



## FINAL REPORT

*Promote conservation agriculture in the northern mountainous region of Vietnam through maintaining and out-scaling farmers' networks and reference sites previously established by ADAM project*

Dr PHAM Thi Sen

NOMAFSI



The present R&D grant has been financed by the French Agency for Development (AFD). The ideas and the opinions presented in this document are the ones of its authors and do not represent necessarily those of the AFD.

June 2018

## 1. Introduction

In the northern mountainous region of Vietnam (NMR), where each year maize is produced in over 500,000 ha, cassava in about 120,000 ha and tea in over 90,000 ha, mostly on slopes, sustainable slopping land use has become a prime priority. Efforts have thus been spent for developing and promoting the adoption of farming practices of value for soil erosion control in the region. Under the AFD funded ADAM project (2010 – 2014), especially, farmers' networks and reference sites have been developed in some locations to test and evaluate different CA (conservation agriculture) practices for maize and tea on slopes. Nevertheless, within the project's short life span not much input could be spent for disseminating and promoting the adoption of practices. In 2015, after the project's end, NOMAFSI with support from CANSEA and its own tight financial capacity continued to maintain some of the ADAM-established CA farmers networks and reference sites, including, (i) CA maize farmers network for single cropping maize slopping land in Moc Chau district of Son La province, (ii) CA maize farmers network for double cropping maize slopping land in Van Chan district of Yen Bai province, and (iii) CA and organic tea reference site in Phu Tho province, and used these three sites for demonstration and dissemination of CA practices.

Aiming to maintain and scale-out the above mentioned sites, ACTAE/CANSEA provided NOMAFSI with a grant to strengthen its activities supporting farmers to practice and scale-out their preferred CA practices in maize system in Yen Bai and maintain the tea site in Phu Tho during April 2016 – March 2018. An additional grant was then given to include the site of Son La during 2017-2018. The main activities include:

- Maintaining and further developing the *CA maize farmers' network* in Yen Bai province for maize-based systems on slopes
- Maintaining and further developing the *CA maize farmers' network* in Son La province for maize-based systems on slopes, and
- Maintaining and further developing the *CA and organic tea reference site* in Phu Tho province for sustainable tea production, in order to tackle the challenge of sustainability and quality of the production.

For maize-based system, the 2 sites (Van Chan district of Yen Bai and Moc Chau district of Son La) are selected as they are complementary in term of the climatic conditions. In Moc Chau, the altitude is higher and thus climatic conditions are colder and with longer dry season, allowing only one maize crop per year. In such conditions, improving the revenues of the farmers includes intercropping and/or growing grass to both control the erosion and feed cattle. In Van Chan, the climatic conditions are not so strong and farmers can have a double maize crop, if farmers can establish the second crop in a very short time after harvesting the first crop, and this requires to use conventional techniques instead of agroecological techniques to make it faster (herbicide, chemical fertilizer,...).

This report briefly presents the activities implemented and results obtained within the frame work of this grant.

## 2. Activities implemented and results obtained

**Table 1: Summary of activities implemented up to 30 Dec 2016**

	<b>Planned activities as described in the TOR</b>	<b>Performed and results obtained</b>
1	<b><i>Maintain and further develop the existing CA maize farmers' network in Van Chan district, Yen Bai province</i></b>	
	Meeting with the member HHs of the existing network (52 HHs) to agree upon the annual action plans	At a meeting with farmers, each HH selected a CA practice to apply in 2016 seasons. Priorities were also defined for the interventions; in addition to the trainings and providing farmers with seeds of intercrops and grasses, farmers also expressed that they need support to make small water reservoir such that they can have water to use when needed for their maize crop management.
	New members to join the network, training them and supporting them to apply CA practices	2016: 19 more households, and thus the total number of HHs are 71 2017: The members amounted to 98
	Supporting the network's members (72 – 80 members) to apply selected CA practices for their maize crops	A total of 71 HHs (in 2016) and 98 HHs (in 2017) were supported Out of these HHs 40 were supported to make a small water reservoir in their fields.
	Supporting farmers (72 - 80) to manage crops and pests, harvesting, keeping records and calculate the yield, benefits...	71 HHs (in 2016) and 98 HHs (in 2017) obtained technical guidance to manage their crops. They were also supported with seeds of intercrops (rice bean, mucuna) and grasses, and some kinds of herbicides, pesticides.... After harvesting a meeting was organized with farmers to review the activities and agree upon the plan for continuing the activities next year.
2	<b><i>Maintain and further develop the existing CA maize farmers' network in Moc Chau district, Son La province</i></b>	
	Meeting with the network farmers (13 existing) to agree upon the annual action plans	At the meetings with farmers, each HH selected a CA practice to apply in 2016 seasons. Priorities were also defined for the interventions; in addition to the trainings and providing farmers with seeds of intercrops and grasses, farmers also expressed that they need support to make small water reservoir such that they can have water to use when needed for their maize crop management.
	New HHs to join the network, training them and supporting them to apply	2016: 14 new households selected, and thus the total number of HHs reached 27 2017: 32 new HHs selected and the total number amounted to 59
	Supporting the network's members (27 HHs, 27.5 ha) to apply selected practices for their maize crops	In 2016, a total of 27 HHs were supported In 2017, 59 HHs (76,9 ha) were supported, among them 65 applying reduced tillage and mulch, 15 HHs applying intercropping with rice bean, 4 with black bean (cowpea) and 1 with pumpkin as 2 <sup>nd</sup> crop/relay crop, and 9 with grass strips.

