# A systematic review of Climate-Smart Village (CSV) and recommendations for adoption in the implementation of Nong thon moi towards climate resilience in the 2021-2030 Strategy

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## Abstract

The National Target Program on New Rural Development (NTM) has passed its first 10-year strategy (2010–2020) and has made many achievements in the preparation of infrastructures and facilitation for economic, social, educational and health developments in rural areas of Vietnam. However, the Program has not been really successful with enhancing adaptive capacity and resilience to climate risks for people and local authorities in highly vulnerable areas. The study used results from a number of studies on 03 models of Climate-Smart Villages (CSV) in Yen Bai province and successful lessons in the world to evaluate the effectiveness and scalability of the model into the implementation of the NTM in its 2021–2030 strategy. From 13 eligible references collected and analyzed using the PRISMA method, of which 5 documents from 02 experimental studies in Yen Bai province during the 2015–2020 period, the author described a six-step process of 20 activities in developing a CSV that is appropriate in the Vietnamese context. The study proposed the application of this process within the NTM Program to help climate-vulnerable communes that have met NTM standards continue to achieve the titles of *'advanced NTM'* and *'demonstration NTM'* towards climate change adaptation associating with 5/19 NTM criteria, including: planning, information and communications, production organization, culture, and environment. In addition, the study proposed a multi-level coordination mechanism, harmonizing the top-down and bottom-up approaches, in order to achieve the highest efficiency in implementation and use of State investment.

Key words: Climate change, CSV, NTM, PRISMA, CSV integration, multi-level coordination

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Sincerely yours,

Bui The Anh (translator)

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## 1. Introduction

The review study on climate-smart agriculture (CSA) by Bui and Vu (2020) summarizes the global CSA movement and in Vietnam over the past 10 years. It also highlights the role and necessity of mainstreaming CSA in the National Target Program on New Rural Development (NTM) towards adaptation and resilience to climate change. Indepth, CSA implememtation needs to be integrated into rural communities that are exposed to specific climate risks to achieve the adaptation, mitigation and productivity goals. These communities are referred to as Climate-Smart Villages (CSV). CSV has been proven to be an effective approach to enhancing adaptive capacity and resilience of rural areas in many geographic regions around the world as well as in Vietnam (Sebastian et al., 2019; Bayala et al., 2016; Taylor and Bhasme; 2020, Ogada et al., 2020; Vernooy and Bouroncle, 2019; Westermann et al., 2015; Bui et al., 2015, 2016, 2017, 2018, 2019).

Aggarwal et al. (2018) reveals 36 CSVs within the global Climate Change, Agricultue and Food Security program (CCAFS), of which three were successfully developed for Vietnam 03 including 01 in Yen Bai province (northern mountain region - NMR), 01 in Ha Tinh province (central region), and 01 in Bac Lieu province (Mekong River Delta), during the 2015–2018 period. Although scales and implementation methods are not the same across different geographic regions, there are similar basic steps for CSV development at all sites. According to Aggarwal et al. (2018), the general CSV approach needs to: (i) understand the effectiveness of climate-smart agriculture technologies and practices (CSA T&Ps) with supporting development programs and policies in order to collectively achieve the adaptation, mitigation and productivity and income goals; (ii) develop a set of CSA T&Ps for enhanced climate adaptation and resilience; (iii) investigate the biophysical, socio-economic and gender constraints and advantages for adoption; and (iv) test CSA T&Ps for successful evidence on adoption enablers and rates, financial sources and institutional arrangement supporting the implementation, and out/up-scaling mechanisms in accordance with national strategies and development plans.

The NTM program in the 2010–2020 strategy has achieved great successes, of which 57% out of nearly 9,000 rural communes have met the NTM standards (Central Steering Committee, 2020). However, the Program has not yet addressed the issue of impacts of climate change in agricultural production in vulnerable rural areas (Bui et al., 2020). The CSV model, which has been successfully tested in three major agro-ecological regions of Vietnam, has a great potential to contribute to improving the Program in terms of enhancing capacities for climate adaptation and resilience in the 2021–2030 strategy. This study, within the framework of the one-year project 30/HĐ-KHCN-NTM funded by the Ministry of Agriculture and Rural Development (MARD) to Vietnam National University of Agriculture (VNUA) in 2020 (Bui et al., 2019), aims to: (i) consolidate an overall stepwise CSV approach collectively gathered from successful CSV experiences from around the world and Vietnam during the 2011–2020 period; (ii) conduct an empirical research on CSV establishment in two out of three agroecologies of of Yen Bai province to create evidence for out/up-scaling; (iii) mainstream CSV

implementation into some suitable NTM criteria for the period 2021–2030 strategy to improve NTM's performance on climate adaptive and resilient rural communnities; and (iv) propose a multi-level and -stakeholder mechanism for best CSV implementation in the 2021–2030 strategy.

