

In Vietnam, the CSV project was implemented in three villages, each managed by a different CGIAR research centre. The Ma CSV, in the northern mountainous Yen Bai province, was set up and managed by the International Centre for Tropical Agriculture (CIAT). The My Loi CSV, in Ha Tinh province on the north central coast, was set up and managed by the World Agroforestry Centre (ICRAF), and Tra Hat CSV, in the Mekong Delta, by the International Rice Research Institute (IRRI).

### 3.2. Data Collection and Analysis

The Ma CSV was selected as the site for fieldwork because it has been chosen by CCAFS as the flagship CSV for scaling efforts, while the My Loi CSV was selected as a comparison site due to its different choice of CSA activities and consequently adaptation outcomes.

Data collection included semi-structured, key informant interviews with farmers in the Ma CSV, CCAFS experts, and local and national government agencies. A two-week field visit to the Ma CSV was undertaken in January 2020 by the first author and a CIAT staff member in the role of facilitator and translator. Interviews and field observations were conducted with ten farmers in the Ma CSV, including seven adopters of the CSA practices implemented in the village, and three non-adopters. A CIAT record of farmers in Ma village and the CSA practices they adopted was stratified by the three broad categories of CSA practices (agricultural waste management, climate resilient rice production, integrated home garden). Two or three farmers from each category were then randomly selected using the MS Excel RAND function. Participants represented a cross section of the community, from both genders and from different age groups and social statuses. Government officials at the local and national level were selected in consultation with CIAT based on their involvement in agriculture, climate change, rural development, and the NTP-NRD program. Key experts from CCAFS included the project managers from Ma, My Loi, and another SEA CSV, as well as experts with a broad overview of the project. Besides the My Loi CSV, information from a CSV in the Philippines was retrieved for additional comparisons to the Ma CSV.

Table 1 presents the interviewees and the topics discussed. Questions within each interviewee category were, as much as possible, kept the same for comparison purposes, with some variations relevant to the specific position of the interviewee. At the local level, interviews were conducted in Vietnamese and directly translated by writing into English, and the Vietnamese audio was recorded for reference. At the key expert and national level, interviews were conducted in English, recorded, and transcribed. Interview transcripts were coded using ATLAS.ti qualitative software to facilitate analysis and the formation of the key enabling factors. Categories included the CSV framework, components, sites,



and outcomes, government priorities, the resilience approaches, and dominant themes that emerged in the interviews.

**Table 1.** Interviewees and topics discussed.

Interviewees	Topics Discussed	No. of Respondents
Ma CSV farmers	Perception of climate risk, opinions on the components of the CSV including experience with the T&Ps adopted, constraints that prevented adoption or caused farmers to abandon practices, and benefits and drawbacks of the project	10
Local officials (village, commune, district, province)	Official mandates and responsibilities, level of involvement in Ma CSV, and the benefits and drawbacks of the project as implemented	7
CCAFS key experts	Project priorities and implementation in Ma and My Loi, comparisons between the Southeast Asia CSVs, and key challenges and success factors	7
National government officials	Official mandates and priorities regarding agriculture, climate change, and rural development, opinion of the CSV as a concept, and how the CSV could provide added value to further agricultural or rural development objectives	5

CSV: Climate-Smart Village; T&P: Technologies & Practices.

#### 4. Key Enabling Factors

A CSV consists of four complementary components. Table 2 lists the ideal CCAFS [33] expectations for each component and highlights to what extent they were implemented in Ma village according to the interviews with farmers, local officials, and project leaders. Based on the implementation of activities in Ma and My Loi, five key factors are drawn out in the next section and listed in Table 3 that enabled the two communities to more effectively adapt to climate change and enhance their resilience. Additionally, because the ultimate goal is mainstreaming into national policy, alignment with national level priorities is also taken into consideration.