	Supporting farmers (27 HHs) to manage crops and pests, harvesting, keeping records and calculate the yield, benefits...	27 HHs (in 2016) and 59 HHs (in 2017) obtained technical guidance to manage their crops. They were also supported with seeds of intercrops (rice bean, pumpkin, black bean) and grass, and some kinds of herbicides, pesticides.... Field days were also organized and a trip of ACTAE project's leader was conducted to the site.
3	<b><i>Maintain and further develop the tea reference site in Phu Tho</i></b>	
	2 ha of tea plantation applying CA and organic practices; Monitoring, keeping records on pest problems, yield of each harvest, calculating the benefits	A tea hill of total 2 ha was were managed according to the following: - 0.5 ha: applying organic fertilizers produced by NOMAFSI - 0.5 ha: applying organic fertilizers produced by NOMAFSI together with mulch and additional application of manure - 0.5 ha: applying purchased bio-fertilizers together with additional manure - 0.5 ha: applying NPK and pesticides as usual.
4	<b><i>Communication and dissemination of practices widely among the target farming communities and extension network</i></b>	
	Trainings on CA and agroecology (120 farmers)	98 maize farmers Yen Bai, 60 tea farmers in Phu Tho, 59 maize farmers in Son La were trained
	Trainings and follow-up activities in herbicides use (120 farmers)	98 maize farmers Yen Bai, 60 tea farmers in Phu Tho, 59 maize farmers in Son La were trained
	Trainings and follow-up activities in agroecological crops protection (120 farmers)	98 maize farmers Yen Bai, 60 tea farmers in Phu Tho, 59 maize farmers in Son La were trained
	Trainings and follow-up activities in CA and organic tea production (60 farmers in Phu Tho)	60 tea farmers Phu Tho were trained
	Trainings and follow-up activities in fodder grass and mucuna processing into feeds (60 farmers)	98 maize farmers Yen Bai, 59 farmers in Son La were trained
	Field days	- 4 field days to maize sites in Yen Bai were organized for 80 participants - 4 field days to tea site in Phu Tho were organized for 80 participants - 4 field days in Son La were organized for 65 participants to maize sites

(1) **Activity 1: Maintaining and further developing the CA maize farmers' network in Van Chan district, Yen Bai province**

In table 2 below are the numbers of farmers in Yen Bai supported to apply the practices they selected.

**Table 2: Numbers of HHs applied CA practices in Van Chan district, Yen Bai province**

Year	Location	RT&M	Grass strips	Intercropping with legumes	Mini-terraces	Sum
2016	Son Think commune (single maize cropping)	2 HHs (2 ha)	2 HHs (0.4 ha)	2 HHs (1 with rice bean, 1 HH with mucuna) (0.4 ha)	1 HH (0.2 ha)	7 HHs (3.0 ha)
	Cat Think commune Bai (double maize cropping)	63 HHs (23 ha)		1 HH (0.1 ha)		64 HHs (23.1 ha)
2017	Son Think commune (single maize cropping)	20 HHs (10 ha)		11 HHs (4 ha)	1 HH (0,2 ha)	28 HHs 12,2 ha
	Cat Think commune (double maize cropping)	64 HHs (23 ha)		6 HHs (0,8 ha)		70 HHs (23,8 ha)

*HHs: Households; RT&M: Reduced tillage and mulch*

Before, in both Son Think and Cat Think communes maize could be produced in 2 cropping seasons. Recently, however, due to climate change impacts (longer dry season, late rainy season), in most of the maize land areas of Son Think commune farmers could only produce 1 crop of maize per year. Thus, in Son Think commune in addition to promoting CA practices for maize, we also intended to develop an additional crop of legumes before maize crop towards increased income for HHs and improved land conditions.