## 2. Methodology

### *2.1.Emperical research*

#### *2.1.1. Research sites*

The empirical research has been conducted within the framework of the 30/HĐ-KHCN-NTM research project funded by the Science and Technology Program for NTM development in the 2016-2020 period by a VNUA research team (Bui et al., 2019) at 02 CSV sites belonging to the agroecology 2 (Van Yen district) and agroecology 3 (Van Chan district) in Yen Bai province (Figure 1). The study utilized the CSV approach that had been successfully tested by the International Center for Tropical Agriculture (CIAT) under the CCAFS program in the 2015–2018 period, for Ma village, Vinh Kien commune, Yen Binh district in the agroecology 1 (Bui et al., 2015, 2016, 2017, 2018). This accomplished work serves as a reference and complimentary site for the study to develop a complete package of evidence for CSV implementation, i.e. one CSV per agroecology, and its scalability horizontally (out-scaling) at the local leves and vertically (up-scaling) at the provincial and national levels. The differences (biophysical and socio-economic characteristics) between the three agroecologies and criteria for site selection are described in detail in Bui et al. (2019).

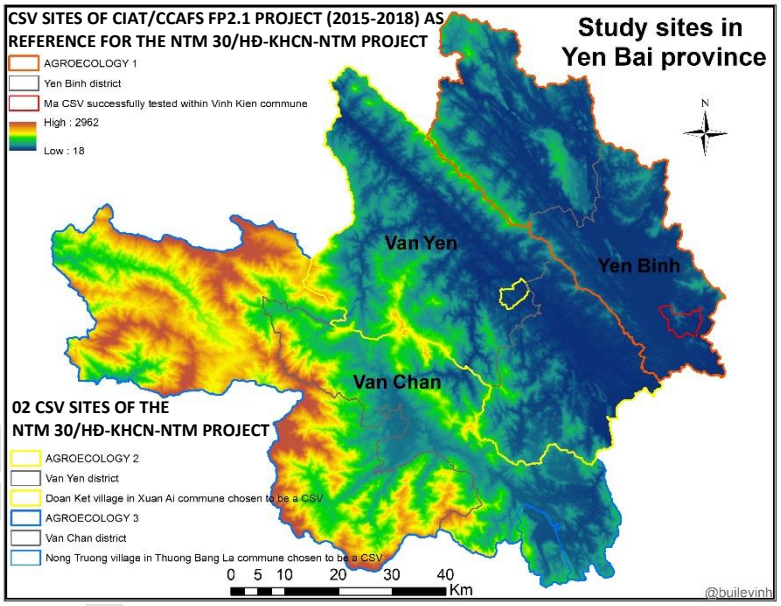


**Figure 1.** Research sites in Yen Bai province (Bui et al., 2019)

#### *2.1.2. Participatory action research*

Bui et al. (2019) applied the participatory action research methodology (**PAR**), which had been successfully implemented to establish Ma CSV (Bui et al., 2015, 2016, 2017, 2018), with participation of a variety of stakeholders, including: government (commune, district) and farmers at the two research sites, the VNUA research team, other research and development (R&D) organizations (CIAT and National University of Ireland Galway), Department of Agriculture and Rural Development (DARD) of Yen Bai province, local private sector (cooperatives, collaborative groups, traders) in product consumption. The participation of these partners takes place throughout the implementation of the

project, i.e. baseline surveys, CSV design and planning, selection and prioritization of CSA T&Ps, social mobilization activities, CSA testing and scaling, monitoring and evaluatation (M&E) of results.

#### *2.1.3. Training*

The research team cooperated with local agricultural extension professionals to provide various types of training, such as on CSA T&Ps, development of the CSV components (Figure 3a), farmer-to-farmer knowledge diffusion, M&E of the overall implementation process, etc. to farmers at the 02 CSV sites. Farmer interest groups were established to collectively conduct specific activities and enhance the sharing of knowledge and experiences among themselves. Champion farmers with good CSV related experiences were selected for training of trainers, i.e. making them become farmer extension workers to diffuse knowledge to other peer farmers and rural communities.

#### *2.1.4. Monitoring and evaluation (M&E)*

The M&E work was conducted throughout the project lifespan at the village, management and research levels to measure the overall project implementation process at the CSV sites. At the village level, a farmer log book was made to help farmers record their observations and results achieved when conducting project activities. At the management level, an M&E tool was developed to assist local and provincial staff to qualitatively and quantitatively measure outputs of the introduced CSV work at the sites and potential outcomes and impacts regarding opportunities for scaling through the ability to identify adoption enablers. At the research level, the research team developed a set of quantitative and qualitative criteria for measuring specific technical workpackages that have scientific values for publications. Furthermore, the research team consolidated M&E results from the work of the other two groups to make an explanatory M&E database for making policy recommendations on out/up-scalability.

### ***2.2.PRISMA***

The study used the PRISMA method which consists of the following four main parts: (i) identification of good quality reference sources, (ii) building a set of criteria for selecting eligible references, (iii) a four-step process of searching and selecting eligible references, and (iv) document synthesis and analysis. The description of the methodology is similar to that of Bui and Vu (2020).

## 3. Results and discussions

### ***3.1.Brief results of the establishment of the 02 new CSVs in Yen Bai province***

Within the framework of 30/HĐ-KHCN-NTM research project, the research team of Bui et al. (2019) has attempted to create 06 CSV components (Figure 3a) in each of the two CSV models in Van Yen and Van Chan districts. However, the components (iii) and (vi) have not been fulfilled because

climate and agricultural development finance AND climate information services and insurance, respectively, are not commonly applied to the grassroot level in Vietnam's NMR. Climate information is provided to villagers from regional forecasts, transmitted through village loudspeakers and updated on village agricultural bulletin boards. This village climate communication model was adopted from the the Ma CSV success story (Bui et al., 2015, 2016).