**Table 2.** Components of an ideal Climate-Smart Village and their level of implementation in Ma CSV.

Component	CSV Ideal	Implementation in Ma CSV
Technologies & Practices	Portfolio of agricultural practices and technologies that address the three CSA pillars of productivity, adaptation, and mitigation	<ul style="list-style-type: none"> <li>- 5 T&amp;Ps selected for promotion and adoption by farmers</li> <li>- Portfolio decided on via a participatory prioritisation process</li> <li>- Field experiments conducted to generate evidence</li> </ul>
Living bed <sup>1</sup>		<ul style="list-style-type: none"> <li>- Bedding for chicken coops made from village by-products</li> <li>- Effective microorganisms decompose dung to keep coop clean</li> <li>- Improves health and productivity of chickens</li> <li>- Adopted by majority of farmers with chickens</li> </ul>
Cassava-grass intercrop		<ul style="list-style-type: none"> <li>- Cassava and grass intercrop strips on a slope</li> <li>- Reduces topsoil loss from erosion by storms</li> <li>- Discontinued due to village abandonment of cassava as a crop following the closure of the cassava processing factory and low cassava selling price</li> </ul>
System of Rice Intensification		<ul style="list-style-type: none"> <li>- High yielding drought and cold tolerant rice varieties</li> <li>- Wider spacing of rice in rows</li> <li>- Limited adoption due to labour and time constraints</li> </ul>
Vermicompost		<ul style="list-style-type: none"> <li>- Cow and buffalo manure composting with red worms</li> <li>- Better waste and smell management, reduce use of chemical fertilisers, worms can be used as chicken feed</li> <li>- Limited to farmers owning a cow</li> </ul>
Fruit trees & pruning		<ul style="list-style-type: none"> <li>- Fruit trees such as guava or pomelo</li> <li>- Pruning to encourage productivity</li> <li>- Trees have high climate resilience</li> <li>- Limited adoption due to high initial investment cost of trees</li> </ul>
Climate Information Services	Agro-advisories based on seasonal and real time weather forecasts to help farmers plan their season	<ul style="list-style-type: none"> <li>- Rain gauge to measure daily rainfall</li> <li>- Loudspeaker system announcing daily forecast</li> <li>- Loudspeaker discontinued after project completion</li> </ul>
Village Development Plans	Village agricultural and contingency plans considering current and future climate risks and agroecological and socio-economic conditions	<ul style="list-style-type: none"> <li>- Not attempted</li> <li>- Guidelines provided during system of rice intensification trainings on when to use which varieties</li> </ul>
Local knowledge	Integrating farmer local knowledge of the environment and climate and promoting local varieties	<ul style="list-style-type: none"> <li>- Farmers consulted during the T&amp;P prioritisation process</li> <li>- Farmers involved in meetings and discussions about T&amp;Ps</li> <li>- No local varieties</li> </ul>

<sup>1</sup> The living bed, cassava-grass intercrop, system of rice intensification, vermicompost, and fruit trees & pruning were the T&Ps chosen for implementation by Ma CSV farmers.

**Table 3.** Five key factors for building resilience in rural communities.

	Key Factors for Building Resilience
1	Engaging the institutional system as partners
2	Landscape approach and market linkages
3	Incentives and support system
4	Community capacity building
5	Adaptive management and scenario planning

#### 4.1. Engaging the Institutional Partners

A CCAFS respondent with an oversight of the SEA CSVs stated that the key to successful implementation of interventions in a community is for the development organisation to make itself superfluous within the project. This is achieved by giving the local government as much ownership of the project as possible and accompanying them throughout the process. Officials at the national level also highlighted engaging the local government as essential. National officials expressed the necessity for a support mechanism for adaptation to be established as part of the existing system, in order to strengthen it and make it more functional. The system includes local authorities from the province to the village level, agriculture staff from the extension centre, hydro-meteorological officials, mass organisations such as the Farmers' Union and Women's Union, local research institutes, and the private sector, which all serve as 'the connection and technology transfer to local people'. While both CIAT and ICRAF engaged local government stakeholders in the project, their approaches differed.

When describing the involvement of the local government, CIAT used terms such as 'we invited [government officials] to come', they 'came to witness', we 'try to be inclusive'. Officials from the commune to district level had hands-on involvement in the project, such as supporting farmer workshops and trainings, implementing and monitoring the T&Ps, and public awareness initiatives. At the provincial level, officials were invited to meetings and events and kept aware of developments but were less involved hands-on. One provincial department called their involvement in Ma 'negligible'. This suggests that Ma was run primarily by the project managers, with local government stakeholders providing support. On the other hand, ICRAF project managers used terms such as 'partner', 'directly working with', 'co-lead, co-implement, co-monitor, and co-scale-out the project'. The province was the main level targeted, in order to develop plans that 'met their demands, not our demands'.