Results obtained are presented in tables 3a, 3b, 4, 5 and diagram 1, and briefly discussed below.

As seen in the table 3a and 3b, in double maize cropping system in Cat Think commune, RT&M and intercropping with mucuna increased the yield. However, mucuna intercrop did not increase the net return as it did not give any additional income while requiring additional inputs (seed of intercrop) and labour. In term of net income per working day RT&M slightly increased, but mucuna intercrop reduced significantly. On the return per VND spent, all the practices did not have clear positive impact. The reason was that CA practices required higher labour and material input cost.

The increase in labour requirements seems to be one of the most important factors inhibiting the scaling-out of CA practices. This is because, as described by farmers, nowadays more and more young people leave countryside to work in cities for more money, and consequently labour force availability for farming significantly reduced and became seriously short, especially during the planting and harvesting periods of main crops. Also, on the other hand, due to their habits, farmers are reluctant to spend increased labour for the same produce.

Results of the single cropping maize system in Son Think commune (Table 4) show that, except grass strips all CA practices increased the yield of maize. However, mucuna as intercrop did not significantly increase the net return as it did not give any additional income while requiring additional inputs (seeds of intercrop and labour). In term of net income per working day RT&M and mini-terraces significantly increased, while the rest 3 practices reduced significantly. On the return per VND spent, mini-terraces increased much compared

to the control followed by RT&M: the rest 3 practices did not have significant impact. However, from grass strips a total of 15.2 tons/ha were harvested per year, and this is enough for feeding 1.5 – 2 cows. This could greatly help develop cattle raising. Again, as in the case of double cropping system, the increase in labour requirements seems to be among the most important factors inhibiting scaling-out of the practices.

Regarding the additional crop (1<sup>st</sup> crop) in single maize cropping land (Son Thinh commune) we have tested the following:

- (i) the control: monoculture of maize applying conventional practice of slash and burn,
- (ii) monoculture of cowpea applying MT &M,
- (iii) cowpea + maize applying MT & M,
- (iv) mung bean + maize applying MT &M.

The sowing time was right after the 1st rain came. For the (iii) and (iv) we used short duration variety of maize (LVN885) and sow the seeds 7-10 days after sowing of legumes, when the legumes germinated; 2 rows of legumes/1 rows of maize, the space between 2 rows of maize was 70 cm. Cowpea and mungbean were used because they are produced locally and there are varieties adapted to the local conditions. Results are presented below (Table 5 and Diagram 1).

As seen on table 5, if cultivate maize in the 1st cropping season as before (the control) the yield and the return were very low and a negative net income was obtained. However, when cultivate legumes (cowpea, mung bean), with or without intercropping with a short duration maize variety, farmers could earn significant income and benefit. (As per our observation, in 2017 there were long and heavy rains during the harvest time of legumes and this caused a significant reduction in the legumes yield otherwise the yield of legumes could be significantly higher.).

More importantly, residues from this 1st crop could serve as good biomass source for mulch in the next, main, crop. This leads to an increase in both yield and benefit of the 2<sup>nd</sup> crop (Diagram 1).

**Table 3a: Yield, cost and benefits of crops in double cropping system in (Cat Thinh commune, Van Chan district, Yen Bai province), 2016**

	<sup>st</sup> 1 crop		<sup>nd</sup> 2 crop		
	Control (burning)	RT&M	Control (burning)	RT&M	Maize + Mucuna
Yield (t/ha)	6.53	7.28	5.74	6.32	6.12
Gross return (000vnd)	32,650	36,400	28,700	31,600	30,600
Total material cost (000vnd)	15,730	16,400	15,430	16,350	16,850
Total labour (working days)	130	141	124	137	152
Net return (000vnd)	16,920	20,000	13,270	15,250	13,750
Net return per working day (vnd)	130,154	141,844	107,016	111,314	90,461
Return per 1000 vnd spent (vnd)	2,150	2,220	1,860	1,930	1,820