The establishment of these CSVs has gone through the six steps presented in Table 1. Although the study could not calculate precisely the exact investment for a CSV, the baseline surveys for identification of climate risks and specific needs for enhancing adaptive capacities and resilience of a rural community can still help estimate a relatively suitable budget for development of a CSV and increase investment efficiency. The project created a multi-stakeholder platform consisiting of a research team (VNUA, NUI Galway and CIAT); a management and extension team with representative members from project communes, ditricts and Yen Bai DARD; the local private sector (the Van Chan orange cooperative, Van Yen cassava factory, and traders and collaborative groups); and farmers. Champion farmers at the 02 CSV sites were gathered into interest groups that handled specific activities. For example, there was an interest group set up for each CSA T&P and the research and extension teams collaboratively organized technical trainings, field days and feedback workshops for key group members and other invited peer farmers. Each CSV site had 05 CSA interest groups, equivalent to 05 different CSA T&Ps, as specifically planned in Bui et al. (2019).

Qualitative and quantitative M&E results, as guided by the M&E guideline presented in session 2.1.4, show completion of 03 CSA objectives of enhanced adaptation (restored soil fertility, reduced soil erosion, dampened impact of red spider mites on cassava and orange), reduced mitigation ($CO_2$ from rice straw burning), and improved productivity of strategic local commodities (cassava and orange) that were set out in Bui et al. (2019). Interview results show that the CSV farmers became more aware of the necessity of the CSV model as well as the role of CSA implementation in enhancing adaptive capacities and resilience for their community and of their role in sustaining the work beyond the project lifespan. This agrees with research findings of Vu et al. (2020) and Bui et al. (2020) in Van Yen district.

### *3.2.Systematic review results*

The arrangement of 20 activities into 06 steps in development of a CSV is presented in (Table 1) based on the selection and careful examination of PRISMA-based 13 eligible qualitative R&D references internationally and from Vietnam. The 06 stepwise CSV procedure synthesized from the review includes: (i) Situation analysis - Needs assessment; (ii) Social mobilization; (iii) Design - Planning; (iv) Implementation; (v) Scaling; and (vi) Monitoring and Evaluation.

#### *3.2.1. Situation analysis – Needs assessment (SANA)*

The systematic work of Aggarwal et al. (2018) on 36 established CSVs under the global CCAFS program emphasized the importance of defining objecties (**OB**) of turning rural areas into climate adaptive and resilient communities before proceeding to other steps. According to Sebastian et al. (2019), in Southeast Asia, the CSV approach aims at setting up the foundation for participatory R&D activities to promote measures for enhancing capacities of adaptation, mitigation, and food security and, more importantly, creating sufficient evidence for out/up-scaling. This goal is agreed by other CSV studies (Bayala et al., 2016; Bui et al., 2019, Taylor and Bhasme, 2020; Bui et al., 2015, 2016, 2017, 2018; Vernooy and Bouroncle, 2019; Westermann et al., 2015). The ongoing work of Bui et al. (2019) has further analyzed objectives to achieve this goal. These objectives were to (i) develop a CSV representative for a specific area with distinct agroecological, socio-economic and gender characteristics, (ii) create sufficient science-based evidence for out-scaling within this agroecology, and (iii) consolidate results for CSV development at the provincial level for recommending national CSV adoption into the NTM program (up-scaling) in the 2021-2030 Strategy. (Session 4).

A site for CSV development needs to be located within a geographic boundary (**BO**) of relatively homogeneous characteristics of biophysics, socio-economics and gender with a reasonable scalability. In the global CCAFS program, CSVs in different countries and territories are placed under different BO dimensions. A CSV is situated within a village boundary in West Africa (Bayala et al., 2016; Aggarwal et al., 2018), South Asia (Aggarwal et al., 2018; Taylor and Bhasme, 2020) and Southeast Asia (Bui et al., 2015, 2016, 2017, 2018, 2019; Sebastian et al., 2019); blended in various rural communities without village boundaries but with good representation in East Africa (Aggarwal et al., 2018); or a larger area within an area of 10km x 10km in South America (Aggarwal et al., 2018).

The next activity is to identify climate risks (**CR**) faced by the CSV site. Information comes from three main sources: national and regional forecasts (Bui and Vu, 2020; Westermann et al., 2015; Aggarwal et al, 2018); interviews of experts and technical staff at various levels (Vernooy and Bouroncle, 2019; Westermann et al., 2015); and farmers through focus group discussions and interviews (Bui et al., 2015, 2016, 2017; Bayala et al., 2016; Sebastian et al., 2019). Correctly identified CR can help accurately estimate the scale and magnitude of impacts and needs required for CSV implementation.