An example of stakeholder involvement for both projects is their CIS component. In the Ma CSV, a CIS was implemented to a certain extent via the provision of daily forecasting through a system of loudspeakers and a local rain gauge. It was funded by the project budget and ran for six months, until funding ceased. CIAT did not regard CIS as a priority component. They felt that a comprehensive CIS with seasonal forecasts and integrated agro-advice was a much larger initiative than could be fulfilled by the CSV because it would require changes within the government structure to enable such a flow of information between departments. It was thus considered outside the mandate of the project, and was rather the domain of the government or CIS-specific projects.

Although there was little added benefit in terms of information, because the daily forecast was also available on the TV and online, all the farmers in Ma appreciated the loudspeaker system due to its convenience before going to the field in the morning (Table S1). Opinions on the usefulness of the CIS differed, however, between the local and provincial levels. Local level authorities were satisfied because farmers were satisfied, while provincial authorities criticised the additional workload for the provincial meteorological office with no added value in the information provided. Province authorities also remarked that CIAT's approach was unsustainable because of funding limitations. Provincial authorities agreed that, in order to be effective and ensure continuity after project completion, a collaboration between the hydro-meteorological and agriculture sectors would need to be integrated within the government structure.



In My Loi, ICRAF's goal for its CSV was to provide tailored seasonal climate forecasts and co-create integrated agro-advisories that were useful for farmers to plan their farming activities. To do so, they brought the provincial hydro-meteorological and crop production officers together to forge a partnership between the two relevant departments and facilitate the flow of information, and they connected them directly with the farmers in the village via a series of meetings. By doing so, the mechanism to provide seasonal forecasting and agro-advice became embedded into the provincial government structure. The My Loi CIS component achieved a high level of implementation and is currently still running.

The My Loi CSV was characterised by working in partnership with the provincial authorities, giving them ownership of the CIS from the start, and bridging governmental structures, together contributing to improving the quality of the service and its sustainability beyond project completion. CIAT's decision to focus on the local level and not address wider structural institutional factors resulted in a partial and short-term implementation of this component.

#### *4.2. Landscape Approach and Market Linkages*

A second area requiring particular attention in the eyes of interviewees at the national level is the development of a more holistic landscape approach, whereby producers and buyers are interconnected within an integrated food-system. Authorities stressed that climate change must not be regarded as a standalone issue, because maintaining or increasing yields is not the only challenge for smallholder farmer livelihoods. Accessing reliable markets is a major hurdle for farmers who, officials say, often produce a sufficient quantity but do not have the necessary skills, market information, logistics, and organisation to appropriately sell their products. Hence the need to connect regional farmers producing certain commodities to committed end buyers, such as private companies. Improving market access and developing value chains across landscapes is then viewed as critical for livelihood security.

Opinions on this topic varied amongst the CCAFS key respondents. One respondent considered the market issue as too 'big' and not workable in the CSV, requiring a larger scope than the scale of the project. However, other CCAFS respondents did stress the importance of understanding the link to the wider landscape. This involves identifying the existing production systems and main livelihood activities in the village and developing CSA options around these main commodities.

In the Ma CSV, some attention was given to a main source of livelihood for the village, namely eucalyptus and acacia plantations for plywood production and export to China, which take up 220 ha of the 350 ha of Ma's agricultural land [35]. During the interviews, many farmers reported the impact of storms on eucalyptus as one of the main climate risks affecting them, and local authorities regretted the absence of T&Ps for forestry. CIAT did not pursue CSA options for forestry, however, as it was considered very challenging and there were budget limitations, focusing instead on food crops and livestock. CIAT also did not explicitly address developing market linkages as they felt that the local market is very fragmented and not all T&Ps can meet market demand or be developed as good value chains. However, some market criteria were considered, for example promoting crops and varieties with good eating quality that are preferred on the market, such as pomelos, guava, and climate resilient rice with good flavour. The living bed T&P also significantly improved the health and quality of chickens, raising their market value compared to free grazing chickens. The farmers who adopted these T&Ps reported being very happy with the increase in income.

