Farmers’ own assessment of climate smart agriculture: Insights from Ma village in Vietnam

Working Paper No. 222

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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Abstract

The project *Integrated agricultural technologies for enhanced adaptive capacity and resilient livelihoods in climate-smart villages (CSVs) of Southeast Asia* aims to provide climate-smart agriculture (CSA) options to enhance adaptive capacity and resilience among CSV farmers and stakeholders. In 2016, in Ma village in Vietnam, one of the CSVs in the region, monitoring and evaluation (M&E) activities focused on the social dimension of the action research: how key actors involved in the research are experiencing progress, costs and benefits, achievements and challenges. To date, M&E of the biophysical dimension by scientists and farmers has received little attention. Although scientists have developed a coherent analytical CSA framework that guides the field research, so far they have struggled to practically track and measure outcome results in a systematic way. This report documents and reflects on how woman and man farmers in Ma village are assessing the biophysical results of the climate-smart techniques and practices they have adopted. They do this mostly through direct observation, some measurement, “before and after” comparison, and some comparison with what neighbours are doing. Overall, farmers’ assessment appears positive despite the lack of quantitative precision to support their judgement. There is work to do for the CSA scientists.

**Keywords**

*Climate-smart agriculture; Farmer indicators; Monitoring and Evaluation; Vietnam*
About the authors

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Acknowledgements

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**Acronyms**

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<th>Definition</th>
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<td>CSA</td>
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<td>CSV</td>
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<td>M&amp;E</td>
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Introduction

The Integrated agricultural technologies for enhanced adaptive capacity and resilient livelihoods in climate-smart villages (CSVs) of Southeast Asia project is a flagship project under the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) in Southeast Asia. It aims to provide climate-smart agriculture (CSA) options to enhance adaptive capacity and resilience among climate-smart village (CSV) farmers and other stakeholders. It focuses on integrated CSA technologies and practices which can be applied at scale across crops/farming systems, aiming to improving farm productivity/income generation and food security while conserving natural resources. Through on-farm/participatory testing of context specific climate smart technologies and practices derived from earlier research of CGIAR Centers and their programs, the project aims to shed light on the process of practical application of introduced technologies, assess their suitability at farm level and from farm to landscape level. The CIAT team in Hanoi coordinates the research in Ma village.

Ma village is one of the pilot CSVs where a set of CSA techniques and practices has been introduced and tested as part of a broader set of CCAFS’ research and capacity development activities (background information about the village can be found in the baseline studies carried out by CCAFS). Since 2015, Ma villagers have been testing the following techniques and practices:

- Cassava-grass strips-cowpea intercropping on sloping lands
- Livestock waste management through vermiculture composting
- Biological bedding for poultry
- Living pen and cut and carry grass production for goat raising
- Crop residue management
- Integrated home gardening
- Climate-smart rice production
- Acacia livelihood development

The “new” techniques and practices are based on a number of ecological principles (Nguyen Duy Nhiem 2016). Animal wastes, agriculture by-products and household wastes can be beneficial inputs to various farming practices like animal raising, home gardens, rice production and fish production. Compost made from animal waste/manure, agriculture by-products (e.g. rice straw, weeds, sawdust), and household waste can be used as high-quality fertilizer for crops and increase crop yield. It could also cuts down input cost and reduces GHG emissions when compared to the use of chemical fertilizers. Agricultural by-products such as rice straw and sawdust, which Vietnamese farmers usually burn, when mixed with soil in dry form, help recycle soil nutrients and reduces emissions of GHGs (methane - CH₄, nitrous oxide - N₂O, and carbon dioxide – CO₂).

Mạ is the largest village in 15 villages in Vĩnh Kiên Commune, Yên Bình District, Yên Bái Province with geographical coordinates 21.74°N, 105.08°E, at a distance of about 160 km far from Hanoi. Yen Bai is one of the 15 provinces in the northern mountainous region of
Vietnam. The province is situated in between the Northwest and Northeast regions of Vietnam, bordering Ha Giang and Tuyen Quang in the east, Son La in the west, Phu Tho in south and Lao Cai province in the north.