Local knowledge (**LO**) is a valuable source of knowledge CSV implementation that can offer available adaptation and resilience measures such as varieties and breeds that can well adapt to climate shocks (eg. hot/cold spells, droughts, etc.). Aggarwal et al. (2018) emphasized the need to link CSV development plans and policies with local knowledge in order to help vulnerable rural communities leverage adaptive capacity and resilience based on capacities they already have. Studies by Bui et al. (2015, 2016, 2017, 2018) in Ma CSV of the agroecology 1 prioritized maintaining local crops and animals that adapt well to climate risks, which has been continued by the work of Bui et al. (2019) at 02 new CSVs in Van Yen and Van Chan districts of the agroecologies 2 and 3 of Yen Bai province.

**Table 1.** Review results on CSV development – Lessons from international studies and Vietnam

| | **Major steps** | **SITUATION ANALYSIS-NEEDS ASSESSMENT** | | | | | | **SM** | **DESIGN, PLANNING** | | | | **IMPLEMETATION** | | | | **SCALING** | | | | | | **MONIRTORING EVALUATION** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 7 | 15 | 16 | 17 | 18 | 19 | 7 | 20 | 13 |
| **Nº** | **Authors/countries, territories** | OB | BO | CR | LO | MA | RE | SM | CO | PS | DP | BU | IG | PA | KS | SM[1] | DE | FF | LO | NA | PR | SM[2] | ME | PA |
| Studies with stepwise CSV development procedures | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Aggarwal et al. (2018), Global CCAFS sites | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ | | | | ✓ | ✓ | ✓ | | | ✓ | |
| 2 | Sebastian et al. (2019), CCAFS SEA (Vietnam, Lao PDR, Cambodia, the Philippines) | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | | | | ✓ | ✓ | ✓ | | | ✓ | |
| 3 | Bayala và et al. (2016), West Africa | ✓ | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| 4 | Bui et al (2019), NTM Vietnam (Yen Bai) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Studies relevant to CSV implementation | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Taylor and Bhasme (2020), India | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | | |
| 6 | Wassmann et al. (2019), Lao PDR | | | | | | | | ✓ | ✓ | | | | | | | | | ✓ | ✓ | | | | |
| 7 | Ogada et al. (2020), Kenya | | | | | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ | | | ✓ | | | | | | |
| 8 | Bui et al. (2015, 2016, 2017, 2018), CCAFS Vietnam (Yen Bai) | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | |
| 9 | Vernooy and Bouroncle (2019), Global CCAFS | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| 10 | Westermann et al (2015), Global CCAFS | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | | ✓ | |

1. OB = **OB**jectives and scale of a CSV
2. BO = Geographical **BO**undary of a CSV
3. CR = **C**limate **R**isks that a CSV is faced with
4. LO = **LO**cal knowledge and adaptive measures
5. MA = Potential **MA**rket for CSA commodities
6. RE = **RE**sources available for CSV implementation
7. SM = **S**ocial **M**obilization activities for CSV implementation
8. CO = COsultations from stakeholders
9. PS = Priority Setting for implementation of CSA T&Ps
10. DP = Design and Planning for CSV implementation
11. BU = **BU**dget calculations for CSV implementation
12. IG = Implementation through interest groups and training activities
13. PA = **PA**rticipation of stakeholders, inclusion of women and poor farmers
14. KS = **S**haring of **K**nowledge and results
15. DE = Development of **DE**monstration models for scaling
16. FF = **F**armer-to-**F**armer knowledge diffusion
17. LO = LOcal development/credit programs
18. NA = **NA**tional programs and policies
19. PR = Involvement of the **PR**ivate sector
20. ME = **M**onitoring & **E**valuation of implementation

[1] Including village regulations on activities for sustaining the CSV work in the long run
[2] Including incentives for knowledge & experience sharing and CSV implementation in rural communities

The analysis and evaluation of potential market (**MA**) for CSA products before they go into production is crucial to the success, failure and sustainability of a CSV. Key factors include: information on market demands CSA products (Aggarwal et al., 2018; Vernooy and Bouroncle, 2019), market prices and production costs (Ogada et al., 2020), distances to markets and products' accessibility to markets (Westermann et al., 2015); and efforts putting into CSA value chain development (Bui et al., 2019). Example of the latter one lays in the work of Bui et al. (2019) which focused on OCOP value chain for Van Chan orange products through promotion of organic fertilizers and reduced use of chemical fertilizers and pesticides.

The final activity is the assessment of resources (**RE**) available, such as natural (land, water and biology), infrastructures (transportation, irrigation, science and technology), finance (savings, credit) and human (indigenous knowledge and traditional cultural values) that can immediately meet the needs for change (Aggarwal et al., 2018; Ogada et al., 2020; Vernooy and Bouroncle, 2019). Indepth investigation of the SANA work can help accurately calculate missing needs, including finance (session 3.2.3), so CSV can be most cost-effective (Bui et al., 2019).