In My Loi, ICRAF reported that all crops promoted were first considered for marketability because farmers would not accept producing crops with little market value. The strategy was to first identify what farmers produce and what they could do to improve production, as well as to diversify income via intercropping or changing crop. Although forestry was also a main source of income in My Loi, ICRAF encouraged farmers to shift to more storm resilient tea and oranges. ICRAF then attempted to create market linkages with

varying success. A successful partnership was forged with tea companies that cooperate with tea farmers to buy their products and provide inputs. For peanuts, a small partnership was initiated with a Hanoi-based peanut butter company, which now buys organic peanuts from three My Loi farmers. A less successful endeavour was finding a market for oranges, due to strong competition from other regions. The same occurred with pigs, for which there was a sudden price drop and farmers had to sell at a loss. According to ICRAF, pig farmers subsequently chose to diversify their farming practices.

These different experiences illustrate the importance for projects to consider the main sources of livelihood in the community. If the products are vulnerable to climate change, a solution should be found, or the crop should be diversified. Diversification appears to help spread risk, whether climate or market related. As importantly, farmers appreciate crops with a market value, and partnerships with private companies are a valuable way to secure income.

#### *4.3. Incentives and Support System*

Although it may be necessary to change crops and adopt new climate resilient technologies, farmers can face barriers to adoption that limit their ability to alter their practices. In the Ma CSV, adoption of the T&Ps was promoted by conducting demonstrations and experiments in select farmers' fields and organising field days and training courses in order to generate evidence of their effectiveness and showcase their benefits. These experiments were also meant for research purposes, in line with the CSV's agricultural research for development approach.

When asked about the benefits of the T&Ps, farmers generally highlighted increases in productivity, and by consequence improvements in food security or livelihood. The most popular T&P was the living bed for chickens because it had the largest increase in productivity, with little to no drawbacks. Other stated benefits from T&Ps included less smell from improved animal waste management, and reductions in the use of other inputs, such as the vermicompost replacing chemical fertilisers. Climate resilience and emission reduction were not explicit priorities of farmers, but rather externalities of the T&Ps that farmers adopted for productivity and convenience reasons. Convenience seemed to be a particularly important consideration, as even T&Ps that were designed to have production gains as well as adaptation benefits, such as the system of rice intensification, cassava-grass intercrop, and fruit trees, had limited adoption success due to constraints. As main drawbacks, farmers cited labour and time constraints that made day-to-day farming more challenging, or financial limitations. The T&Ps were adopted, avoided, or abandoned based on these factors. Poorer households, or those with elderly residents or with a limited labour force, particularly highlighted these constraints.

Thus, farmers prioritised adoption of the T&Ps that they saw as having high productivity and/or being convenient, and that did not increase labour and time requirements. As a result, while the basket of T&Ps was diverse and addressed the three CSV pillars, only the living bed had a high adoption rate, with half of agricultural households adopting it, followed by vermicomposting. Local authorities across all levels valued the T&Ps' improvements in productivity and livelihood. However, some officials considered the T&Ps adopted by farmers too one sided for focussing primarily on livestock productivity and insufficiently on crops and climate resilience.

The example of the Ma CSV illustrates that an evidence-based push for adoption can have limited success if the technologies promoted do not have obvious production benefits or if farmers face constraints such as finance, time, and labour. As such, one of the main needs identified by one CCAFS respondent is to provide incentives and support systems in order to encourage farmers to adopt practices that are not only production centred, but also address the other two CSA pillars. According to the respondent, trainings are not sufficient to stimulate farmers to adopt new practices. As an alternative, the respondent cited the Community Innovation Fund (CIF), a kick-start fund adopted by ICRAF in My Loi and the CSV in the Philippines, for farmers to take out loans solely for CSA purposes, such as

purchasing inputs and tools. The money is seeded by the farmers themselves and is run by farmer groups that meet regularly to discuss the use of the fund. ICRAF stated that the fund enables farmers to invest in T&Ps with high initial costs, such as fruit trees, thus removing a cost barrier. Even if farmers have enough personal money to invest, ICRAF deemed that a fund is a way to motivate them to experiment and try out new practices. According to ICRAF, an officer from the NTP-NRD program appreciated My Loi's CIF fund as a mechanism that 'facilitates many other things', and he considered it the key to sustainability. Indeed, the CIF and the farmer groups have continued after the end of the CSV project to facilitate investments in climate-smart practices.