Ma village has a total land area of about 350 ha, classified according to land use patterns as follows: double-crop rice land (12.34 ha), single-crop rice land (3 ha) other crops’ land (over 100 ha), forestry land (220 ha), land for residential and flood plain (about 25 ha). All the agricultural land area is allocated to 176 households for use and management. On average, each household has a land tenure of 0.68 ha. In addition to this land, during the dry season, when the water level in Thac Ba lake is low, Ma villagers also grow some annual crops in the land areas along the lake sides (Cos land). The total area of this land is 1.5 – 2 ha depending on the water level. The main crops cultivated here are groundnut and various vegetables. Villagers use Thac Ba lake (about 500 ha) for aquaculture and fishing (Sen et al. 2014).

**Monitoring and evaluation efforts**

Since 2015, Ma villagers have experimented with the “new” techniques and practices. First, only a few villagers took part in the efforts by trying out one practice or technique. Having observed and learned firsthand from the pioneers, a larger number of villagers followed suit, some of them testing more than one technique or practice. Other villagers in Ma, in neighboring villages and much farther away, in other districts (e.g. Van Yen) and other provinces (e.g. Cao Bang) are now also adopting techniques and practices first tested by a few farmers. Farmers themselves have been very important actors in the dissemination of knowhow and practical experiences.

Scaling is an important objective of the work done in Ma and of the CCAFS efforts overall. Scaling has two dimensions: upwards to people of authority and outwards to the rest of the farming communities. To realize effective scaling, the involvement of the extension service is crucial (Eisen 2018). The Vietnamese extension service has a national mandate and covers the whole country. In 2016, following the Photovoice contest in the village, Ma villagers set up a communication team to “spread the CSA word”. This has proven to be very effective (Romero 2017). The Photovoice, **Tiếng nói qua ảnh** in Vietnamese, is a tool that allows people to identify local issues and problems and work for solutions, and communicate these through images and photos. It is a tool used in participatory action research through which participants reflect and document on community needs visually, promote dialogue and inform and dialogue with policymakers about village improvement (Joven 2017).

In order to track research progress and achievements, ensure the production of planned deliverables and outcomes of the project, and learn from the experiences, a M&E plan was designed early in 2015. This M&E plan has two broad dimensions: a more technical one that deals with the biophysical research results and a more social one that deals with how they key actors involved in the research experience progress, costs and benefits, achievements and challenges. A first M&E field mission to Ma village, Vietnam, at the end of 2016 used qualitative methods to assess initial progress of the social dimension of the research efforts. Ma women and men farmers are satisfied with emerging results of most of the introduced climate-smart practices and highly appreciative of the collaborative approach. Full adoption will increase efficiency of resource use within the farm and could contribute to increased
farm productivity and income of households. However, the report concluded that in order to promote wide-scale adoption of these practices, a much better well-thought scaling strategy should be designed and implemented (Hoang Thi Lua and Vernooy 2017). The more or less spontaneous out-scaling efforts are laudable, but not enough to bring about change at the scale originally envisioned by the project and by CCAFS.

For the biophysical research the CIAT-Vietnam team in Hanoi developed an original analytical framework that depicts how the selected techniques and practices interact and impact on climate change adaptation (Figure 1).

Figure 1. Analytical framework for the climate-smart research in Ma village

![Analytical Framework](image-url)

Source: Bui Le Vinh (CIAT-Vietnam office)
The framework is complemented by a set of scientific outcome indicators (table 1).