### *3.2.2. Social mobilization (SM)*

This is an indispensable activity in improving farmers' perceptions of impacts of climate change on local production livelihoods, as well as responsibilities to their community and families, thereby leveraging their motivation of engaging in CSV development. All of the CSV sites within the framework of the global CCAFS program applied **SM** activities as a premise for implementation of CSA T&Ps in the CSV environment (Aggarwal et al., 2018; Ogada et al., 2020; Vernooy and Bouroncle, 2019; Sebastian et al., 2019). However, SM activities should be carried out more throughout the implementation process, from raising awareness of climate change, testing CSA T&Ps and building CSV, and to becoming CSV ambassadors in scaling. This has been detailed in the long-term study of CIAT (Bui et al., 2015, 2016, 2017, 2018) in Yen Bai province of Vietnam' NMR. Bui et al (2020) highlighted the successful SM story of the Van Yen district government in sustaining a local conservation agriculture on cassava slopes from 2003 to present. These SM experiences have been adopted by Bui et al. (2019) in development of 02 more CSV in in Van Yen and Van Chan districts in 2020.

### *3.2.3. Design – Planning*

Most of the selected references emphasize the importance of stakeholder consultation (**CO**) in CSV design and planning. Key stakeholders include international R&D organizations (e.g. the CGIAR), national research networks, NGOs, private sector, farmers and farmer oganizations (Aggarwal et al., 2018). Besides, it's necessary to involve policy makers, extension organizations and staff at all levels (Wassmann et al., 2019; Bui et al., 2015, 2016, 2017, 2018, 2019; Sebastian et al., 2019); innovation foundations and funding organizations (Westermann et al., 2015).

In addition to joint action planning activities, stakeholders also played an important role in selecting and prioritizing CSA T&Ps (**PS**) to be implemented in the CSV context. CSA T&Ps were gathered from two sources: science-based evidence and indigenous knowledge of suitable measures (Wassmann et al., 2019; Bui et al., 2015, 2016, 2017, 2018, 2019; Vernooy and Bouroncle, 2019). Next, multi-stakeholder workshops were organized to pre-select T&Ps suitable for a specific CSV context based on results of the SANA work (Westermann et al., 2015; Sebastian et al., 2019; Aggarwal et al., 2018). Finally, a cost-benefit analysis (CBS) tool was applied to finalize and prioritize T&Ps with success potentials for implementation (Bui et al., 2015, 2016). After this step, the CSV design and planning CSV (**DP**) was conducted with specific tasks assigned to involved stakeholders (Bui et al., 2019).

Budget calculation (**BU**) for CSV development is important to help achieve the highest budget use efficiency but have not paid enough attention to by many studies. Studies by Taylor and Bhasme (2020), Vernooy and Bouroncle (2019) and Westermann et al. (2015) mentioned the mobilization of investment from different sources, such as the government, people, and R&D national and international programs. However, they did not conduct in-depth analyses of the importance of BU for the most effective use of investment, especially that from governments. In Vietnam, Bui et al. (2020) pointed out that the average allocation of 2 billion VND (equivalent to 87,000 USD) to one NTM commune without needs-based calculations led to an enormous waste of investment in places with higher financial and infrastructural capacities and deficits in places with much lower capacities. The long-term R&D work of Bui et al (2015, 2016, 2017, 2018, 2019) in Yen Bai province only stopped at the use of the CBA tools in calculating budget needed for implementation of CSA T&Ps, not the CSV model as a whole.

### *3.2.4. Implementation*

CSV development activities are carried out through farmer interest groups (**IG**), with each group being in charge of a specific activity (Vernooy and Bouroncle, 2019; Ogada et al., 2020), such as CSA T&P groups, a SM group, a communication group, and a training for scaling group (including key members of the above groups) (Bui et al., 2015, 2016, 2017, 2018, 2019). Each group has a leader and they all join the coordination network for implementation at the village, commune, and district levels (Bui et al., 2019). The implementation of CSV development activities involves the participation of stakeholders (**PA**), such as scientists, local leaders and extension professionals, collaborative groups, cooperatives (PR) in terms of value chain development for CSA products, and decision making at provincial and national levels (Bui et al., 2019). The synergized PA is implemented through joint training activities, planning workshops (Bui et al., 2015; Vernooy and Bouroncle, 2019; Sebastian et al., 2019), policy dialogues (Bui et al., 2016), field day events and feedback workshops (Bayala et al., 2016; Taylor and Bhasme, 2020; Ogada et al., 2020).

The sharing of knowledge and experiences in CSV development (**KS**) is an important activity for out-scaling and needs to be conducted throughout the implementation process (Sebastian et al., 2019). Bui et al. (2016, 2017, 2019) gathered a team of champion farmers who had successfully implemented the Ma CSV model to deliver technical trainings and sharing experiences with farmers in 03 districts of Cao Bang (in 2016) and those at the new CSV sites in Van Yen and Van Chan districts of Yen Bai

province (in 2017 and 2020). At this stage, SM activities are still very important to motivate engaged farmers and promote encourage more farmers, future beneficiaries of the work, to join the CSV process and adopt CSA T&Ps in their everyday life. However, many studies were more focused on SM at the early stage of the work (session 3.2.2) rather than at the implementation stage. The success story of the local upland conservation agriculture program Van Yen district (Bui et al., 2020) shows that SM is a very useful tool in determining the success of a R&D program and needs to be fully utilized throughout the lifespan of the program.

