



Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam

AGB/2012/061

Activity 1.3 Flowering

Nguyen Van Son
SOFRI

15 October 2019

Implementing Agency



SIAEP



Funding Agency



Australian Government
Australian Centre for
International Agricultural Research

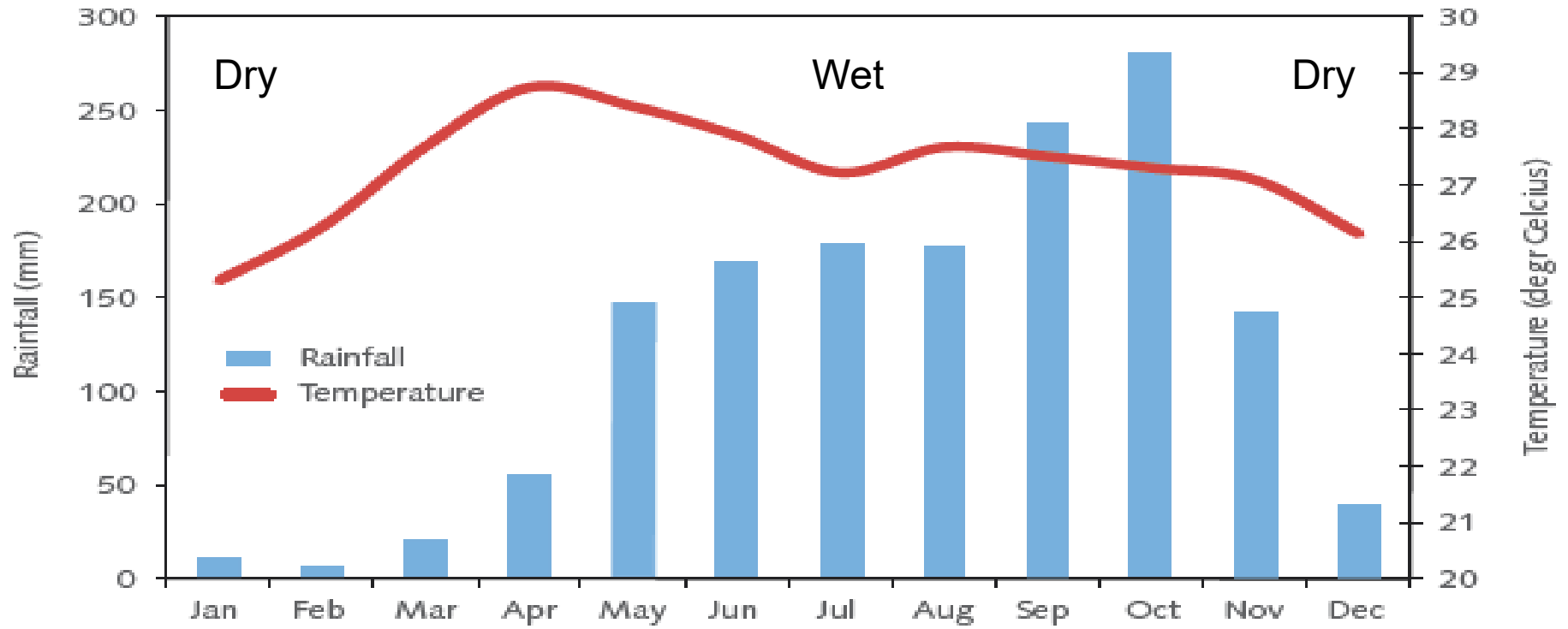
Aim and purpose

- ▶ Understand current seasonal flowering, and on-farm production practices and issues
- ▶ The mango industry in southern Vietnam was segmented into the major production regions
- ▶ Semi-structured interviews with 20 farmers in 2 provinces: Tien Giang and Dong Thap
- ▶ Questions developed in workshop March 2019
- ▶ Interviews conducted June-August 2019
- ▶ First year report 30 October 2019