Table 1. Proposed outcome indicators to measure the results of selected CSA techniques and practices

<table>
<thead>
<tr>
<th>CSA technique/practice</th>
<th>Outcome indicator proposed by scientists to measure the results</th>
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</table>
| Cassava-grass strips-cowpea                                | - Reduced soil erosion  
- Improved soil fertility: increase nitrogen amount and soil moisture content  
- Improved resistance to termite attack in cassava  
- Stabilized cassava yield  
- Additional feed for cattle from grass strips              |
| Livestock waste management (vermiculture – composting)     | - Reduced GHG emissions from fresh dung exposed to the atmosphere  
- Increased use of bio-fertilizer/compost for vegetables and crops (rice, cassava, fruit trees, maize…)  
- Reduced environmental pollution from the traditional practice |
| Biological bedding for poultry                             | - Improved animal health and growth  
- Increased use of bio-fertilizer from the bedding material after 6 months of usage for vegetables, fruit trees and crops  
- Reduced environmental pollution from the traditional practice |
| Integrated crop residue management                          | - Reduced GHG emissions from burning of rice straw  
- Increased use of bio-fertilizer for vegetables, rice, fruit trees and crops |
| Integrated home gardens                                    | - Improved eco-efficiency of home garden components: waste of one becomes input of another/others  
- Diversified and increased household income  
- Diversified and improved household nutrition |
| Climate-smart rice production                              | - Input-smart: reduced use of seeds, agrochemicals, water  
- Increased rice yield by 20%  
- Improved resilience to climate change due to tolerance abilities (to cold and hot spells) |
| Acacia livelihood development                               | - Improved soil health and restored degraded land  
- Improved water holding/storing capacity                    |

Source: Bui Le Vinh (CIAT-Vietnam office)

However, to date, very little scientific measurement according to these indicators has been done in Ma village. The M&E done by the scientists has mostly been qualitative through visual field observations and conversations with farmers about their observations. For example, GHG emissions have not been measured/compared. Nothing has been done to measure changes in soil fertility or soil health. Even yield data have not been collected and compared.

In addition, to date, very little has been done to find out how woman and man farmers themselves assess the results of their “new” CSA techniques and practices implemented at

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1 Other types of indicators are readiness and process indicators. All three types are part of the CCAFS monitoring and evaluation framework (see the manual Climate-smart agriculture 101 produced by CCAFS available on-line). Readiness and process indicators are not discussed here.
To fill this knowledge gap, a second M&E field study was designed to learn more about farmers’ own observations and possible measurements of the changes the “new” techniques and practices are bringing about. A simple questionnaire was used to interview a number of selected woman and man farmers in Ma village engaged in six of the techniques and practices adopted in the village (see Annex 1). With the help of the village leader and the NOMAFSI staff, five women and four men were identified. Some of them were early implementers, some of them only of recent date (2017). Apart from an interview a visit to the farm was made to observe the chosen technique(s)/practice(s) first hand and to verify the answers as far as was possible. No one was interviewed about the acacia livelihood development initiative given that it only started very recently (second part of 2017). For the rice improvement experiment the NOMAFSI team provided the information, but given that this report focuses on farmers’ findings it will not be included here.

M&E of CSA interventions around the world

CCAFS has developed a comprehensive assessment framework for its overall program that includes 32 guiding monitoring and evaluation questions focused on its three CSA pillars: productivity (eight questions), mitigation (10 questions), and adaptation/resilience (14 questions). The framework includes biophysical and socio-economic indicators. For practical reasons, CSA country studies narrow down this very broad framework. For example, assessment of CSA work in Tanzania focuses on yield, income, soil health, soil erosion, water use efficiency, labour use, women’s workload, genetic diversity and diversification (CCAFS No date). Assessment of CSA work in India focuses on labour use, methane emissions, water use efficiency, access to weather service, soil health, soil fertility, energy use efficiency, crop diversification, cost of inputs, input efficiency (CCAFS and CIMMYT 2014). In Nepal, CSA assessment focuses on the results of tillage and crop establishment practices, precision management of water, nutrients and energy, seed and crop residue management, and crop diversification and intensification (CCAFS 2017: 8-9).

Farmers’ own assessment of the results of CSA techniques and practices

Technology/practice tested: livestock waste management through vermiculture composting; in some cases combined with controlled chicken raising. There are 15 households now practicing this technique.