*RT&M: reduce tillage & mulch; Mucuna/Velvet bean: Đậu mào*

**Table 3b: Yield, cost and benefits of crops in double cropping system in (Cat Think commune, Van Chan district, Yen Bai province), 2017**

	1st crop		2 <sup>nd</sup> crop	
	Control	RT&M	Control	RT&M
Yield of maize (t/ha)	6,12	6,93	5,64	6,22
Gross return (000vnd)	30.600	34.650	28.200	31.100
Total material cost (000vnd)	<b>15.130</b>	<b>15.750</b>	<b>15.130</b>	<b>15.750</b>
Total labour (working days)	<b>130</b>	<b>141</b>	<b>124</b>	<b>137</b>
Net return (000vnd)	<b>15.470</b>	<b>18.900</b>	<b>13.070</b>	<b>15.350</b>
Net return per working day (vnd)	119	134,04	105,40	112,04
Return per 1000 vnd spent (vnd)	2.02	2.2	1.86	1.97

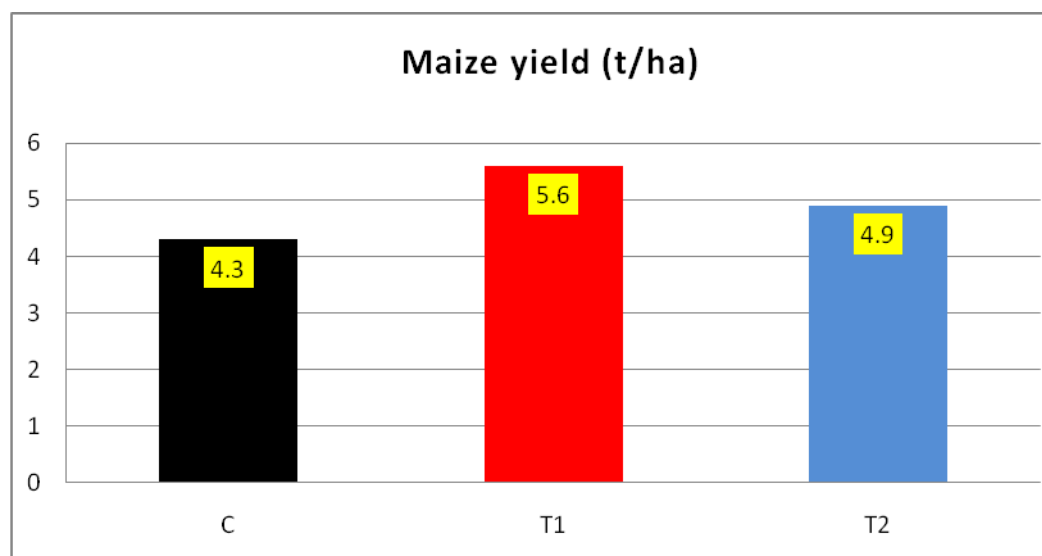
*RT&M: reduce tillage & mulch*

**Table 4: Yield, cost and benefits of crops in single cropping system in (Son Think commune, Van Chan district, Yen Bai province), 2016**

	Control (burning)	RT&M	Maize + Mucuna	Maize + rice bean	Mini-terrace	Grass trips(*)
Yield of maize (t/ha)	3.96	4.46	4.21	4.34	4.93	4.01
Gross return (000vnd)	19,800	22,300	21,050	21,700	24,650	20,050
Total material cost (000vnd)	8,800	9,100	9,500	9,400	9,000	9,100
Total labour (working days)	122	131	148	145	149	152
Net return (000vnd/ha)	11,000	13,200	11,550	12,300	15,650	10,950
Net return per working day (vnd)	90,016	100,763	78,041	84,828	105,034	71,039
Return per 1000vnd spent (vnd)	2,250	2,450	2,220	2,310	2,740	2,200
Additional return from intercrop (000 vnd/ha)	-	-	no	no		15.2 tone/ha/year

**Table 5: First (additional crop) in Son Thinh commune, Spring-summer, 2017**

	<i>Control (conventional Monoculture of maize)</i>	<i>Monoculture of cowpea</i>	<i>Cowpea + maize</i>	<i>Mungbean + maize</i>
Maize yield (t/ha)	0.71	-	0.32	0.34
Legume yield (t/ha)	-	3.8	0.25	0.15
Gross return (000vnd)	3,905	13,300	10,510	5,620
Total material cost (000vnd)	5,920	3,895	4,225	3,600
Total labour (working days)	100	143	140	137
Net income (000vnd)	-2,015	9,405	6,290	2,020
Net return per working day (vnd)	-20.15	65.77	44.90	14.74
Return per 1vnd spent (vnd)	0.66	3.41	2.49	1.56