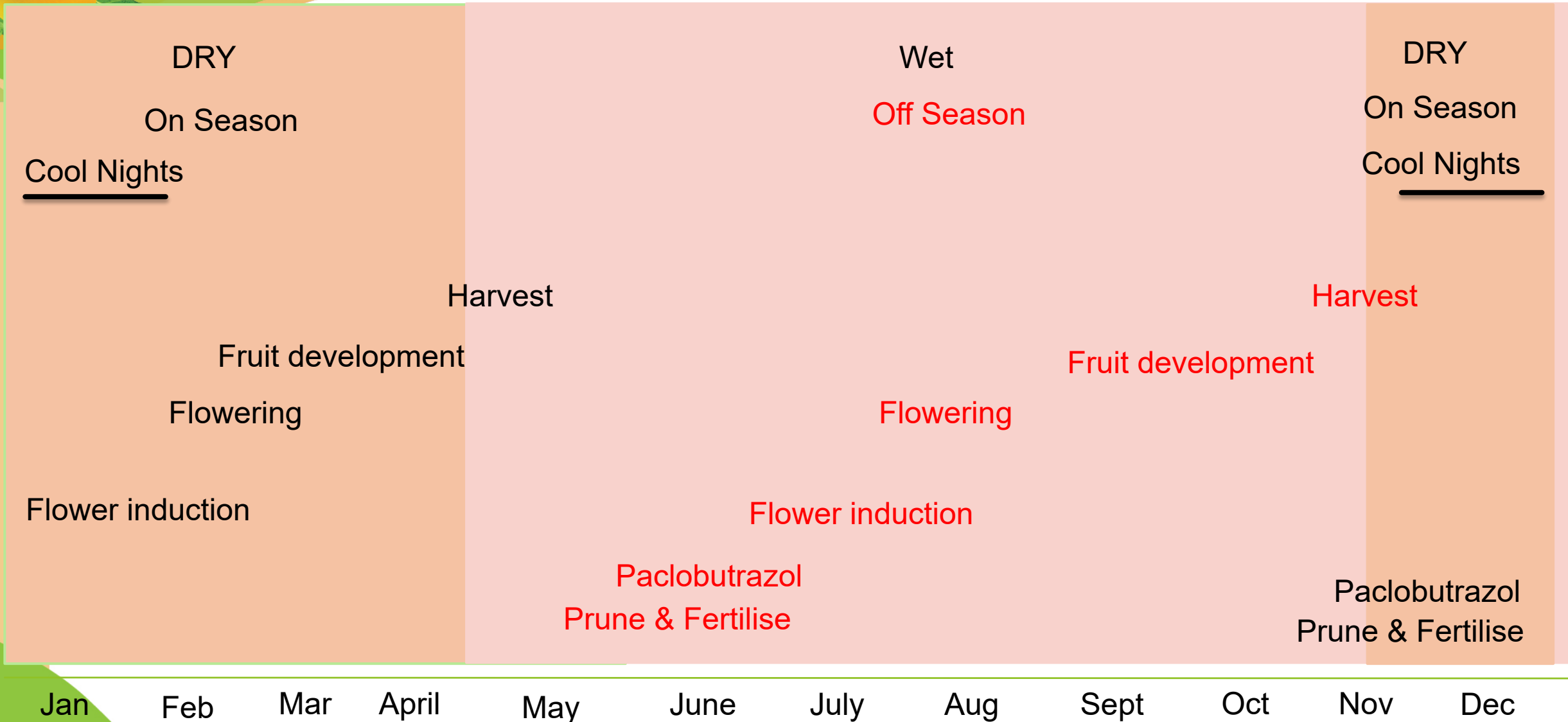


Mean monthly maximum temperature & rainfall Ho Chi Minh City



Source: Khoa, N.V., Thao, N.C. and van der Geest, K. (2012). "Where the Rain Falls"