#### 4.4. Community Capacity Building

The Ministry of Agriculture and Rural Development stated that one of the primary objectives of the NTP-NRD program is to promote local empowerment and autonomy, and to give communities the tools to help themselves. To respond to climate change, people will be encouraged to be proactive, draw on their own experiences and awareness of their environment, and return to more natural ways of production. Consequently, the requirement most emphasised at the national level was capacity building of communities. An official from the NTP-NRD program specifically stressed that communities must be the main actors and be able to figure out what is best for them, rather than external agencies implementing specific production or adaptation techniques.

In alignment with national priorities, the CSV concept promotes a bottom-up, community-based participatory approach to engage farmers in building their own adaptive capacity. Farmers are considered the main actors, and ideally components such as the T&Ps, CIS, and village development plans are intended to capture farmer knowledge and feed it into concrete tools farmers can use to adapt. In the Ma CSV, a participatory process engaged farmers in a series of meetings in order to select a number of T&Ps that responded to the risks and suited their needs. In these meetings, farmers were actively encouraged to voice their opinions and provide and discuss suggestions to decide on the technologies. While not all farmers interviewed had been involved in the participatory decision-making process, those who had valued the engagement and felt that CIAT had appreciated and encouraged their inputs and opinions and innovations based on their experiential knowledge. Local authorities also praised the bottom-up approach to select the interventions.

All farmers in Ma stated that there was an enhanced social atmosphere in the village brought about by the increased interactions, meetings, and activities organised by the project. Some farmers reported previously being shy, and via the CSV, developing the confidence to actively participate in discussions and introduce their adopted practices to visitors through the organised visits and project activities. Additionally, most farmers proudly stated that they were now more aware of climate change and environmental issues, and some said that they had become more proactive in searching out new information. The most cited benefit of the project by the local authorities was the increase of farmer awareness of environmental and climate change issues, and their resulting proactiveness to look for new information and try out different farming practices.

The village development plan component, however, was not considered a priority in Ma and was not implemented, primarily due to lack of staff resources. CIAT did provide guidelines for certain T&Ps, such as the type of crops or varieties to plant in certain scenarios, for example, drought tolerant varieties for dry years. Local authorities would have liked to see all farmers following one organised plan and implementing the relevant practices, and they regretted the lack of village coordination. My Loi, as part of the village development plan component, developed planning tools and documentation together with local authorities and farmers to help them identify different crops or management practices in case of various climate risks. Working groups were set up for farmers to discuss with each other how to deal with various issues. My Loi also had a strong gender focus in the project, fostering women's participation and promoting trust and information sharing between husband and wife. ICRAF stressed the importance of this focus, as women

play a vital role in agriculture, and interventions should reach them and suit their needs. ICRAF considered these working groups and gender considerations as contributing factors that foster community spirit, encourage farmers to work together, and enable them to be proactive in decision making.

#### 4.5. Adaptive Management and Scenario Planning

According to the social-ecological resilience school of thought, learning about past experiences, reflecting on adaptive strategies, and self-organisation are key components of capacity building [21,36]. The national level also gave importance to farmers' ability to draw on their own experiences and awareness of their environment in order to figure out what is best for them, as well as having the tools to help themselves.

ICRAF added to the CSV's community-based approach by emphasising adaptive learning and raising farmer awareness. The decision stemmed from a difficulty ICRAF identified with implementing practices based on self-identified farmers' needs, namely the tendency of farmers to think short-term and to only consider climate impacts that have recently affected them. While productivity appears to be a primary motivator, ICRAF noted that households may have more nuanced needs, such as valuing a more stable yield vs. an increase in yield. Accordingly, ICRAF's strategy was to discuss with farmers their individual priorities and accompany them over the course of several seasons to help them evaluate their farming practices as a way of achieving their goals. By generating evidence together with the researchers, farmers learned to observe climate impacts on their crops, assess the strengths and weaknesses of their current practices, and consider more long-term climate-smart pathways. One of the CCAFS key experts stated that the introduced T&Ps in My Loi were very well accepted by farmers, partially because researchers helped farmers identify and focus on the crops and practices already existing in the area that were climate smart.