Brief description: to reduce the impact of emissions from untreated livestock’s fresh dung to the atmosphere and produce additional feed to poultry and fish and bio-fertilizer to crops and vegetables, vermicomposting is introduced. The technology includes vermicomposting and

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2 When typing the keywords “climate-smart agriculture indicators” to search in CCAFS’ on-line publication data-base, only three items appear. One of them is the CSA programming and indicator tool that presents the CCAFS M&E framework and the three assessment pillars: productivity, mitigation, and adaptation.
For vermicomposting, fresh dung is put in a prepared space of 1.5x3x1m in dimension and a height of 0.5m. One kg of earth worms are then put on top of the dung. Worms feed on digest dung to produce compost. After the first two months, farmers harvest worms twice every week and take away part of the compost to put in their gardens. New worms and dung are added. Through this practice, farmers have extra feed for their livestock and good bio-fertilizer for their crops and vegetables. Compost is made using an effective microorganisms (EM) product. Dung is piled up in layers and an EM mixture is sprayed on each of the layers. The decomposition process of the EM product eliminates weed seeds and diseases that can occur in fresh dung. The final result of the process is organic matter that can be used as bio-fertilizer for crops. This bio-fertilizer can be applied after 30–40 days.

Scientific indicators: reduced GHG emissions (household and village levels); reduced environmental pollution compared to the traditional practice of not using livestock waste (household and village levels); increased use of bio-fertilizer in crop and livestock production (household level)

Photos: (credit: Bioversity International/R.Vernooy)

Scale: in the farm-yard by individual households; a composting structure varies from 5-10 m²; women often manage the process

Purpose/purposes:

- To decrease air pollution from animal dung (cows, buffaloes, pigs, chicken)
- To produce feed for chicken; the number of chicken varies from 50 to 200. Chicken are mainly raised for home consumption of eggs and meat and to some degree for the sale of eggs and meat.

Since when is the technology/practice being tested: the first farmers started in 2016; others followed in 2017

Who is involved in managing: family members contribute

Who is doing the monitoring: family members and CIAT staff

The results so far:

- The bad smell of dung around the house has been reduced.
- Good quantities of worms are produced.
- The weight and health of chicken has improved. Improved health leads to savings on expenditures of (buying) medicines. There are savings on expenditures of (buying) chicken feed.

How are these results observed and/or measured?

Daily observations and some recording in a notebook of the costs of inputs and the weight of the chicken.

Are the results compared to how it was before?

- The survival rate of the chickens until the moment of consumption has gone up from 70% to 98%.
- The total growth up to the 5th months has increased from an average of 1.5kg to 2.4kg.
- Chicken are laying more eggs than before.
- Environmental pollution (air, ground) has been reduced.
- Now, safe meat is produced: human health has improved due to less medicine residues in eggs and meat.

Are the results being compared with farmers who do not test the technology?

Some neighbors bring dung to the rice field; this requires more labor than collecting dung in the farm-yard.

**Technology/practice tested: living bed for chicken**

Brief description: instead of free roaming and egg laying chicken, a confined space is created, usually in an existing coop, of a mixture of rice husks, sawdust and brewer’s yeast. The microorganisms in the mixture decompose the chicken dung quickly keeping bad odors away and maintaining the ground clean. The quality of the environmental health is improved and as a result, the chicken’s health as well.

Scientific indicators: reduced GHG emissions (household and village levels); reduced environmental pollution compared to the traditional practice of free roaming chicken (household and village level); improved animal and human health (household and village level); increased use of bio-fertilizer (bedding material can be used as compost after about 6 months)

Scale: in the farm-yard by individual households; a living bed structure can be of varied sizes depending on the number of chicken (from a few square meters up to 25m² or more)

**Purpose/purposes:**

- To decrease air pollution from chicken dung
- To produce healthier and faster growing chicken; the number of chicken varies from 50 to 500. Chicken are mainly raised for home consumption of eggs and meat and to some degree for the sale of eggs and meat.
- To improve income
Since when is the technology/practice being tested: the first farmers started in 2015; others followed in 2016 and 2017

Who is involved in managing: family members

Who is doing the monitoring: family members and CIAT staff

The results so far:

- The bad smell of dung around the house and yard has been reduced.
- The health of chicken has improved. Improved health leads to less disease and savings on expenditures of (buying) medicines.
- There are no longer early deaths (of chicks).
- The overall death rate has been reduced.
- The time to full growth is shorter than before: from 6/7 months to 4 months.
- Feeding has become more efficient: there is less waste of feed and this has led to cost savings.
- Healthier and heavier chicken have a higher market price.
- Workload has been reduced: there is no longer need to clean dung every day; dung can be easily cleaned and collected; chicken can be easily observed and there is no longer need to bring them home every day.
- Chicken no longer get “lost”.
- The compost resulting from the bedding can be easily applied to crops.

