



# Appendix 1 – Intervention context

## 1.1 Socio-economic and biophysical conditions of the studied areas

Tien Giang and Dong Thap are located in the Mekong Delta with natural areas of 2,511 and 3,374 km<sup>2</sup>, respectively. Both provinces have flat terrain with slopes of less than 1% and elevations ranging from 0 to 1.6 metres (0.0 to 5.2 ft) above sea level. The climate is in a tropical climate zone, divided into two major seasons, the wet season (May to November) and the dry season (December to April), with an average temperature of around 27°C. Tien Giang province is the 14th most populous in Vietnam, with 1.8 million people, slightly higher than Dong Thap province, which has 1.7 million people. Tien Giang and Dong Thap have GDP per capita of 2100 and 1700 USD, respectively. Both provinces are experiencing annual economic growth rates of 7 to 7.5%. Overall, thanks to their geographic location, economic condition, and road and waterway transportation, both provinces have various advantages in agricultural production, particularly mango fruit.

### *Mango production in the Mekong Delta*

Along with economic growth and agricultural development in recent years, the mango cultivation area of Tien Giang and Dong Thap has increased dramatically (Table 1), making them the country's top three mango-growing provinces (together with An Giang). Cat Chu mango is famous in Dong Thap, while the most famous Cat Hoa Loc mango is certified as a geographical indication in Tien Giang.

**Table 1. Mango production in the Mekong Delta**

Province	2018			2019		
	Area (ha)	Yield (tonne)	Productivity (tonne/ha)	Area (ha)	Yield (tonne)	Productivity (tonne/ha)
Dong Thap	10.168,6	105.712,0	10,4	11.395	114.581	10,1
Tien Giang	4.255,0	101.842,4	23,9	5.934	91.748	23,3
An Giang	10.246,6	136.184,9	13,3	11.178	164.523	14,7
Vinh Long	4.899,0	59.257,1	12,1	5.045	65.164	12,9
Soc Trang	2.048,0	14.055,0	6,9	2.093	21.133	10,1

Source: GSO (2020)

### *Mango production in the project areas*

Tan Thuan Tay commune (Cao Lanh city) and My Xuong commune (Cao Lanh district) of Dong Thap province and Hoa Hung commune (Cai Be district) of Tien Giang have been selected to implement this project since 2018. Tan Thuan Tay commune's mango growing area is 491 hectares, whereas in My Xuong commune, this area is about 498 ha<sup>1</sup>. Cat Chu mango is the dominant variety in both communes, with an average yield of 7 to 8 tonnes/ha/year. According to the current situation survey, Hoa Hung commune (Tien Giang) has 658 hectares of mango, of which 601 hectares are Hoa Loc mangoes, 36 hectares of Taiwanese mangoes, 15.8 hectares of Cat Chu mangoes, and 10 hectares are other varieties. The area of mangoes has recently decreased as people have shifted to growing fruit trees with higher economic value, such as Thai jackfruit and longan.

<sup>1</sup> By October 2021.

**Table 2. Mango production in the project areas**

	<b>Tan Thuan Tay</b>	<b>My Xuong</b>	<b>Hoa Hung</b>
Total mango area (ha)	491	498	658
Area of VietGAP (Ha)	53	57.4	
Area with plantation code (Ha)	55	159.5	

Source: Commune's People Committees

Mango prices dropped sharply from the end of February to September last year due to COVID19, but the price of mangoes increased again at the time of our survey. Mangoes have been introduced, promoted, linked, and consumed by some mango cooperatives in the project area. Contracts were signed with MegaMarket, Hung Hau Company, Song Nhi Company, Ninh Kieu Can Tho Company, and Viettel Post, and mangoes were purchased for members at half the price of the previous year, ranging from VND7,000 to 10,000/kg.

## Appendix 2 – Interventional experiments

### General information

Due to operational reasons, the actual experiments differ slightly from the original intervention design (Table 3). However, this did not have a material impact on the impact assessment.