### *3.2.5. Scaling*

Aggarwal et al. (2018) concluded that scaling of the CSV approach needs to go horizontally and vertilically. Scaling pathways across a variety of administrative levels were visualized by by Wassmann et al. (2019) and further detailed in Bui et al. (2019) in Figure 2. In the horizontal direction, a CSV acts as a demonstration site (**DE**) for out-scaling (or horizontal scaling) which consists of 06 components (Figure 3a) and implemented thrrough 06 steps (Figure 3b) (Bayala et al., 2016; Taylor and Bhasme, 2020; Ogada et al., 2020). Farmers in the CSV receive learning opportunities by interacting and engaging with champion farmers who have participated and gained knowledge and experiences from testing activities through the so-called farmer-to-farmer knowledge diffusion scheme (**FF**) (Vernooy and Bouroncle, 2019; Bui et al., 2015, 2016, 2017). At the commune and district levels, horizontal scaling can be done more effectively and efficiently through local annual development plans and credit programs (**LO**), which can increase the number of CSVs established and end beneficiaries (Sebastian et al., 2019). In Vietnam, the fact that local development programs are under large national programs, for example the NTM, allows an autonomy for horizontal scaling at the local levels based on results of the SANA work (Bui et al., 2019), i.e. through prioritizing NTM communities for CSV adoption.

In the vertical direction, the proven CSV model can be replicated nationwide through national development programs and policies (**NA**). Scientific proven CSV empirical research achievements under the CCAFS program in the 2011-2020 need to be compiled for policy recommendations of national adoption in many countries (Aggarwal et al., 2018; Vernooy and Bouroncle, 2019; Sebastian et al., 2019; Westermann et al., 2015). The joint long-term research collaboration between VNUA and CIAT (Bui et al., 2015, 2016, 2017, 2018, 2019) has been collecting and compiling evidence of successful CSV out/up-scaling at the provincial level (Yen Bai province) for mainstreaming into the nationwide implementation of the NTM's 2021-2030 strategy.

Out/up-scaling pathways need engagement of the private sector (**PR**) at various scales (eg. small traders, collective groups, cooperatives, companies, factories, and enterprises) in CSA value chain development. Aggarwal et al. (2018), Vernooy and Bouroncle (2019) and Westermann et al. (2015) pthe pointed out the importance of the PR investment in ensuring sustainable CSA value chains. This is well reflected Van Yen success story (Bui et al., 2020) where Van Yen cassava factory subsidized the production by providing agricultural inputs (eg. fertilizers and pesticides) and paid commissions to the district government which was then reinvested in the program. At this stage, **SM** activities are to promote and increase adoption rates of the CSV approach and CSA T&Ps horizontally (Bui et al., 2019).

### *3.2.6. Monitoring – Evaluation*

Monitoring and evaluation (**ME**) needs to be implemented throughout the CSV implementation process, aiming at collecting qualitative and quantitative achievement results in building science-based evidence for recommending local, provincial and national adoption policies. ME indicators and implementation procedure need to be identified and developed at the early stage of a project based on specific objectives for specific activities and the project as a whole (Aggarwal et al., 2018; Vernooy and Bouroncle, 2019; Sebastian et al., 2019; Westermann et al., 2015). The ME implementation should be divided among different levels and types of activities. At the village level, results were monitored and recorded by farmers using the farmer log book (Le et al., 2017) and aggregated into data and information through participatory feedback workshops with scientists (Hoang and Vernooy, 2017; Vernooy et al., 2018). At the commune, district, and provincial levels, extension workers, agricultural professionals and PR stakeholders were given separate ME protocols through which they could record and evaluate results and achievements in the most objective way. Scientists have their own ME protocol to measure qualitative and quantitative results in a more scientific way for academic publications (Eitzinger et al., 2019). The above ME implementation process demonstrates the important participation (**PA**) of all stakeholders throughout the project work.

## 4. Recommendations for CSV adoption in the implementation of NTM's 2021-2030 Strategy

### *4.1.Major components and implementation steps in CSV development*

Figure 3a shows 06 CSV components (COM) adopted from Aggarwal et al. (2018) which was applied in the study of Bui et al. (2019) in 2020 at the 02 CSV sites of the agroecologies 2 and 3 of Yen Bai province. *CSA practices and technologies* (COM1) play a central role in climate change adaptation, mitigation and sustainable rural agriculture landscapes. To additionally support the sustainability of CSA T&Ps in leveraging overall adaptive capacity and resilience of the CSV, good *farmers' knowledge* (COM4) needs to be conserved and mobilized through integration of good village cultural values into implementation and SM activities in the rural community. The *climate information services and insurance* component (COM6), analyzed in Bui and Vu (2020), aims to provide good short, medium and long-term weather forecasts to local authorities and farmers for most suitable context-specific priority setting of CSA T&Ps. The review of Bui and Vu (2020) shows that climate insurance helps farmers increase their confidence and readiness for adoption of measures in CSA T&Ps implementation and, therefore, their engagement CSV development activities. The *climate and agricultural development finance* component (COM3) consists of different investment sources and credit funds that allow farmers to take loans at reseasonable interest rates. These sources mostly come from *national and subnational plans and policies* (COM5) through long-term development programs, such as the NTM program. Last but not least, the *local and national public and private instructions* component (COM2) also plays an important role in coordinating the implementation, management, monitoring and evaluation of performances and creating opportunities for CSA value chains. The study proposed six main steps in CSV development (Figure 3b), which is the result of the synthesis work presented in Table 1 and analyzed in detail in session 3.