Mango production system, Dong Thap & Tien Giang





Summary of surveyed orchards

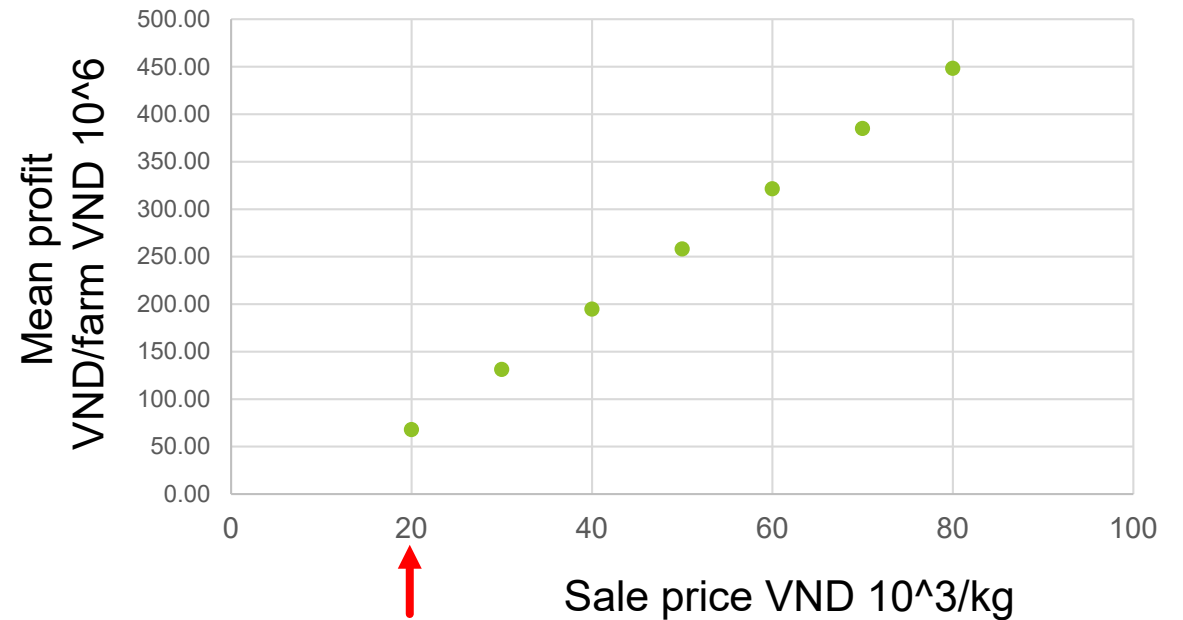
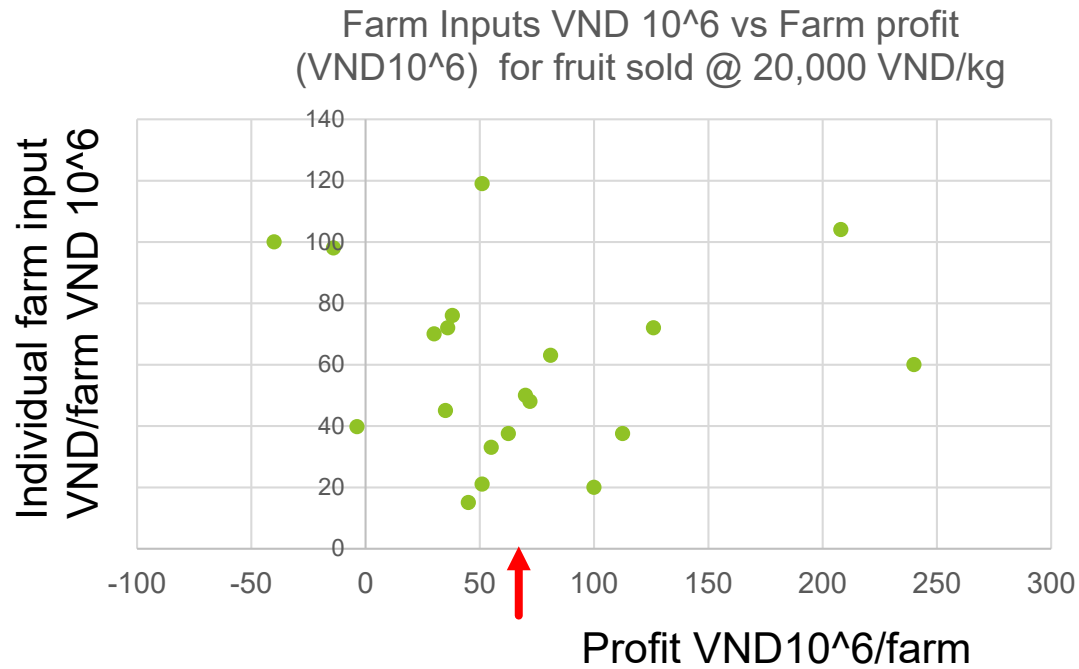
	Mean farm size (ha)	Mean number of trees farm ⁻¹	Mean tree planting density (trees ha ⁻¹)	Mean yield (t ha ⁻¹)	Orchard age (years)	Number of orchards surveyed with grafted trees
Tien Giang	0.7	111.8	150.4	9.3	20.35	1:20
Dong Thap	2.9	780.2	336.7	16.6	15.4	7:20