**Table 3. Basic information of households participating in the interventions**

Experiment	Household name	Mango area		Cultivar	Density m x m	Year of plantation
		Total area (ha)	Treated area			
Fertilising	Nguyen Van Mach	0.8	20 tree	Cat Chu	6 x 10	1994, 2000
	Le Thanh Tung	1.2	25 tree	Cat Chu, Cat Hoa Loc	8 x 8	2000
	Nguyen Van Thuc		20 tree	Cat Hoa Loc	6 x 7	2001
	Nguyen Van Tiep	0.6	20 tree	Cat Hoa Loc	8 x 8	2002
Flowering	Nguyen Van Chi	0.4	16 tree	Cat Chu, Taiwan	4 x 4	2003
	Nguyen Van Tiep	0.6	14 tree	Cat Hoa Loc	8 x 8	2002
Sap burn	Nguyen Van Mach			Cat Chu		
	Le Hoang Tung	0.8		Cat Chu	6 x 6	2000
	Nguyen Van Thuc			Cat Hoa Loc		

Source: Surveyed result, 2021

### Plantation

In general, the selected households in Tien Giang and Dong Thap are cultivating Cat Hoa Loc and Cat Chu mango varieties, grown in the years 2000, 2002, 2003. One family in Dong Thap, has been planting since 1994 (Mr. Mach). The majority of the households have pure plantations with common densities ranging from 8 m x 8 m to 6 m x 10 m, i.e. 100 to 120 trees per hectare for both mango varieties. Mr. Chi's household in Tan Thuan Tay, intercroops Cat Chu with Taiwanese mango variety at the density of 4 m x 4 m, which is quite thick. Most Dong Thap households plant in home gardens for easy tending, whereas Hoa Loc mango growers in Tien Giang have scattered gardens, with one a few kilometres away (Mr. Tiep, Mr. Thuc).

## Tending

Technical application	Description
Weeding	Weeding is carried out all year round, about 3 to 6 times/year, in the form of a mower. Households now no longer use herbicides that have an impact on the soil environment and living organisms.
Thinning	Usually, only once a year, at the beginning of the first crop, ie around May to June.
Watering	5 to 6 times/month, during the dry 5 to 6 month season.
Fertilising	Previously, households only focused on fertilising with inorganic fertilisers, but in the past 3 to 4 years, households have combined with organic fertilisers (Binh Duong elephant brand) or other organic fertilisers. Organic fertiliser is applied 6 to 9 times/year, or 2 to 3 times/crop (2.5kg/tree/time), and is often combined with Yara synthetic NPK inorganic fertiliser (20:20:10 or 20:20:15), with a dosage of 0.9kg/tree/time. For Hoa Loc mango, the amount is 2.5 kg/tree/time, 2 times/year. Dosage can be increased or decreased depending on the size of the canopy or the age of the tree. Synthetic NPK is often applied to further support fruit setting and development. Fertilisation is very dependent on each household's experience and even household financial condition.
Planting diseasing treating	To control for pests and diseases on flowers, young leaves, and mango fruit in their young fruit stage. Common chemicals are Ridomin, Zinep, Zithan, Antrecol, Amabamety, Metalaxyl. The frequency of spraying depends on the occurrence of epidemics and the weather. More applications in the rainy season.
Flowering stimulating	Flowering treatments have now become popular among mango growers. The popular substances are Uniconazole (UCZ), prohexadione-calcium - PC (growth regulator to promote plant growth and lateral shoot development through foliar treatment, regulating flowering period). From the time of spraying to stimulate flowering to the time of flower buds, it takes 10 to 15 days. Commonly used flowering stimulants are KNO <sub>3</sub> , Dollar, Forfer, F94. In addition, people also spray fertiliser through the leaves. The most commonly used is Boom Flower-n.
Fruit developing	This is a relatively new and popular method for supplementing nutrition and increasing the size of the fruit. In addition to PBZ, there are many other types of PBZ on the market, such as Hai-Pb Calcium Nitrare and Hai Chyoda.
Fruit covering	Fruit covering has become a popular technique in recent times to create uniform fruits, beautiful colors, limit stinging pests, and reduce harvest loss. For Cat Chu mango, the fruit bag can be reused, but the paper bag for Hoa Loc mango can only be used once.

## Harvesting

Cat Chu mango harvests three times per year, one main crop and two off-seasonal crops, which is different from Cat Hoa Loc cultivar, only two harvests per year (see calendar in Table 3). Both the experimental and traditional cultivated mangoes were harvested in the same manner, with pickers, ladders, and plastic baskets and trolleys transported from the garden to the house before sorting and cleaning. Morning is the most common time for harvesting (also applied for sap burn intervention). Pricing is made by local trader first, then households make several checking with sold mango of their neighbours to make negotiate and make final decision.