### *4.2.Mainstreawming CSV into some NTM criteria*

From 06 NTM criteria (1, 3, 4, 8, 13 and 16) suitable for CSA mainstreaming as discussed in Bui and Vu (2020), the author identified 05 suitable criteria (1, 8, 13 and 16) (Table 2) for CSV inclusion in achieving the *'advanced'* NTM and *'demonstration'* NTM titles using the 6-step procedure. All 20 activities of the 06 steps need to be applied in **communal planning** (activities 1-20) to ensure the participation of all stakeholders, especially the disadvantaged and vulnerable groups. **Information and communications** (activities 7, 9, 10, 12-20) tools need to be effectively utilized in promoting benefits of the CSV model, mobilizing contributions and synergies, and capacity building for local authorities and farmers in CSV development. Information technology and smart phone applications can help convey information and knowledge to all societal members, which helps them easily contribute their ideas to improving the implementation plan, sharing knowledge and experiences for scaling, monitoring and evaluating results achieved throughout the implementation process. Next, the **organization of production** (activities 7-20) should be carefully and specifically planned based on the SANA results, promoted and replicated through social mobilization activities. Farmers proactively cooperate with relevant stakeholders in monitoring, evaluating and reporting the results of the production organization process to various project management levels. Propaganda and mobilization activities synergies collection in climate-resilient NTM development applying the CSV model will be more effective if harmoniously mainstreamed (activities 7-10, 12-16, 20) into **cucltural** values and activities; for example, integrating CSV activities into village rituals and conventions, effectively using cultural means such as loudspeakers, newspapers, agricultural extension bookcases, community libraries for educational and communicational purposes (Bui et al., 2015, 2016, 2017, 2019). The **environment** criterion (activities 7-20) needs to be aligned with CSV development activities to thoroughly resolve current environmental issues in climate-vulnerable rural areas in NTM implementation towards climate adaptation and resilience.

### *4.3.Multi-level coordination and cooperation framework in implementation of 'advanced NTM' and 'demonstration NTM'*

Bui et al. (2020) analyzed the opportunity of mainstreaming climate change adaptation issues in achieving the titles of *advanced* NTM and *demonstration* NTM. The implementation of CSA T&Ps within a CSV environment (Bui and Vu, 2020) would clearly be essential for climate-vulnerable rural communities to enhance adaptive capacities and resilience as core conditions for achieving the 02 titles above, applicable to communes that have achieved the NTM title. A multi-level scheme has been proposed to leverage interactive coordination and cooperation of different administrative government levels in implementation of the *advanced* NTM and *demonstration* NTM titles across the country (Figure 3c). In this scheme, the *bottom-up* and *top-down* approaches need to be harmoniously and complimentarily implemented. At the grassroots level, the evaluation of available resources, needs for change and investment priorities is aggregated from all villages and reported to commune, communes to to district, and districts to province. Provinces, prioritized for enhancing climate adaptation and resilience, develop and submit synthesis reports to MARD for national evaluation and budget prioritization for implementation of the *advanced* NTM and *demonstration* NTM titles.

**Table 2.** Recommendations of mainstreaming CSV into 5/19 relevant NTM criteria for the 2021-2030 Strategy

| Major steps | Situation Analysis – Needs Assessment | | | | | | SM | Design - Planning | | | | Implementation | | | | Scaling | | | | | | Monitoring Evaluation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NTM criteria** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 7 | 15 | 16 | 17 | 18 | 19 | 7 | 20 | 13 |
| 1. Communal planning[3] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8. Information and Communications | | | | | | | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 13. Production Organization | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 16. Culture | | | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ |
| 17. Environment | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