Source: Team analysis

Notes: n=20; Provinces= Tien Giang, Dong Thap



Tien Giang profit derived from VND inputs, yield & farmgate sales



Source: Team analysis
Notes: n=20



Mango fertiliser requirements

Nutrient required per ton of mangoes (kg)		Amount required to compensate for crop and losses per ton (kg)
Nitrogen (N)	0.845	1.77
Phosphorus (P)	0.180	0.45
Potassium (K)	1.285	2.83
Calcium (Ca)	1.15	1.61

*Source: Winston Tropical Horticulture Services
Note: Based on Australian requirements*



Common nutrient loss estimates

N	30-50% - leaching or volatilisation
P	50-100% - by fixation
K & Mg	20-30% by leaching
Ca & S	5-20% by erosion and run off
B	up to 60% by leaching

*Source: Winston Tropical Horticulture Services
Notes: Based on Australian requirements*



Excessive levels of nutrition

	Mean N kg/ha	Mean P kg/ha	Mean K kg/ha	Mean N removed by fruit kg/ha	Mean K removed by fruit kg/ha	Mean K removed by Fruit kg/ha	Mean kg/ha N to replace crop and losses	Mean kg/ha P to replace crop and losses	Mean kg/ha K to replace crop and losses	Times excess N applied	Times excess P applied	Times excess K applied
Tien Giang	186.0	117.7	142.2	7.9	1.7	12.0	16.5	4.2	26.3	12.5	32.6	6.3
Dong Thap	162.1	134.7	157.5	14.1	3.0	21.4	29.5	7.5	47.0	6.1	22.1	4.1

- Only 6 farms in Dong Thap recorded application of Lime (Ca)
- Only 6 farms in Tien Giang recorded applying Ca Bo (Ca & B)
- No farms recorded application of Mg

Source: Team analysis



Excessive N or wrong timing - negative effects

Early fruit set

direct Ca from fruit to leaves (leaves are bigger sink)

Pre-harvest

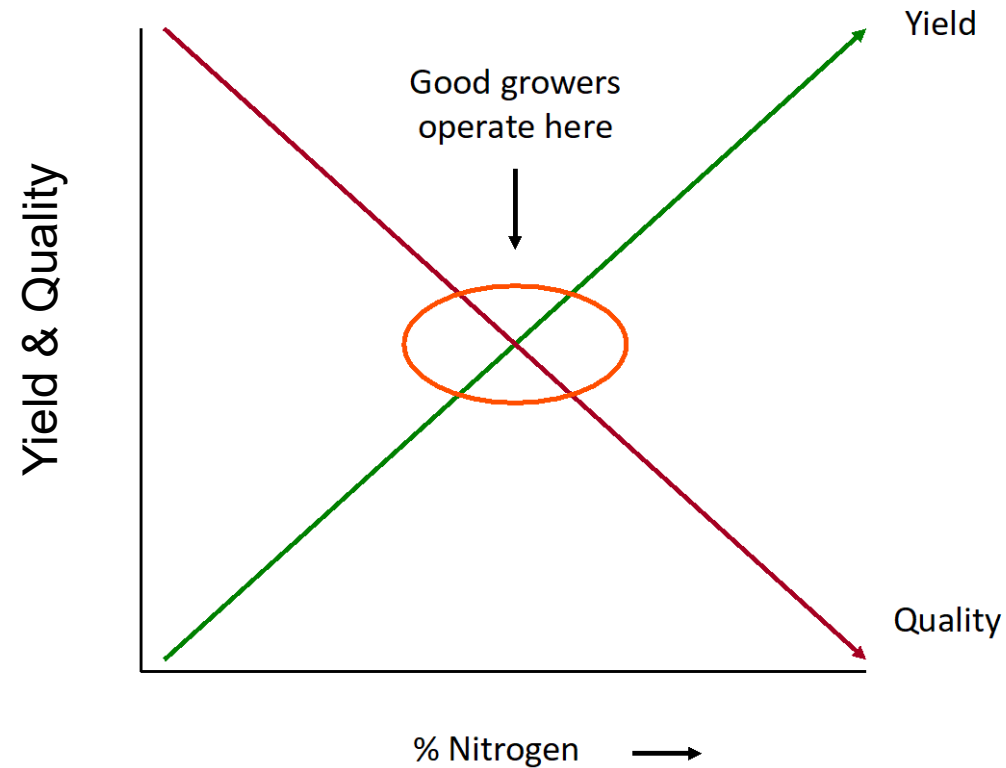
- excessive leaf growth – lowers K concentration

Post-harvest

- green, ripe fruit
- less blush
- softer fruit
- increased postharvest rots
- increased internal disorders (jelly seed, stem-end cavity, soft nose)

The nitrogen relationship

What is the relationship for Cat Hoa Loc in Vietnam?