How are these results observed and/or measured?

Daily observations and some recording in a notebook of the costs of inputs and the weight of the chicken.

Are the results compared to how it was before?

- There is less disease than before.
- The time to full growth is shorter than before: from 6/7 months to 4 months.
• Healthier and heavier chicken have a higher market price.
• Environmental pollution (air, ground) has been reduced.

Are the results being compared with farmers who do not test the technology?
The disease rate of neighbor’s chicken is higher and the growth is slower.

**Technology/practice tested: Living bed (pen) and cut-and-carry grass for goats**

Brief description: less effective natural grazing causing high death rates and slow growth of goats is now replaced by a more effective practice, combining living bed (pen) and cut-and-carry system. A bungalow-styled pen is constructed for 15-20 goats with a small fenced yard in front of it for goats to exercise. Forage grass is cut, chopped and fed to goats several times a day. Goat dung is made into compost using an effective microorganism product.

Scientific indicators: reduced GHG emissions (household and village levels); reduced environmental pollution (household and village level); improved animal and human health (household and village level); increased use of bio-fertilizer (bedding material can be used as compost after about 6 months)

Photos (credit: Bioversity International/R.Vernooy)

**Scale:** in the farm-yard by individual households; a living bed (pen) structure can be of varied sizes depending on the number of goats (5m² and more). Grasses can easily be interplanted in the backyard or in a field not far from the farmyard.

**Purpose/purposes:**

• To produce healthier and faster growing goats; goats are raised for home consumption and sale of meat
• To reduce environmental pollution at farm, village and landscape levels
• To improve income
Since when is the technology/practice being tested: 2015

Who is involved in managing: family members

Who is doing the monitoring: family members and CIAT staff

The results so far:

- The health of goats has improved. Improved health leads to less disease and savings on expenditures of (buying) medicines.
- The total weight has increased.
- Workload has been reduced: the goats can be easily observed and there is no longer need to “patrol” them and bring them home every day.

How are these results observed and/or measured?

Daily observations and some recording in a notebook of the costs of inputs and the weight of the chicken.

Are the results compared to how it was before?

- Goats are now healthier and heavier.
- Goats produce more meat that can be sold in the market.
- Environmental pollution (air, ground) has been reduced on the farm and in the village and surroundings.

Are the results being compared with farmers who do not test the technology?

To date there is only one farmer practicing these two techniques in the case of goats.

**Technology/practice tested: Cassava intercropped with grasses (strips) and legumes**

Brief description: mono-cropped cassava has been known as the number one soil erosion factor on sloping lands. To mitigate the problem, an intercropping system is introduced. There are three components in this system (grasses, legumes, cassava). Grass strips are planted along contour lines to shorten erosive slope length and mitigate soil erosion. Leguminous cover crops are intercropped with cassava to reduce evapotranspiration, limit the invasion of weed and improve soil fertility through biological nitrogen fixation (Vinh Le Bui 2018).

Scientific indicators: reduced soil erosion; improved soil fertility (N and moisture); improved resistance to termites in cassava; stabilized cassava yield; additional feed for cattle from grasses

Scale: at field level; fields can vary in size, but an effective practice requires several “layers” of intercropping
Purpose/purposes:

- To decrease soil erosion
- To increase soil fertility
- To increase cassava productivity

Since when is the technology/practice being tested: 2015

Who is involved in managing: family members

Who is doing the monitoring: family members and CIAT staff

The results so far:

- Cassava yield has been good due to better stem growth, but unfortunately, the prize has gone down in the last few years.
- It seems therefore that soil fertility has improved.
- There is less soil erosion. Soil has accumulated above the grass strips.
- Grasses have been harvested (cut and carry for a cow raised in the farmyard).