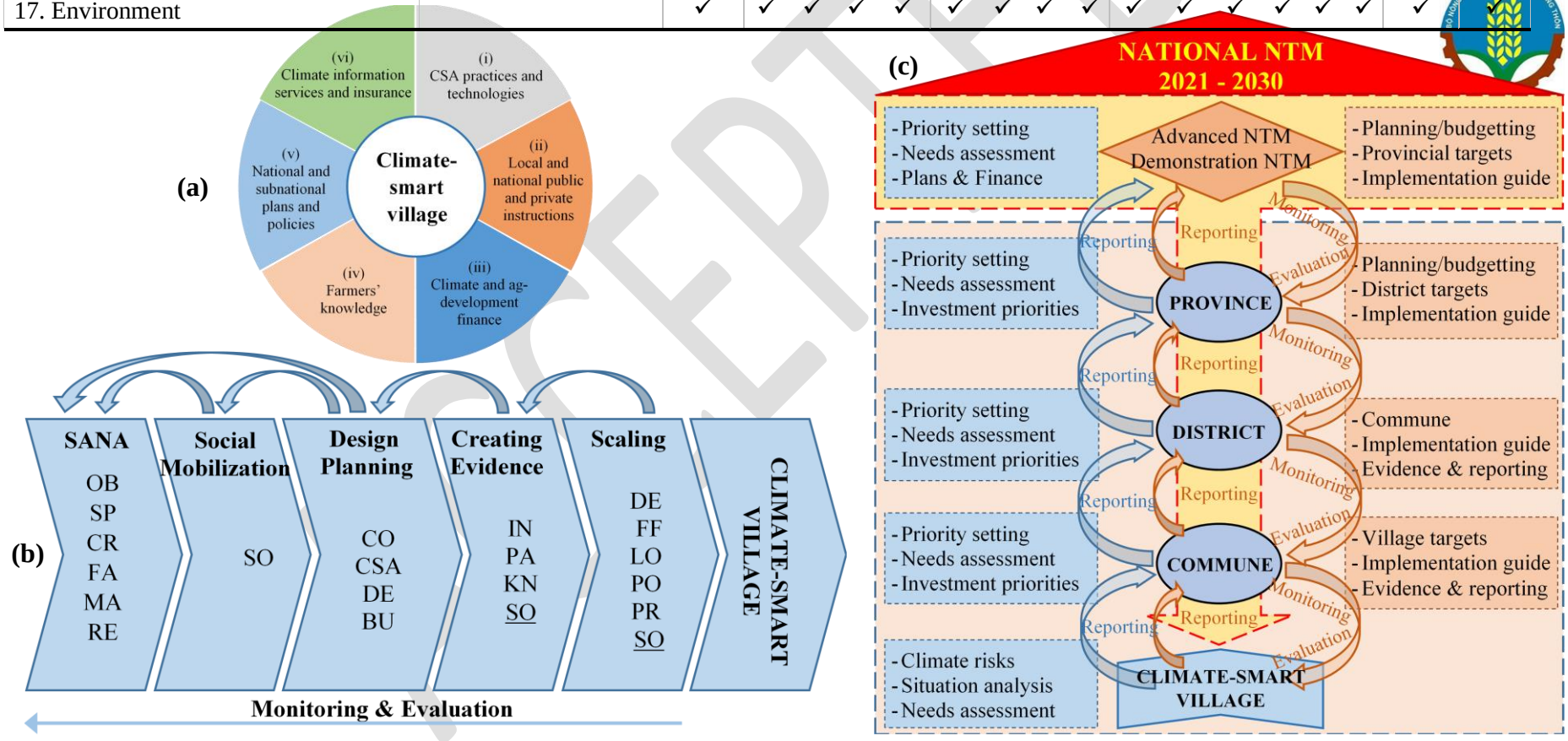


**Figure 3.** Application of CSV components (a) (Aggarwal et al, 2018) in mainstreaming CSV implementation (b) (results from Table 1) into national NTM 2021-2030 Strategy (c) (adapted from Bui and Vu (2020))

[3] Communal planning needs to ensure the mainstreaming of agricultural restructuring with climate adaptation, urbanization of peri-urban areas and meeting rural environmental requirements

In the opposite direction, the national NTM program needs to review and approve climate change adaptation indicators for achieving the two NTM titles for NTM accomplished communes in areas of high climate risks. The six-step CSV implementation process and its components should be approved and developed into detailed implementation guidelines that can be flexibly applied in different locations with climate vulnerabilities. Based on the national plan for 2021-2030, the NTM program assigns specific targets to provinces with distinct climate risks. The provinces assign targets and tasks to districts, districts to communes, and communes to villages. To achieve the targets and expected outcomes and impacts, the national NTM program needs to develop a set of muti-level guidelines for monitoring and evaluating performances of all implementation levels from central to grassroots levels. These guidelines should allow a flexible application at context-specific locations provided that the bottom-up reporting to higher management levels can still meet minimal requirements for synthesis reports. After submitting the ME reports, communes and districts proceed a review procedure for achieving the 'advanced' NTM and 'deonstration' NTM titles for communes that have proven of their enhanced climate adaptive capacities and resilience.

## 5. Conclusions

The study has addressed 04 main research objectives, in which:

1) Prioritized and classified 13 eligible qualitative references into 20 activities falling under 06 main CSV developing steps, including: situation analysis and needs assessment (06 activities), social mibilization (01 activity), design-planning (04 activities), implementation (04 activities), scaling (06 activities), and monitoring-evaluation (02 activities). The SM and PA activities are repeated through 3 and 2 steps, respectively, and implemented throughout the CSV implementation process;

2) Successfully established 02 CSV models in Van Yen and Van Chan districts to create a set of 03 CSVs representing 03 agroecologies sub-regions in Yen Bai province for out/up-scaling purposes;

3) Identified five NTM criteria for mainstreaming the CSV model in enhancing climate adaptive capcities and resilience of the national NTM program in climate vulnerable regions in the 2021–2030 strategy, including: planning, information and communication, production organization, and culture; and

4) Proposed 03 main recommendations for systematically mainstreaming the CSV model into the NTM's 2021-2030 strategy, including the adoption of: **(i)** 06 CSV components; **(ii)** 06 steps and 20 activities in CSV implememtation as mentioned in the conclusion 1; and **(iii)** a multi-level coordination and cooperation mechanism and harmonization of the bottom-up and top-down approaches CSV implementation, monitoring, evaluation and reporting of results across local-central administrative levels.

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