



EFICAS project

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Improving Cardamom production through the spraying of sugar-rich solutions at Cardamom flowering stage

EFICAS workshop, Monday, March 27th 2017, Luang Prabang

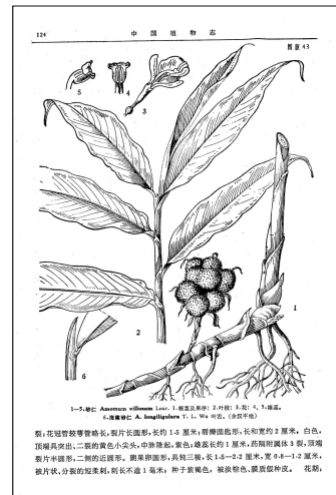
Outline

- Understanding **Cardamom boom** in northern Laos
- Cardamom **productivity variability**: a key issue towards regular income and improved livelihoods
- **On-farm experiments** to improve Cardamom fructification (2015 – 2016)
- **Prospects** for 2017



Cardamom (*Amomum spp.*)

- Cardamom is a non-ligneous perennial plant of the *Zingiberaceae* (ginger)
- Wild cardamom grows naturally under the cover of forest canopy at elevations upwards of 700 m asl on the banks of flowing water where humidity is high
- In China, use of medicinal cardamom goes back 1300 years. It is used as a main component to treat stomach-aches, constipation and other digestion problems.
- 82% is Guangdong variety. Other cheap varieties are used for cuisine (spice)
- In Phongsaly province, cardamom cultivation started in early 1980s. Three main varieties: Guangdong, Paksong and wild. (Boupha, 2015)

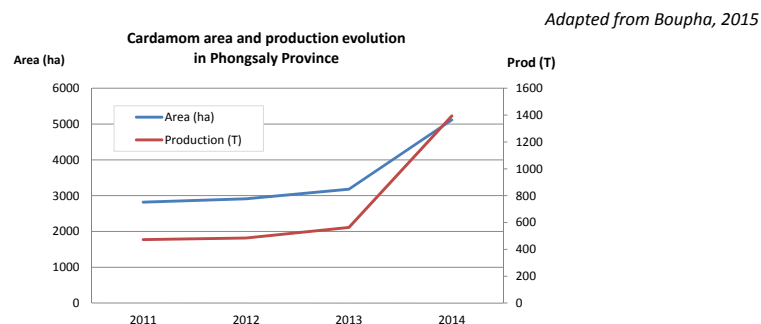


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Cardamom boom

- Increase in surface and production in PGY province



- About 18,000 HHs and 5,200 ha in 2014 in PGY province
- About 10,000 ha in Laos in 2013



Cardamom boom

- Cardamom status in EFICAS project villages (2016)

	Village	Nb HHs	% of total HHs	Area (ha)
Mai district	nakham	11	27%	4,9
	huayvangkao	12	27%	4,4
	phia	35	74%	25,4
	ngakha	18	43%	7,0
Samphan district	mokpha	64	100%	84,5
	axer	75	100%	92,7
	phialuang	35	100%	32,5
	sanamha	36	95%	60,6
	TOTAL	286	74%	312,0

Understanding cardamom boom

- Demand vs offer (Boupha, 2015)

Demand and supply of medicinal cardamom in China

	2010	2011	2012	2013	2014
Supply	2,513	2,750	2,966	3,167	3,312
Demand	2,952	3,202	3,498	3,767	3,916
Under-supply	439	452	532	600	604

- Chinese production decreased by 40% in past 10 years due to rubber and banana plantations.
- In some areas cardamom can no longer be cultivated as environmental conditions have been altered

Understanding cardamom boom

- Price
 - Farm-gate price for dry Guangdong cardamom increased from about 100,000 LAK/kg in 2011, to about 450,000 LAK/kg in 2014 down to **380,000 LAK/kg in 2016**
- Demand/offer forecast (Boupha, 2015)

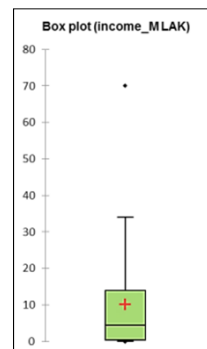
Projection of market trend in China

	2015	2016	2017	2018	2019
Supply	3,525	3,733	3,944	4,180	4,425
Demand	4,142	4,382	4,609	4,866	5,135
Under-supply	617	649	665	686	710