**Diagram 1: Yield of maize in the 2<sup>nd</sup> crop in Son Thinh commune**

(C: Control – no additional 1st crop, maize only with slash and burn practice; T1: maize + cowpea after harvest of the additional 1st crop ( cowpea + maize), T3: Maize only with RT&M without the 1st crop)

**(2) Activity 2: Maintaining and further developing the CA maize farmers' network in Moc Chau district, Son La province**

In 2016 the 13 HHs in the existing network were provided with necessary support to apply RT&M and intercropping with rice bean and grass strips. In difference to Yen Bai where each HH only selected to apply 1 practice, in Son La all these 13 HHs applied, each in one plot, RT&M together with intercropping; and out of them 11 also applied, each in another plot, reduced tillage alone; and 3 also had grass strips in other plots (Table 6). In 2017 the HHs number increased to 59.



**Table 6: HHs and area applying selected practices in Chieng Hac commune in Moc Chau district, Son La province 2016 and 2017**

RT&M	Grass strips	Intercropping (rice bean)	Additional 2 <sup>nd</sup> crop (cowpea)	Additional 2 <sup>nd</sup> crop (pumpkin)	SUM
<b>2016</b>					
11 HHs (22 ha)	1 HHs (1.5 ha)	13 HHs (4 ha)			13 HHs (27.5 ha)
<b>2017</b>					
59 HHs (64 ha)	9 HHs (3.94 ha)	15 HHs 8.3 ha	4 HHs (0.7 ha)	1 HH (0,2 ha)	59 HHs (76.9 ha)

HHs: Households; RT&M: Reduced tillage and mulch

(\*) : The HHs applied grass strip and RT&M are among those who applied intercropping

(\*\*) : The HHs applied other practices were among those who applied RT&M

Results in 2016 (Table 7) show that both practices (RT&M and intercropping with rice bean) increased the maize yield, net return, and net return per working days as well as return per vnd spent. In addition, rice bean also gave a yield of 330 kg of grains per hectare and thus an additional income of over 8.000.000 vnd/ha. For poor farmers in the region such an additional income is of high values for their livelihoods and food security.

In 2017 results (Table 8) show that, again, CA practices increased the maize yield, net return, and net return per working days as well as return per vnd spent. In addition, rice bean also gave a yield of 270 kg of grains per hectare, and thus an additional income of over 8.154.000 vnd/ha.

Similar to Yen Bai, in Son La, in 2017 we also supported farmers to produce additional crop after harvesting of maize. Farmers selected to plant pumpkin or cowpea after maize. The yield of pumpkin was 1.87 t/ha (over 13 mil vnd/ha of additional net return), and that of cowpea was 0.38 t/ha (almost 11 mil vnd/ha of additional net return).

It is also important to note that, as observed by farmers soil conditions in the field with CA application looked much better and less soil erosion was observed. Farmers also noticed that under the mulch layer soil is moister, softer and darker.

**Table 7: Yield, cost and benefits of crop in Son La(single maize cropping systems), 2016**

	Control	RT& M	Intercropping with rice bean	
			From maize	From rice bean(*)
Yield (t/ha)	4.55	5.12	5.04	0.33
Gross return (000vnd/ha)	22,750	25,600	25,200	8.250
Total material cost (000vnd/ha)	14,693	13,191	12,682	0.3
Total labour (working days/ha)	63	62	63	51
Net return (000vnd/ha)	8,057	12,409	12,518	7.950
Net return per working day (000vnd)	127,889	200,145	196,807	
Return per 1000vnd (vnd)	1,550	1,940	2,576	

**Table 8: Yield, cost and benefits of crop in Son La (single maize cropping systems), 2017**

	Control	RT&M			Intercropping with rice bean		Grass strips	
		Maize (main crop)	Pumpkin (additional crop)	Cowpea (additional crop)	Maize	Rice bean	Maize	Grass
Yield (t/ha)	4.97	5.28	1.87	0.38	5.37	0.27	5.01	16.80
Price ('000vnd/t)	4,200	4,200	8,000	30,000	4,200	30,000	4,200	Grass used as feeds
Gross return ('000vnd/ha)	20,864	22,190	14,933	11,538	22,571	8,154	21,030	
Total material cost ('000vnd/ha)	8,246	7,228	1,621	692	6,858	221	6,794	2,488
Net return ('000vnd)	12,618	14,962	13,312	10,846	15,713	7,933	14,236	
Total labour (working days)	59	61	32	29	61	26	60	30
Net return per working day (vnd)	214	246	416	371	256	306	239	-