© State of Queensland 2015

Department of Agriculture and Fisheries

Source: Winston, T 2012 Tropical Horticultural consulting



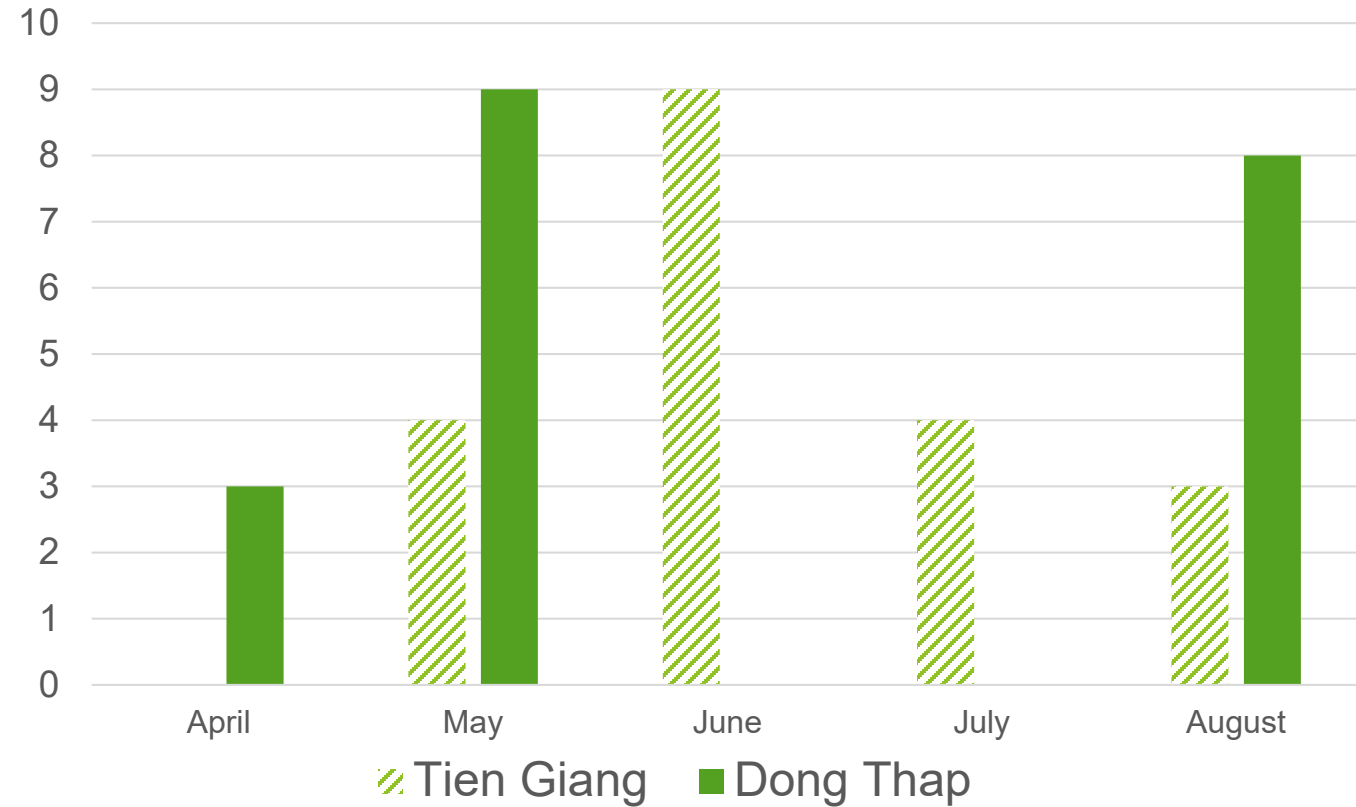
Timing of panicle bagging to stop fruit flies & # pesticide sprays

Is this due to rain and/or fertiliser levels?