How are these results observed and/or measured?

Through visual observations mostly. CIAT staff is measuring soil accumulation on a regular basis.

Are the results compared to how it was before?

Before, cassava was grown as a monocrop and soil ran down the slope easily.

Are the results being compared with farmers who do not test the technology?

This is difficult as there are no neighbors doing the same thing. One neighbor has cassava interplanted with trees, but it seems hard to compare trees and grasses/legumes.

Technology/practice tested: integrated home garden

Brief description: According to FAO (1995), a[n integrated] home garden can be defined as “a farming system which combines different physical, social and economic functions on the
area of land around the family home. Within the typical home garden are social areas for meetings, children's play and gardens for display; economic areas for growing food, medicinal plants and trees and for raising animals and fish; physical areas for storage, living, washing and waste disposal. It is a place for people to live in but it also produces a variety of foods and other things for both home use and income.”

The home garden surveyed (4500 m²) consists of a vegetable and herb/spice garden, fruit tree areas (dragon fruit, guava, pomelo, lemon), 10 cows kept in a modern shed, a field for the production of cow feed (a forage known as VA06 is grown) by means of a cut and carry practice. All produce is for home consumption; fruits and meat are sold at the market. Composting is an important activity and has been enhanced with the use of effective micro-organisms (introduced by NOMAFSI). Compost is used throughout the garden. Cows are kept and fed in a newly constructed shed made of concrete and wood that is easy to maintain (allowing easy and efficient composting).

Scientific indicators: improved efficiency of home garden components: waste of one component becomes compost for another; diversified and increased household income; diversified and improved household nutrition

Photos (credit: Bioversity International/R.Vernooy)

Scale: at farm level; the size of a home garden can vary considerably: from a backyard garden of a few square meters to a patchwork of garden areas around the homestead of several hundred square meters.

Purpose/purposes: to enhance family income

Since when is the technology/practice being tested: 2015

Who is involved in managing: family members

Who is doing the monitoring: family members and NOMAFSI staff

The results so far:

- The production elements are better integrated.
- The fruit trees are healthier (less pest and disease attacks); the yield of the fruit trees has increased.
- Cows are healthy and strong.
• The number of cows that can be maintained has doubled (from 5 to 10).
• Composting has resulted in the elimination of chemical fertilizer use. The cost saving has been about VND 4,000,000/year (1 US $ is about VND 23,000).
• The cut and carry system combined with the modern shed have reduced labor costs.

How are these results observed and/or measured?
Through direct observations, but no measurements of any kind.

Are the results compared to how it was before?
Composting has become less smelly and more efficient. Before it would take three months and now only one month.
The yield of the trees has improved because they benefit from 20-30kg of compost/year; they did not receive any before.
The cows are healthier and stronger because they benefit from 15-20kg of feed/day, which they did not receive before.

Are the results being compared with farmers who do not test the technology?
The quality of the fruit is better than that of the neighbors. The fruit sells easier.

**Technology/practice tested: integrated crop residue management (ICM) for rice**

Brief description: rice straw is kept in the field after harvesting and decomposed by using an effective microorganism (product). Such a product activates microorganisms that live in soil and water and maximizes their natural power. Rice plants are transplanted at low density and fertilizers are deeply placed 3-5 days after transplanting.

Scientific indicators: savings on seed and fertilizer; reduced fertilizer loss, increased yield and soil fertility maintained. The practice can also reduce or stop altogether the use of herbicides and the burning of rice straw; not burning reduces emissions.

Scale: at field level (from very small to very large)

Purpose/purposes:
• To reduce herbicide use for the rice straw
• To save seed and fertilizer
• To stimulate healthy and strong development of rice plants
• To increase grain yield
Since when is the technology/practice being tested: 2016

Who is involved in managing: family members

Who is doing the monitoring: family members and NOMAFSI staff

The results so far:

- Rice plants develop well with strong root system
- The amount of fertilizer applied has been reduced
- Grain yields have increased

How are these results observed and/or measured?