Understanding cardamom boom

- Income
 - In 2014, value of cardamom production was estimated at 40M USD
 - Main driver of target villages development in Samphan district
 - Mean income of 10,1 M LAK/HH/year

Village	Income (M LAK)
nakhm	3
huayvangkao	5
phia	32
ngakha	9
mokpha	1 312
axer	470
phialuang	425
sanamha	617
TOTAL	2 874



Understanding cardamom boom

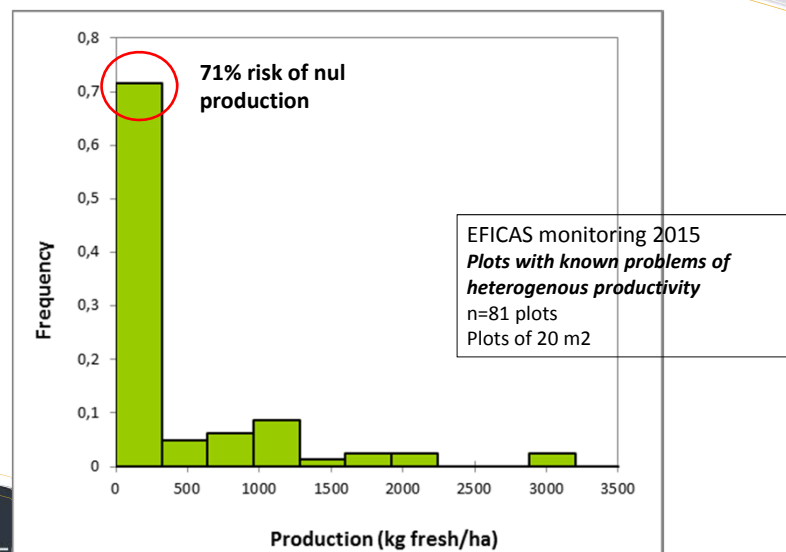
- Labour requirements
 - limited as compared to other traditional crops

Labor requirements	Mean	Min-Max
Job's tear	124	(43 - 246)
Maize	129	(86 - 246)
Paddy rice	151	(58 - 215)
Upland rice	207	(89 - 346)
Cardamom	57	(32 - 86)

- limited competition in time with other farming activities
 - Slashing in Feb, before S&B and main crops sowing (April-May)
 - Harvest in August, after main crop sowing



Cardamom productivity variability



Cardamom productivity variability

- « Environmental » factors affecting productivity

Factor	Some environmental conditions for Guangdong cardamom cultivation
Temperature	The best average temperature is 22-28°C. During flowering stage, if temperature difference between day and night is too high, flowers will be affected. The most suitable temperature is about 24°C .
Shading	In year 2, Guangdong cardamom requires about 60-70% shading , and after that about 50-60% is most suitable for flowering and producing fruits.
Humidity	Soil moisture content and air humidity influence cardamom's growth. During flowering and producing fruits stage, requirement of soil moisture content is about 25% , and air humidity is about 90% .
Elevation	Best suited to elevations of 500-1,100 m asl
Slope	Best suited to slope of about 15-30 degrees
Sun orientation	Best suited to fields south or southeast- sun oriented
Soil fertility	Cardamom does not require very fertile soil but thick, loose biomass and high water retention .

Adapted from Boupha, 2015



Cardamom productivity variability

- « Time » factors affecting productivity
 - Plantation age (best 4 to 6 years old)
 - 1 year on 2 ? (*M. Khamson Sisanhouth*)
- Other factors
 - Sowing density (best spacing 10,000-15,000 seedlings/ha)
 - ***Environmental conditions impacting cardamom effective pollination*** by insects (NUDP, 2015)



On-farm experiments to improve Cardamom pollination hence fructification (2015 – 2016)

• 2015

- Assessment of alternative clearing methods impact on pollination
- 3 treatments tested:
 - Treatment 1: no leaf clearing in April
 - Treatment 2: leaf clearing (conventional system)
 - Treatment 3: leaf clearing + rhizome slight removal from soil

Clearing treatment	Obs	Mean yield (kg fresh/ha)	Group
No leaf clearing	27	399	A
Leaf clearing (conv)	27	444	A
Leaf + stolon clearing	27	413	A

No statistical difference



On-farm experiments to improve Cardamom pollination hence fructification (2015 – 2016)