	Mean number of days after flowering till bagging	Mean number of pesticide sprays days from pre flowering till bagging	Range
Tien Giang	40.26	7.8	5 - 12
Dong Thap	44.28	7.8	4 - 13

Source: Team analysis

Number of growers/month, 2019, applying paclobutrazol



Source: Team analysis



Paclobutrazol application

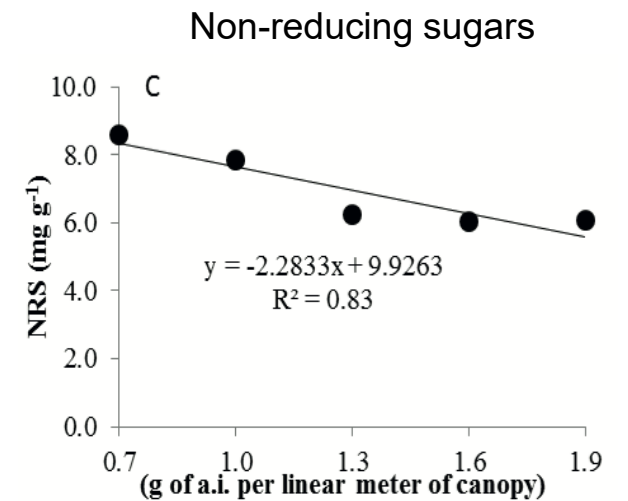
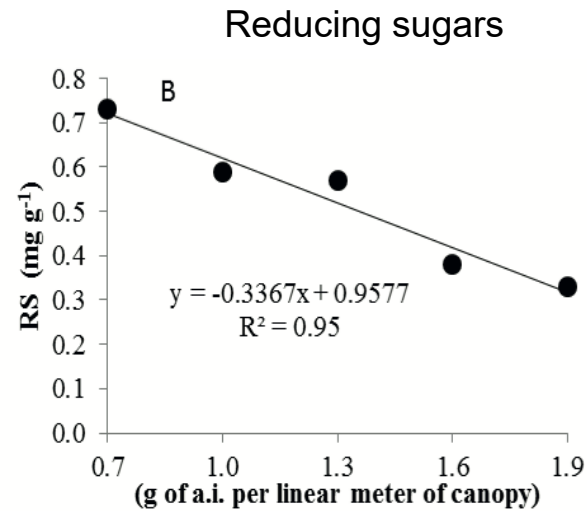
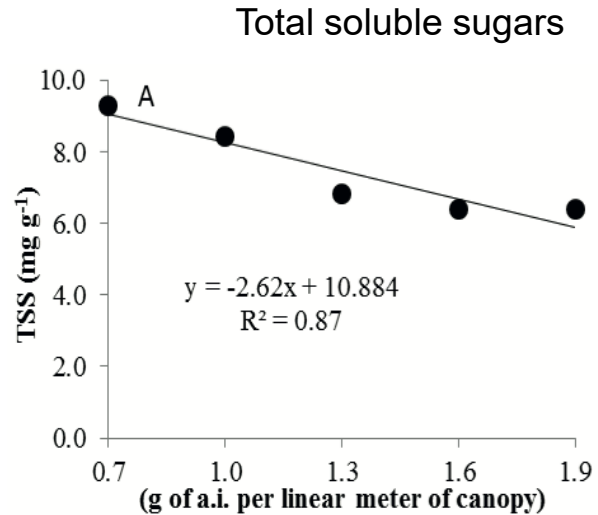
	PBZ applied per tree (g)		Amount of PBZ applied relative to recommended 5g/tree			
	@15%	@20%	@ 15%	Range	@20%	Range
Tien Giang	19.0	25.0	3.8	1.5 - 6.0	5.0	2.0 - 8.0
Dong Thap	13.3	17.7	2.7	0.5 -7.5	3.5	0.7 - 10

Maximum per tree: 16 to 20mL @ 25% active or 5g per tree

Source: Team analysis



Effects of paclobutrazol on Brazilian Palmer mangoes



Paclobutrazol

- Reduces the rate of photosynthesis
- Lowers fruit sugar content
- Inhibits root growth
- Modifies nutrient uptake

Source: Souza et al 2016 *Physiological and biochemical characterization of mango tree with paclobutrazol application via irrigation* *Pesq. Agropec. Trop., Goiânia, v. 46, n. 4, p. 442-449, Oct./Dec. 2016*



Mango fruit quality

Could plant growth regulators be used to improve fruit size (CPPU)?