**(3) Activity 2: Maintaining and further developing the CA and organic tea reference site in Phu Tho province**

A 2 ha 10-year old tea hill, which had not been exposure to any synthetic chemical fertilizers and pesticides continuously for 4 years, and of which soil analysis results met the requirements for safe food production, was selected for building a reference site as below:

- Plot0 (0.5 ha): applying NPK and pesticides as usual, mechanical harvest (the control)
- Plot1 (0.5 ha): applying NPK and pesticides as usual, manual harvest
- Plot2 (0.5 ha): applying organic fertilizers produced by NOMAFSI, no pesticides, no synthetic fertilizers, manual harvest
- Plot3 (0.5 ha): applying organic fertilizers produced by NOMAFSI together with mulch and additional application of manure, no pesticides, no synthetic fertilizers, manual harvest
- Plot4 (0.5 ha): applying purchased bio-organic fertilizers together with additional manure application, manual harvest

The processing complied with HACCP requirements

### **In 2006:**

Results obtained (Table 9) show clearly impacts of organic fertilizers on the tea yield and quality. Comparing to the Plot 4, all the rest three plots had much higher yield, total return, net return and also the net return per working day as well as per vnd spent. Due to lowest material inputs cost (using only organic fertilizers produced by NOMAFSI) the plot 2 yielded the highest net return per working day and also return per vnd spent (more than 10 times higher compared to plot 3 and plot 4, and almost 20 times higher than the plot 1).

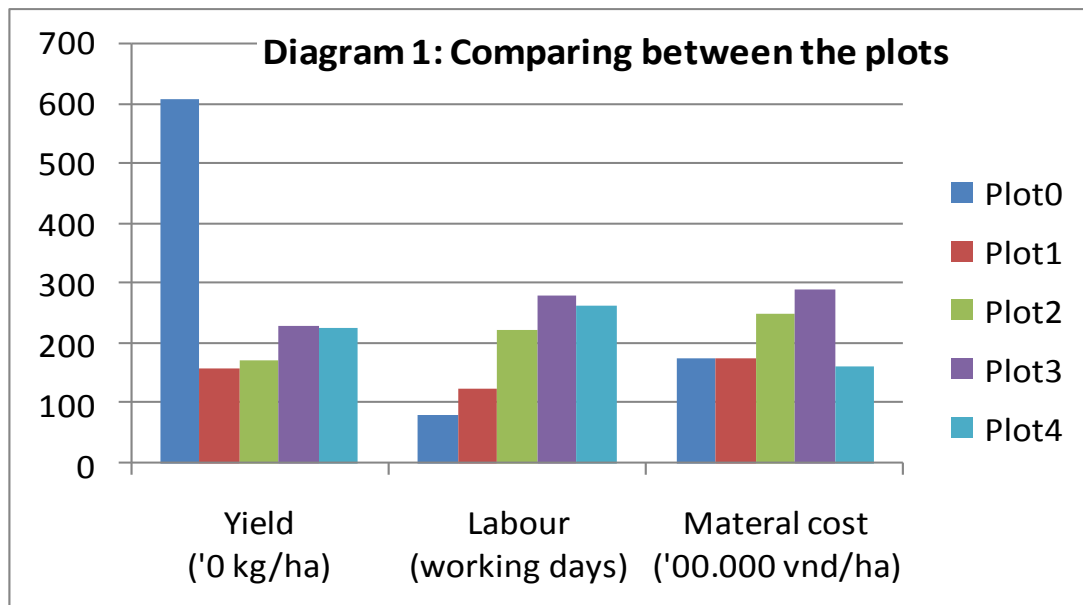
**Table 6: Results of tea in the reference site**