Another tool introduced in My Loi was to build climate scenarios as part of the CIS. The provincial hydro-meteorological officer would share seasonal forecasts to the CSV in the form of likelihoods, such as a 60% chance of a dry season. Plans were then developed together with the provincial crop officer and the farmers for that scenario, as well as alternative scenarios. The village development plans in My Loi were also in the form of 'if . . . then' scenarios. ICRAF stated that they worked out a long list of scenarios and contingency plans as part of the CIS and village development plans, which farmers are now able to choose from depending on how the climate unfolds.

Farmers must deal with uncertainty regarding future climate change impacts, as well as rapidly evolving market and socio-economic conditions. Equipping farmers with methods to assess situations and learn from events and flexibly adapt their practices, in other words adaptive management, as well as prepare for a range of future scenarios via scenario planning, can allow them to better cope with unexpected situations. ICRAF reported that these tools allowed farmers to be more autonomous in adapting their practices in response to their environment. A CCAFS respondent considered the increase in farmer proactivity and independence in dealing with difficulties as one of the most notable outcomes of the My Loi project.

## 5. Discussion

This analysis of the implementation of the CSV project in Vietnam sought to identify key factors of adaptation mainstreaming and enable the building of resilience for farming communities, as well as to reflect on the nature of resilience itself. Based on our conclusions of what worked in the CSV project, we discuss to what extent the four resilience approaches are indeed distinct and independent, as portrayed in literature, or whether they instead are complementary. The four approaches were reflected in our case studies in Ma and My Loi, from which five key factors were identified as most conducive to building resilience at a local level.

In the first key factor, we determined that involving the local government as partners and promoting their ownership over project processes facilitates adaptation and increases the stability of interventions. It is only directly through the various scales of government that structural institutional issues constraining local adaptation can be addressed [5]. In the case of Vietnam, a major factor hampering the integration of agro-advisories with seasonal forecasting to inform climate information services is the silo structure of the hydro-meteorological departments and the Department of Crop Production. CIAT recognised in Ma that implementing a full CIS would require bridging this functional fragmentation within the government structure, an issue considered beyond the scope of the project. My Loi was more successful in implementing an integrated CIS by bringing together officials from the two departments at the provincial level to facilitate a dialogue between them and enable the flow of information down to the village level. Additionally, incorporating interventions into government structures and giving local authorities ownership of the process increases the chances for long-term continuation of the practice due to the stability of institutions relative to non-governmental organisations [37]. Thus, working in partnership with the local authorities in My Loi and giving them ownership of the CIS contributed to improving the quality of the service and its sustainability beyond project completion. This example supports the approach emphasising addressing the underlying, off-farm, drivers of vulnerability in order to increase resilience, such as by engaging with wider institutions and strengthening their ability to adapt.

It is important to consider the complexity of landscapes and market factors in order to build resilient systems. The national government respondents all remarked that, as well as maintaining or increasing yields in the face of climate change, farmers must also be able to access markets and sell their produce. Creating conditions to access input-output markets enables farmers to adopt new technologies while providing opportunities to improve their livelihood [19]. Remunerative market outlets should be considered for all promoted crops, and can be fostered by developing value chains and multi-stakeholder partnerships, such as with organisations or private businesses [37]. Additionally, the experience of Ma and My Loi shows that the main production system should be identified and focussed on, so as to determine whether to apply a CSA intervention or shift away to a more climate resilient crop. Diversification of crops is a commonly recognised way to reduce risk from both climate and market factors [38]. This is also in line with the wider vulnerability approach, focusing on another important off-farm aspect, namely market access.