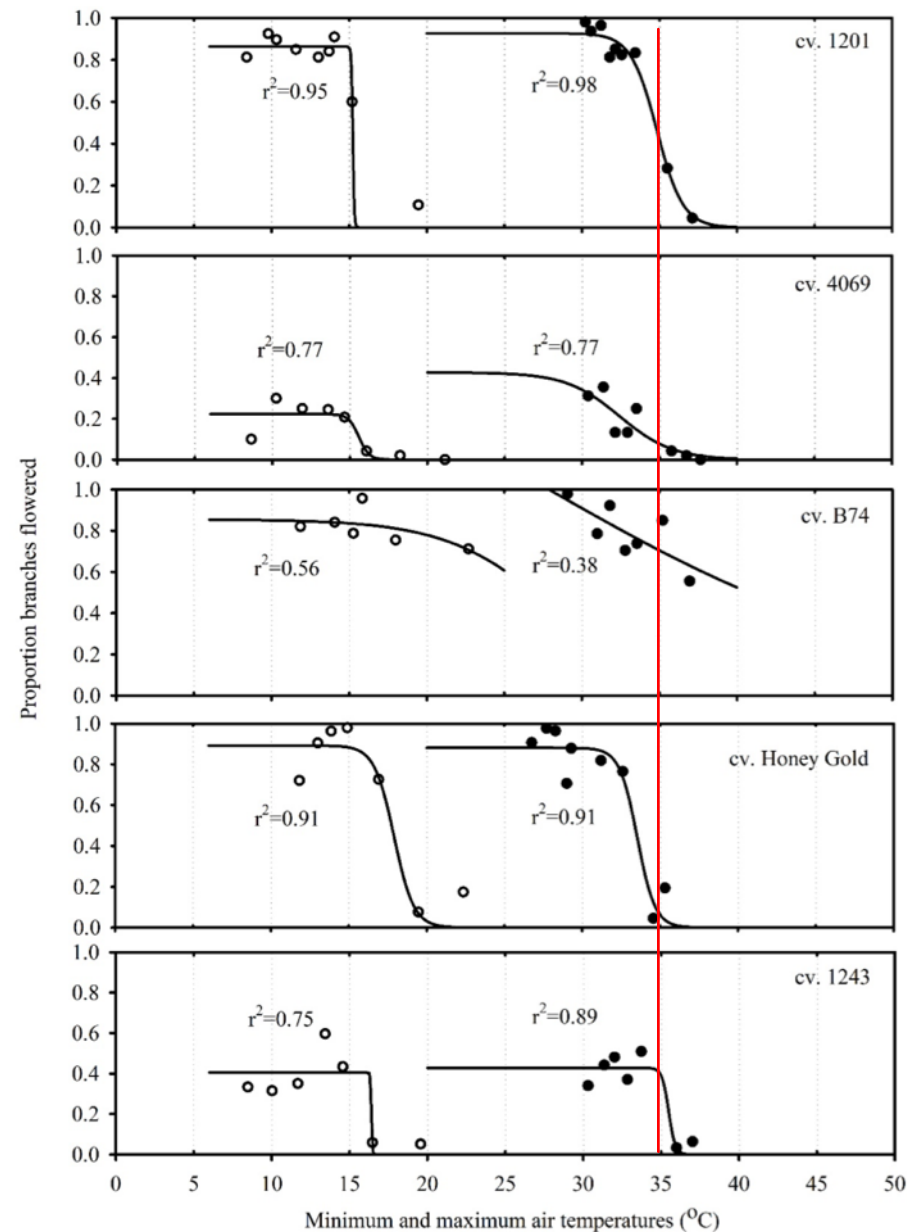
	Grade 1	Grade 2	Grade 3
Size	>400-500g	<400 but >300	<300
Rot	none	none	some



35°C is a problem for flowering in some mango cultivars

Regression of proportion of branches flowered across average daily maximum temperature & sum of hours above 34 °C for 9 day integration period.