	<b>Plot 1 (NPK)</b>	<b>Plot 2 (Produced OF)</b>	<b>Plot 3 (Produced OF + M)</b>	<b>Plot 4 (Purchased BF)</b>
Working days (day)	124	221	281	261
Total material cost (000vnd)	17.400	1.600	24.800	28.800
Yield of fresh leaves (kg/ha/year)	1.572	1.720	2.274	2.243
% of leaves with good quality	70%	100%	100%	100%
Total return (000vnd/ha/year)	47.160	86.000	113.700	112.150
Net return (000vnd/ha/year)	29.760	84.400	90.900	83.350
Net return per day (vnd)	240.000	381.900	323.500	319.350
Return per 1000vnd spent (vnd)	2.710	53.750	4.665	3.984
Plants died during the dry season	++	0	0	0
Insects (green bugs, red spiders...)	Above the ET	Almost no observed	Almost no observed	Far below the ET

### **In 2017:**

- Organic farming increased the yield by 9,4 – 44,7%. The highest increase was observed for Plot3, following by Plot4 and Plot2, compared to the Plot1
- However, if compared to the control (non-organic and using machine to harvest) all the 4 plots (Plot1-Plot4) had much reduced yield
- The cost of labour and materials were higher for all organic plots. The cost is more than double for Plot3 and Plot4, and about 50% higher for Plot2.

- All the products from Plot2, Plot3 and Plot4 met the requirements of safe products (no residues of any pesticides, heavy metals and harmful microorganisms).
- The organic plots were with insignificant density of pests (red spiders, green aphids, mosquito bugs)
- In 2016 there was a severe drought but in organic plots no plant died while in other plots a significant number of plants died.





0-25-02

**VINACERT-CONTROL**

www.vinacert.vn

**KẾT QUẢ THỬ NGHIỆM**

TEST REPORT

Số phiếu/Sr: VICB11610010/YNKM 33314

Mã số file/AC: 1

Mã mẫu/Sample Code: 7

1. Khách hàng/ Customer:

Trung tâm Nghiên cứu và Phát triển Chế - Viện khoa học kỹ thuật nông  
lâm nghiệp miền núi phía Bắc

2. Địa chỉ/ Address:

Phủ Hồ - thị xã Phú Thọ - tỉnh Phú Thọ

3. Tên mẫu/ Sample:

Mẫu chè

4. Số TCCS/ES:

Chè Phú Hồ

5. Tình trạng mẫu/ Status:

Mẫu tại kho, đựng trong túi nylon bao kín

6. Lượng mẫu/ Sample Amount:

1,5 kg

7. Ngày nhận mẫu/ Sample receiving date:

27/07/2016

8. Người lấy mẫu/ Sample collector:

Khách hàng tự mang mẫu đến

9. Ngày thử nghiệm/ Testing date:

Từ 27/07/2016 đến 12/08/2016

10. Kết quả/ Results:

STT No	Chỉ tiêu Criterion	Đơn vị Unit	Kết quả Results	Phương pháp thử Testing method	Ghi chú Note
1	Asen (As)	mg/kg	KPH LOD=1	Ref. AOAC 986.15 (VICB-TN-02-126)	
2	Cadimi (Cd)	mg/kg	KPH LOD=1	Ref. AOAC 999.11 (VICB-TN-02-124)	
3	Chì (Pb)	mg/kg	KPH LOD=2	Ref. AOAC 999.11 (VICB-TN-02-124)	
4	Thủy ngân (Hg)*	µg/kg	8,3	H.HD.QT.297 (DMA60)	
5	Fipronil*	µg/kg	KPH	Ref. AOAC 2007.01 (GC/MS/MS)	
6	Hàm lượng Caffein*	g/100g	2,05	H.HD.QT.164 (Ref. TCVN 9744-2013)	
7	Hàm lượng chất tan	%	50,77	TCVN 5610-2007	
8	Hàm lượng Polyphenol tổng số*	g/100g	17,0	H.HD.QT.365 (UV-VIS) (TCVN 9745-1-2013)	
9	Hàm lượng Protein thô	%	25,80	10TCN 850-2006	
10	Hàm lượng tanin*	g/100g	36,30	H.HD.QT.086 (AOAC 955.35)	
11	Hàm lượng Theanine*	mg/100g	834,00	H.HD.QT.046	
12	Hàm lượng tro tan trong nước	%	5,96	TCVN 5084-2007	
13	Hàm lượng Đường tổng số*	g/100g	21,20	H.HD.QT.162	
14	Tro thô	%	5,66	TCVN 5611-2007	
15	Xơ thô	%	10,50	TCVN 5714-2007	

Hà Nội, ngày 12 tháng/month 08 năm/year 2016



Nguyễn Thọ Khiêm

Pic 1 : Result of analysis tea leaved in chemicals

# Tea quality



*Pic. 2: Results of analysis of tea leaved in microorganisms*

## (4) Activity 3: Communication for dissemination of practices widely among the target farming communities and extension network

In total, 217 farmers were trained in CA and agroecology, herbicides use, agroecological crops protection, 60 in organic tea production and 157 in fodder grass processing into feeds (Table 1). In addition, in each site (Son La, Yen Bai and Phu Tho) 4 field days were organized for dissemination and demonstration of practices values and impacts.