Proposing technologies based on researched evidence of their effectiveness has not been shown to stimulate widespread adoption. Indeed, Hounkonnou et al. [39] state that pushing technological research and its results as a driver of adoption is often ineffective in a smallholder context—even if the selection of technologies is done via a participatory approach and takes into consideration farmer needs and wishes. They assert that, although farmers might be ‘knowledgeable, skilled, motivated, and empowered’ and have participated in developing seemingly suitable technologies, the institutional context may constrain opportunities for uptake. Kpadonou et al. [40] and Dougill et al. [41] also point to important constraining factors such as lack of labour force and poor access to financial support and input-output markets. This is illustrated in Ma where adoption of the full range of technologies in the CSV portfolio was limited, although they were promoted through demonstrations of their benefits. Farmers were not provided with means to overcome the constraints to adoption that they highlighted. While some constraints such as lack of labour and access to markets are complex issues to address, barriers such as financial limitations can be practically dealt with within a project. For example, Dougill et al. [41] highlights that initiatives such as village loan schemes, e.g., the Community Innovation Fund implemented in My Loi for CSA activities, are effective in providing short-term incentives for adoption and helping smallholder farmers afford costly technologies. In My Loi, the fund was deemed a sustainable model of financing that facilitated the adoption of climate-smart practices. This situation indicates that participatory processes as part of a community-based approach, as well as a techno-fix approach, are in themselves insufficient

to generate meaningful change in farmers' behaviour, and consequently to contribute to increasing resilience. However, if wider constraints to adoption are identified and can be addressed through community-based activities, community-based adaptation may enable sustainable adaptive action such as the adoption of technologies.

Capacity building of communities was another priority of the national government. Both the Ma and My Loi CSVs reported increased climate change awareness, social cohesion, community spirit, and proactiveness in the village due to the meetings and discussions organised in the project, thus encouraging farmers to share and discuss innovative farming practices. Increased interactions enhance the flow of information between individuals and groups and can facilitate collective action and joint decision making [42]. Explicitly taking into consideration gender in community-based adaptation also helps to engage women, an important aspect because women play a vital role in smallholder agriculture but tend to be disproportionately affected by an increase of labour resulting from the adoption of adaptive practices [43]. These benefits support the community-based approach, because increasing the engagement of local people and facilitating communication and community-spirit within a village can help farmers become more proactive in decisions related to adaptation.

Adaptation to climate change is a dynamic and complex process in which outcomes of policy measures and technical interventions are affected by a range of factors from the natural and social environment. This contextual interdependence not only makes it difficult to predict outcomes in advance; it also points at potential benefits from involving a variety of social actors in policy implementation. However, community mobilisation for technical interventions is not sufficient to help farmers cope with an uncertain future [7,39,44,45]. Scenario planning and adaptive management are complementary approaches, informing policy implementation and policy agenda setting, and can help farmers deal with uncertain futures [29]. The CSV project in My Loi has experimented with these approaches in their village development plan and CIS components. Scenario planning, in the form of 'if . . . then' strategies, provided farmers with concrete tools to manage their farming activities and be aware of actions to take in the event of adverse climate situations. In line with adaptive management, farmers were guided to explicitly observe and reflect on past and present climate impacts, re-evaluate their current practices, build up a knowledge base of adaptive responses (on what strategies were most and least effective and why), and test theories through action and experimentation. Farmers in My Loi were thus better equipped to proactively manage uncertainty, whether climate or socioeconomic, and respondents considered that this was a meaningful outcome of the project. Promoting autonomy and giving communities the tools to help themselves is in line with the primary objective of the national rural development program of Vietnam as well as with the social-ecological resilience approach.

Although the Ma and My Loi CSVs were not assessed at the same level, since fieldwork was only conducted in Ma, we can still draw out valuable lessons learned and recommendations for adaptation mainstreaming, as well as insights on the nature of resilience. Community-based initiatives involving local communities, such as the CSV, are a welcome evolution from a pure top-down, climate-proofing approach, especially in countries such as Vietnam where top-down implementation is still an institutional norm. However, focusing interventions only at the local level overlooks the fact that institutional rules, norms, and procedures profoundly determine the opportunities and resources available to smallholder farmers [5,7]. Although participatory and community-based initiatives aim to empower local people, these structural issues are beyond the control of farmers and cannot be tackled solely at the local scale with a community based adaptation approach [46]. Attention must also be given to other dimensions of vulnerability. Because climate change affects ecologies and physical environments in a variety of ways, technical adaptations have an important role to play. However, solutions should not be limited solely to technical interventions in a techno-fix approach. Underlying drivers of vulnerability must also be addressed that take into consideration the broader socio-economic and institutional context. Additionally, adaptation to climate change requires the ability to deal with uncertainty and