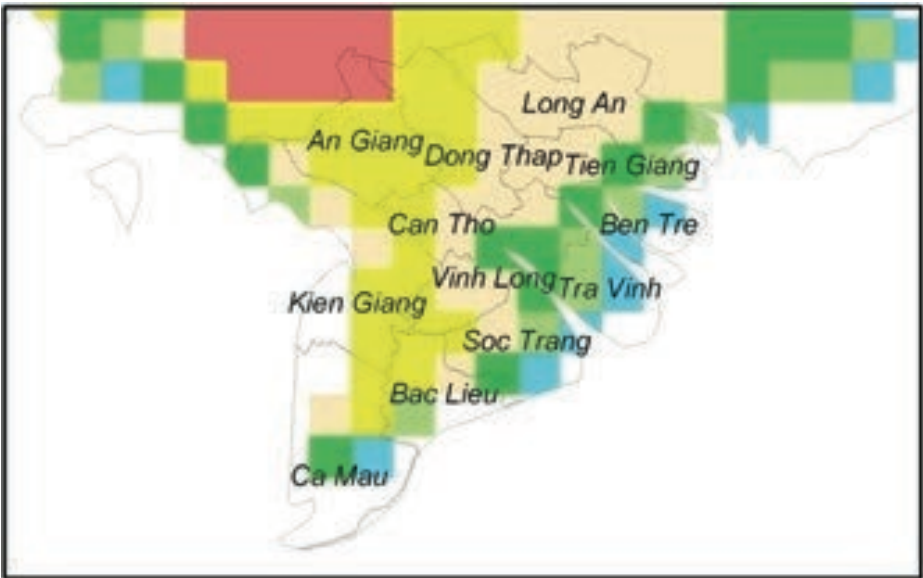
Source: Clonan et al., work in progress



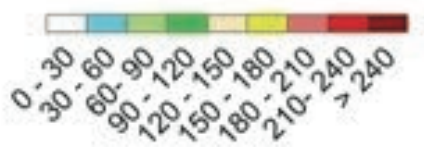


Projected Days >35°C for Tien Giang & Dong Thap

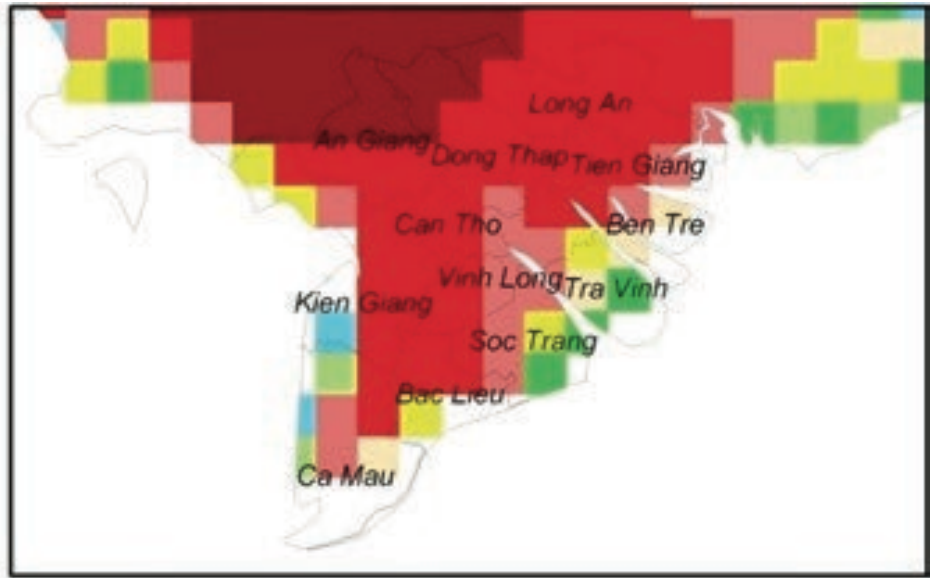
Can thiourea still work?



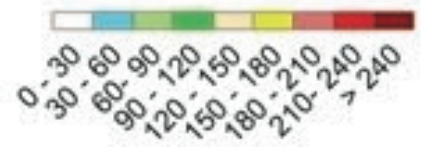
Hot (> 35°C) days per annum



1980s



Hot (> 35°C) days per annum



2030s

Tuan, L. A and S. Chinvano, S. 2011 Climate change in the Mekong river delta and key concerns on future climate threats. *In Advances in Global Change Reseach* Chapter.207-217.



Future areas of research

- ▶ Improved fertiliser management
- ▶ Use of GA and CPPU to increase fruit quality
- ▶ Prohexadione-calcium as an alternative to paclobutrazol
- ▶ Temperature limits for off-season flowering