### 3. Conclusions

The activities were implemented as required and were welcome by farmers and local officers. In general, the application of CA practices had ~~good~~ limited impacts on the yield and net income.

Regarding maize systems: As discussed above, except the grass strips, all the CA practiced selected by farmers increased the yield of maize and the gross return. However, on the total net return and per working day net return the impacts were different between practices. This was because higher labour inputs were required for the application of CA practices and the increase in working days number were different between practices. Comparing two sites, Yen Bai and Son La, in Yen Bai the labour input was much higher, and this was due to smaller scale of households and plots, and all activities were implemented by hands, while in Son La such activities as ploughing, spraying herbicides... are implemented with small machines. The increase in labour requirement, as mentioned before is one of the main factors inhibiting the scaling-out of the adoption. Developing adapted mechanization should reduce the labour input and probably help the scaling-out of CA practices' adoption. Nevertheless, due to small scale of farms and plots, and because of complicated topography despite some efforts have been spent for this not yet any realistic options identified.

When grass strips were planted as contours, the maize yield could be reduced due to the decrease in the number of maize plants in a hectare. However, HHs could also harvest grass to feed their cattle, and this greatly helps develop animal husbandry. Farmers who raise cattle mentioned that this would be of great benefits for them. The problem however was that the fields are far from HHs and farmers face difficulties in bringing grasses home to feed their cattle.

Regarding tea: The application of mulch and organic fertilizers brought higher yield, total return, net return and also the net return per working day as well as per VND spent. In addition, in term of the pest, the organic plots did not have significant problems with pests; although no pesticides were applied no pest was observed at significant density while in plot 0 and plot 1 pests were observed at the density higher than the economic threshold and pesticides application was needed. Also, the dry season (autumn + winter 2016) was exceptionally very dry, no rains at all during the 4 months, and thus in non-organic plot and in the non-organic tea plantations in the area significant numbers of tea plants died while in the organic plots no dead plants were observed. This was because the mulch helped keep the soil moisture better and the organic fertilizers make plants more vigorous. Regarding the tea quality, organic plots gave "safe tea" leaves with high quality. The tea leaves were analyzed in chemical and microorganism contaminations, and results show that tea leaves were free of all the chemical and microorganism elements according to the safe tea product standards.

In addition to these socio-economic results and more globally, the activities implemented with the support of ACTAE-Cansea also allowed to:

- Get a good knowledge of alternative CA systems (DMC, rotation, intercropping, grasses,...) allowing technical and socio-economic advices in various growing conditions of mountainous areas;
- Establish farmers networks for promoting the adoptions of these practices

- Link with other international / regional or even local R&D or extension programs
- Strengthen capacity building, communication and methodology

But it is not yet enough to get a visible implementation of these practices in the mountainous landscape. Additional efforts should be done and priorities should focus on:

- Building capacity for farmers in safe use of chemicals (for the users, the food products and the environment)
- Strengthening Research for Development on agroecological control of pests & diseases (ACP approach)
- Developing CA and AE systems suitable for different contexts to gradually replace mono-cropping systems of maize or cassava on slopes ... as part of the 4 per 1000 program recently signed by MARD.

By Dr Pham Thi Sen / NOMAFSI

29<sup>th</sup> of June, 2018



**Some pictures:**



Reduced tillage and mulch in Yen Bai



Mini-terraces in Yen Bai



Intercropping with rice bean in Yen Bai



Field day in Yen Bai



Intercropping with rice bean in Son La



Additional harvest of rice bean



Maize + cowpea

Maize + mucuna



Field day to tea site in Phu Tho



Training in AE for tea production



Legume and legume with maize in additional cropping season in Yen Bai



2<sup>nd</sup> maize crop (after 1st maize crop) in Yen Bai



Grass strips and pumpkin as the 2<sup>nd</sup> crop in Son La