**Table 4. Seasonal calendar of mango production**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
		Third harvest 3 (Main season)			First harvest (Off-season)				Second harvest (Off-season)				
<b>Cat Chu mango</b>	<b>Farm: Tran Van Mach, Nguyen Van Chi</b>												
Technical measure	Fertilising Organic: 6 times, 5kg/time/tree (Binh Duong Elephant) NPK:		time 6		time 1		time 2		time 3		time 4		time 5
	Thinning: 3 times/year												
	Weeding (6 to 8 times/year)												
	Watering												
	Plant disease applying												
	Flowering stimulating												
	Fruit development stimulating												
Harvesting													
<b>Cat Hoa Loc mango</b>	<b>Farm: Nguyen Van Thuc, Nguyen Van Tiep</b>												
Technical measure	Fertilising: - Organic - NPK					Organic				Organic			
	Thinning (once, in April or May)												
	Weeding (4 to 6 times/year)												
	Watering (4 to 5 times/month in dry season)												
	Plant disease applying												
	Flowering stimulating (every 3 days)												
	Fruit development stimulating (every 5 days)												
Harvesting													

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## Appendix 3 – Checklist for collecting information for impact assessment

*ACIAR project*

*“Improving smallholder farmer incomes through strategic market development in mango supply chains in Southern Vietnam”*

### CHECKLIST

Intervention feasibility analysis and validation study

**Date of interview:**

**Interview team:**

**Name of Household HEAD:**

**Name of the interviewee and relation to household head:**

**Address:**

**Farm code (location, team, farm):**

**Major productions:**

**I. General information: (this part applied for 3 experiments)**

1. How many hectares of mango do you currently have? .....

2. When did you planted your mango garden? .....

So the current age would be .....(N) Are there any difference of age classes of your mango garden? .....

If YES, what are the other age classes?.....

3. What is the density that you planted? .....

What was the successful rate that leads to stable growth after planting? .....

4. What is the name of seedling (cultivar) that you are planting? .....

Are they homogenous or did you intercrop with other cultivars?

.....

**II. Inputs: (this part applied for 3 experiments)**

5. What kind of fertiliser and chemical inputs that you invested before the intervention for your mango garden?

Type of fertiliser	Kilograms	Unit cost (VND/kg)	Total amount (kg)	Total (VND)
N				
P				
K				
Ca				
Other				
Total for fertiliser				
Pesticides				
Herbicides				
Flowering stimulus				
Total				

6. What kind of other inputs in addition to fertiliser and chemical that you invested before the intervention for your mango garden?

Type of inputs	Material cost	Labour Cost		Total VND
		Unit (VND/day)	No. of days	
Fertiliser	Already asked			
Pesticide				
Herbicide				
Flowering stimulus				
Weeding				
Thinning + Pruning				
Watering				
Fruits cover				
Harvesting				



7. What kind of fertiliser and chemical inputs that you invested after the intervention for your mango garden?

Type of fertiliser	Kilograms	Unit cost (VND/kg)	Total amount (kg)	Total (VND)
N				
P				
K				
Ca				
Other				
Total for fertiliser				
Pesticides				
Herbicides				
Flowering stimulus				
Total				

8. What kind of other inputs in addition to fertiliser and chemical that you invested before the intervention for your mango garden?

Type of inputs	Material cost	Labour Cost		Total VND
		Unit (VND/day)	No. of days	
Fertiliser	Already asked			
Pesticide				
Herbicide				
Flowering stimulus				
Weeding				
Thinning + Pruning				
Watering				
Fruits cover				
Harvesting				

Extra questions for fertilising experiments:

9. Do you think the conventional fertiliser application before applying the intervention is appropriate? .....

Why .....

10. Do you think it is wasted/unnecessary to keep the conventional fertilising? .....

Why.....

11. Do you think we should reduce the amounts of fertiliser? ..... If yes.....

Why.....

12. What kind of fertiliser can be reduced without having impact on fruit quality and quantity?

.....  
.....

13. How much do you save/spend more from decreasing/increasing the amount of each fertiliser of the intervention to compare with the conventional fertilising formula?

N .....

P.....