Farmers regularly observe growth and health of rice plants in the field. Yields are measured.

Are the results compared to how it was before?

- Rice plants are growing better
- Grain yield is higher
- The environment is protected by not using herbicide

Are the results being compared with farmers who do not test the technology?

Rice grain yield is higher than that of neighbors who do not use ICM.

Farmers’ observations and measurements: some reflections

What can be learned from these findings? First, the interviewed farmers are keen observers of the results of their novel technologies and practices and can easily list them when asked (see table 2 for a comparison of scientist and farmer outcome indicators).
Table 2. Scientist and farmer outcome indicators compared

<table>
<thead>
<tr>
<th>CSA</th>
<th>Outcome indicator proposed by scientists</th>
<th>Outcome indicator used by farmers</th>
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<tbody>
<tr>
<td>Cassava-grass strips-legumes</td>
<td>Reduced soil erosion</td>
<td>Reduced soil erosion</td>
</tr>
<tr>
<td></td>
<td>Improved soil fertility: increase nitrogen amount and soil moisture content</td>
<td>Productivity (cassava and grass)</td>
</tr>
<tr>
<td></td>
<td>Improved resistance to termite attack in cassava</td>
<td></td>
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<td></td>
<td>Stabilized cassava yield</td>
<td></td>
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<tr>
<td></td>
<td>Additional feed for cattle from grass strips</td>
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<tr>
<td>Livestock waste management</td>
<td>Reduced GHG emissions from fresh dung exposed to the atmosphere</td>
<td>Reduced bad smell</td>
</tr>
<tr>
<td>(vermiculture composting)</td>
<td>Increased use of bio-fertilizer/compost for vegetables and crops (rice, cassava, fruit trees, maize...)</td>
<td>Improved animal health</td>
</tr>
<tr>
<td></td>
<td>Reduced environmental pollution compared to the traditional practice</td>
<td>Cost savings</td>
</tr>
<tr>
<td>Biological bedding for poultry</td>
<td>Improved animal health and growth</td>
<td>Reduced bad smell</td>
</tr>
<tr>
<td></td>
<td>Increased use of bio-fertilizer from the bedding material after 6 months of usage for vegetables, fruit trees and crops</td>
<td>Improved animal health</td>
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<td></td>
<td>Reduced environmental pollution compared to the traditional practice</td>
<td>Labour savings</td>
</tr>
<tr>
<td>Pen for goats and cut and carry system</td>
<td>Improved animal health and growth</td>
<td>Reduced environmental waste</td>
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<td></td>
<td>Reduced environmental pollution compared to the traditional practice</td>
<td></td>
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<tr>
<td></td>
<td>Increased use of bio-fertilizer for vegetables, rice, fruit trees and crops</td>
<td></td>
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<tr>
<td>Integrated home gardens</td>
<td>Improved eco-efficiency of home garden components: waste of one becomes input of another/others</td>
<td>Productivity (meat, fruits)</td>
</tr>
<tr>
<td></td>
<td>Diversified and increased household income</td>
<td></td>
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<tr>
<td></td>
<td>Diversified and improved household nutrition</td>
<td></td>
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<tr>
<td>Integrated crop residue management</td>
<td>Savings on seed and fertilizer</td>
<td>Cost savings</td>
</tr>
<tr>
<td>for rice</td>
<td>Reduced fertilizer loss</td>
<td></td>
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<td></td>
<td>Increased yield</td>
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<td></td>
<td>Soil fertility maintained</td>
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<td></td>
<td>Reduced emissions from burning straw</td>
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<td></td>
<td>Productivity (grain yield)</td>
<td>Environmental protection</td>
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<td></td>
<td>Cost savings</td>
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However, they hardly do any systematic quantitative measurements nor keep any systematic recordings of any kind. There is no planned quantification of outcomes, although some farmers estimate “before and after” differences, comparing their novel practice with the old one(s), e.g. weight increase/month, early death rate/number of births. A few interviewed farmers compare the results with a control technology/practice of a neighbor or neighbors through visual observations. Only recently, some of them have started to put some information in a logbook provided by the CIAT research team. From the interviews it became clear that they most likely are doing this not so much out of own interest, but to please the research team.