to make decisions in the face of unknown future climate stressors. Hence the importance of developing tools to build resilience, such as adaptive management and scenario planning. Therefore, we conclude that the concept of resilience is not one-dimensional, and it would be counterproductive to frame it and work towards it solely through a single approach. We assert that the four approaches to resilience prominent in the literature are in fact complementary, and it is necessary to integrate technological fixes, improve community action and address wider institutional and market issues, as well as build up adaptive capacity to deal with uncertainty.

Looking at the CSV framework can also provide insights for organisations that aim to mainstream their approach into national or subnational development agendas. This paper highlights the shortcomings of the CSV's linear approach, which places conducting project baseline surveys first, followed by implementation, and concluding with scaling-up and monitoring and evaluation. This approach lends itself to CCAFS's agricultural research for development objective but is less suited for development aims. Ma was more aligned with the agricultural research for development approach of testing CSA practices, whereas My Loi gave more focus to institutional engagement and livelihood development. Mainstreaming adaptation into institutions should be integrated into the project from the start through awareness of the priorities at the target level, rather than at the end in a scaling-up phase. Aligning project implementation with those values from the start generates more meaningful partnerships with local authorities and gives them ownership of the process. The Ma CSV project managers recognised that they would have designed the project to better align with the national priorities, had they known them earlier, which would have also permitted earlier mainstreaming of the lessons learned from the project into the NTP-NRD program. Indeed, if the ultimate aim is to mainstream adaptation into national or sub-national institutions, then the project should generate experience of doing just that. These findings are in line with the study by Ayers et al. [6] on the mainstreaming process in Bangladesh, which concluded that mainstreaming in practice is not a linear, step-by-step process, and that projectised approaches to adaptation should better engage with institutional frameworks and long-term policy to enable successful mainstreaming.

## 6. Conclusions

The interconnectedness between climate change and development has generated an increasing interest amongst development organisations to integrate climate change adaptation into rural development agendas and plans. From pilot projects, we can obtain valuable lessons on how to more effectively increase resilience at a local level, which can then inform adaptation mainstreaming into national and sub-national development agendas. This paper draws out such lessons via a case study of a community-based, Climate-Smart Agriculture project in Vietnam. The aim of the paper was to better understand the key factors to effectively implement adaptation and increase resilience in rural communities. Furthermore, this paper evaluated four approaches to resilience prominent in the literature and assessed to what extent they are standalone or whether they complement each other.

This paper showed that community-based initiatives provide an effective approach to engage local communities in their own adaptation process and build adaptive capacity, if tools to deal with uncertainty are also promoted and underlying and structural factors of vulnerability are addressed. On the other hand, and given the complexity of climate change, initiatives such as agricultural research for development projects whose primary aim is to implement technical interventions, study their efficacy, and encourage adoption by showcasing benefits are not a recipe for immediate and measurable climate-smart outcomes for farmers. Accordingly, this paper identified five key factors that enhance the building of resilience in a smallholder context: (i) engaging the local government as partners and integrating project processes within institutional structures to improve service provision and increase the sustainability of interventions, (ii) considering broader landscape issues such as market access in order to improve livelihoods and build resilient systems, (iii) providing farmers with incentives and support to facilitate adoption of CSA practices, (iv)

fostering community capacity building in order to engage farmers in their own adaptation and increase autonomy, and (v) promoting adaptive management and scenario planning as tools to help farmers deal with uncertainty and build adaptive capacity. These five factors indicate that the concept of resilience is multidimensional and not solely in line with one of the four approaches dominant in the literature. Therefore, we recommend organisations aiming to assist governments in mainstreaming adaptation into their development agendas to consider all four aspects and that space is made for constructive engagement between them, in an integrative approach to resilience.

**Supplementary Materials:** The following are available online at <https://www.mdpi.com/article/10.3390/agronomy11101926/s1>, Table S1: Key benefits and weaknesses of the CSV components listed by farmers, local authorities, and the Ma CSV project managers.

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