• 2016

- Assessment of the impact of sugar-rich treatment at cardamom flowering stage impact on pollination
- 3 treatments tested (3 villages, 6 replicates/village, plot of 500 m2) :
 - Treatment 1: no spraying (control)
 - Treatment 2: spraying at 25-30 % flowering stage with honey-rich solution (1% concentration: 150 ml of honey into 15L water)
 - Treatment 3: spraying at 25-30 % flowering stage with sugar-rich solution (6,7% concentration: 1 kg of sugar into 15L water)

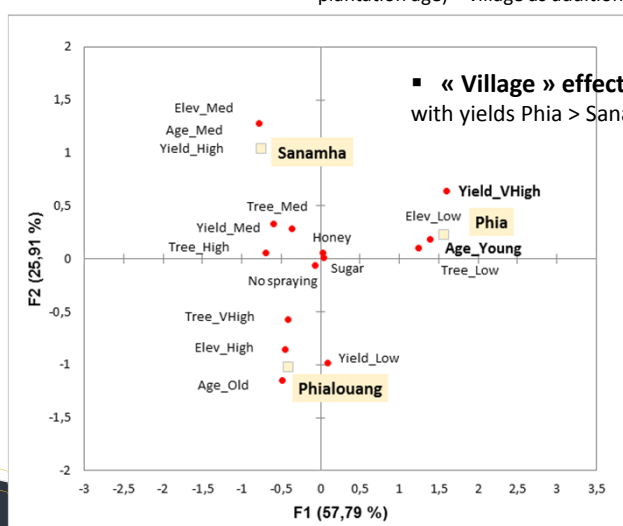
Treatment	Price (LAK/ kg)	Qty / 15L (sprayer)	Price per sprayer (LAK)
Sugar	8,000	1 kg	8,000
Honey	60,000	150 mL	9,000





Main results (2016)

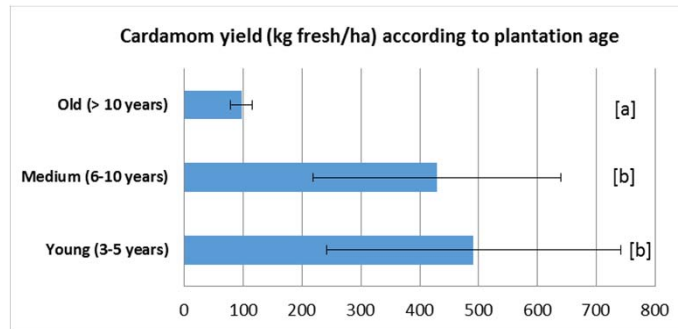
Multiple correspondence analysis (MCA)
On 5 variables (yield, treatment, tree dens, elevation, plantation age) + village as additional variable



Main results (2016)

▪ « Cardamom plantation age » effect

with yields of young and medium age plantation (< 10 years) > old plantation (> 10 years)

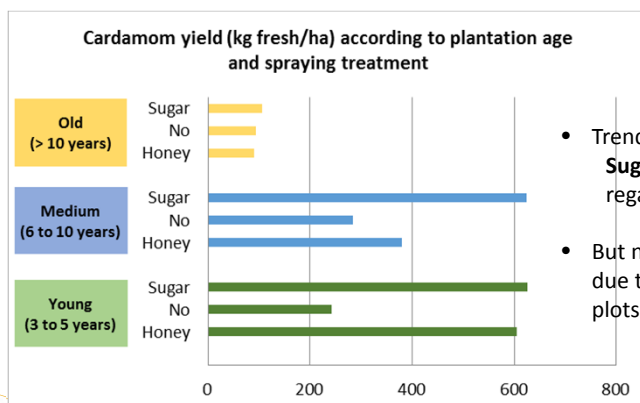


Letters between brackets indicate significant differences according to Kruskal-Wallis test ($P < 0.05$), Bonferroni correction.



Main results (2016)

▪ Effect of sugar-based treatment?



- Trend yields:
Sugar > Honey > No spraying regardless of plantation age
- But no statistical differences due to high intra and inter plots variability



Prospects for 2017

- **High interest** from farmers to test sugar-based treatment (> 50 HHs in 3 villages?)
- **On-farm experiments** conducted to test sugar best dilution (1 kg vs 0,5 kg/ 15L-sprayer; 6,7 vs 3,2% sugar concentration)
- **Drudgery** of spraying operation in Cardamom plantation with traditional backnap sprayer: introduction of new sprayer (battery-based constant pressure) to assess impact on spraying chore
- Invest in **drying oven** to improve quality (decreased spoiling and mould)



Thank you for your attention!

For more information:

www.eficas-laos.net



Eco-Friendly Intensification and Climate resilient Agricultural Systems (EFICAS)