Second, the interviewed farmers listed multiple indicators for each of the technologies/practices, from two to five. This does not differ much from what the CIAT research team has come up with. None of the sets of indicators by technology/practice is the same—a useful finding that suggests avoiding the use of a ‘one fits all’ set of indicators. Some of the farmer indicators are frequently recurring ones: productivity gain and related income gain (mostly in terms of quality and quantity of meat, in the case of the home-garden also of fruits, and in the ICM for rice in grain yield) and savings (cost, labour). Interestingly, savings do not appear in the list of indicators put together by the CIAT research team. The interviewed farmers, women and men alike, mentioned savings eagerly. Although there seems to be no labour shortage in Ma village, the farmers are pleased to reduce labour inputs whenever possible. Concerning cost savings, also eagerly mentioned, interviewed farmers made some calculations when asked for. These calculations indicate that savings are considerable. They were perhaps not given much thought at the beginning of the testing, but they now seem to be an important incentive/pay off.

Third, interviewed farmers, women and men alike, mention reduction of bad smell as an important outcome. It indicates improved environmental health/reduced environmental pollution (read emissions). It is the only indicator mentioned by interviewed farmers, which goes beyond the farm level. As farmers observed: “The village has become cleaner.” This is an important finding, but not surprising given the nature of the selected technologies/practices in Ma village. It does of course raise questions about the scale of the results of the majority of the technologies/practices.

Fourth, only one farmer mentioned integration of production components (trees, crops, livestock), which could be seen as a process indicator leading to positive productivity, mitigation, and adaptation outcomes. It seems likely that for farmers integrating various farm activities is everyday practice and not something new they have to learn from scratch.

Fifth, animals are important for the livelihoods of Ma villagers. Interviewed farmers, women and men alike, expressed great satisfaction with the improved animal health resulting from several of the tested technologies/practices. Improved animal health contributes to productivity, in particular, more and better quality of meat, which contributes to food security and to income generation. It also contributes to adaptation through savings.

Sixth, and perhaps surprisingly, interviewed farmers did not say anything explicitly about strengthened farming skills, although from interactions with them it becomes clear that they have become more knowledgeable and skillful in their agricultural profession.
Last, directly or indirectly, the farmer indicators speak to the CCAFS assessment pillars of productivity, mitigation, and adaptation, although farmers do not use the terms mitigation and adaptation.

**Conclusion**

This report has documented and reflected on how woman and man farmers in Ma village are assessing the biophysical results of the climate-smart techniques and practices they have adopted. They do this mostly through direct observations, some measurement, “before and after” comparison, and some comparison with what neighbours are doing. Their assessment concerns to a very large degree of individual outcome results at the household and/or farm level. The only outcome referred to at the collective level is environmental health. Three outcome indicators that farmers, women and men alike, recurrently refer to are: improved animal health, improved productivity, cost savings (labour, inputs), and improved environmental health (reduction of bad smells and pollution by animal waste).

Overall, farmers’ assessment appears positive despite the lack of quantitative precision to support their judgement. The lack of quantitative precision makes it very difficult to formulate strong conclusions about the outcomes of the CSA interventions and the overall approach and methodology that inform it. There is therefore still ample work to do for the CSA scientists.
References


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ANNEX 1: questionnaire Ma village farmers own monitoring of CSA technologies and practices

Farmer’s name:

What technology/practice is being tested?

At what scale (plot, yard, home-garden, whole farm, together with other farmers)?

What is the purpose / are the purposes?

Since when is the technology/practice being tested?

Who is involved in managing it?

Who is doing the monitoring?

What are the results so far?

How are these results observed?

Are results being measured by any means? If so, how?

Are the results compared to how it was before? Could this be done?

Are the results being compared with farmers who do not test the technology? Could this be done?
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