K.....,

Others.....

**III. Process changes: (this part applied for 2 experiments of SOFRI)**

14. What do you observe/to what extents about the process changes when applying SOFRI's fertilising/flowering?

a. Dormancy.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

b. Flowering.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

c. Fruit development.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

d. Harvesting.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

Do you think the harvest time is different from the conventional one?.....If YES, sooner or later.....

Why do you think that the harvest is sooner or later.....

e. Others (may be some change in the fruiting period, longer or faster).....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

**IV. Output: (this part applied for 2 experiments of SOFRI)**

**15.** Do you observe that the following change due to SOFRI's experiment?

a. Yield of mango.....

How.....Increase/Decrease.....To what extent.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

b. Size of mango.....

How.....Increase/Decrease/Stay the same.....To what extent.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

c. Colour of mango.....

How.....Look nicer.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

**16.** How did you sell your mango coming from the SOFRI's experiment? .....

As normal as the conventional cultivation? Easier/more difficult.....

Why.....

Higher/lower prices?.....

Why.....

Do you think this is due to SOFRI experiment (and why?).....

**For sap burn experiment**

17. How the fruits look like after the treatment? Is sap still comes out from stalk?

.....

Why do you think so.....

Do you think this is resulted from the treatment by SIAP? And why?.....

18. Did you sell treated mango easier/more difficult?

.....

.....

19. Did you sell the treated mango with higher/lower price?

.....

.....

**V. Applying the intervention: (this part applied for 3 experiments of SOFRI)**

20. You agreed to participate in the intervention, why do you think (the intuition behind) this intervention is important for mango farmers like yours?

.....

.....

21. What are the strengths and pitfalls (weaknesses) of this intervention?

Strengths.....

Why? .....

Weaknesses.....

Why? .....

**22. Do you think that this experiment is easy/difficult/risky to implement?**

Easy.....

Why?.....

Difficult .....

Why? .....

Risky .....

Why? .....

**23. How do you rate the level of success of this experiment (from 1 to 100% successfulness)?**

Why.....

**24. Do you believe if correctly applied, the intervention will generate positive impact to the farm?**

Yes.....

Why and to what extent?.....

No.....

Why and to what extent?.....

**25. Will you continue this experiment in the future?**

Yes.....

Why? .....

No.....

Why? .....

**26. Can you do it yourself for the next rotation?**

.....

.....

If you can not do it, why?

.....

In case you want to do the experiment again, but you can not implement, what kind of support is needed?

.....

.....


1. Financial supports
2. Technical supports
3. Market Access
4. Community support
5. Other (specify)

**27.** Is this experiment suitable to your family condition (Labour, financial, accumulation..)

.....

.....

**28.** Do you think you learn tremendously (household capacity improved) after involving in this intervention?

If yes, to what extent? .....

Any specific skill/knowledge that you mastered .....

**29.** Do you think the bargaining power of your family overall improved because of involvement in this experiment?.....

.....

To what extent? (Not at all, not much, relatively, very much).....

**30.** Are you willing to introduce this intervention to other households in the region?.....

Why.....

**Part 5: House income (For all interventions)**

Ask the following questions:

	31. Cost reduction / increase / stay the same (due to decreased costs of fertiliser and time) = A	32. Yield increase / decrease / stay the same = B	Overall income gain/loose/stay the same =A+B
<b>Increase</b>			
<b>To what extent?</b>			
<b>Why?</b>			
<b>Decrease</b>			
<b>To what extent?</b>			
<b>Why?</b>			
<b>Stay the same</b>			
<b>To what extent?</b>			
<b>Why?</b>			

33. What is your expected income change if the intervention produce the intended outcome?

.....  
 .....

34. Do you think you are overall satisfied with this intervention?

Satisfy.....to what extend? .....

Why?.....

Not satisfy.....to what extend? .....

Why?.....

Other thinking?.....

**Question for sap burn experiment:**

*You know that sap burn intervention might result in higher mango price to do reducing transportation and storing losses, mango can be kept longer in car/train or supermarkets, with these advantages:*

**35.** Do you think that you can sell mango with higher prices?

If Yes, why.....

And to what extent should you sell higher?.....

If No, why.....

**36.** With this intervention, do you think that you can enhance your bargaining power to get higher prices?

If Yes, why.....

If No, why.....