



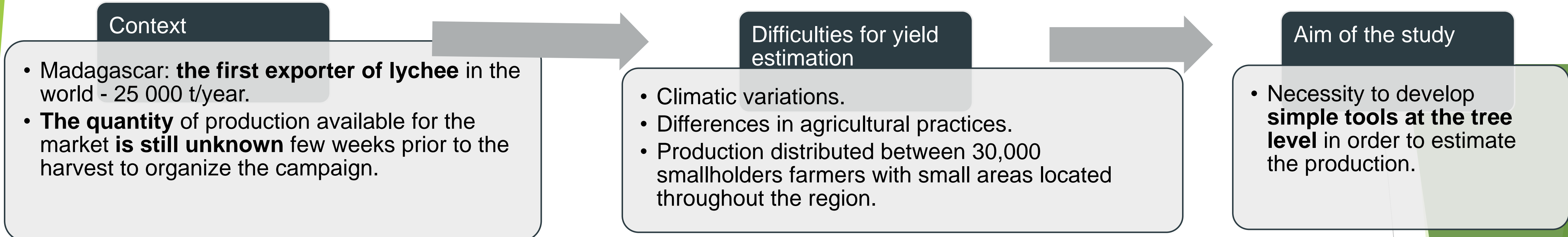
Estimation of fruit tree production by quantitative indicators: the case of lychee in Madagascar

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INTRODUCTION



MATERIALS AND METHODS

Lychee chinensis Sonn - Kwai Mee 12 to 60 years	Madagascar Toamasina 18° 3'34.18"S 49°24'3.33"E	Estimation from: Physical and fructification characteristics of the tree Canopy image analysis
2015: 30 trees 2016: 35 trees Heterogeneity of size		Analysis with R software – Linear regression

RESULTS

TREE PHYSICAL AND FRUCTIFICATION CHARACTERISTICS

Fruit load rate

Tree production depends on both i) tree size that represents a potential for production and ii) the flowering rate and the fruit load rate of the tree.
In order to achieve more accuracy, the load rate observed was used with the canopy volume in order to estimate the production.

IMAGE ANALYSIS

Pictures of two opposed sides

Red pixels (Color of fruits)

Estimate number of fruits

	Tree production (1 – 859.8 Kg)	Canopy height (2.4 – 11.6 m)	Canopy diameter (3.9 – 14.1 m)	Canopy volume (20.6 – 1207 m3)	Basal trunk diameter (0.15 – 1.38m)	DBH (0.06 – 1.19m)	Estimated number of bunches	Real number of bunches (14 – 1170)
r ²	0.56	0.53	0.8	0.89	0.85	0.9	0.92	
RMSE (Kg)	87.53	95.46	63.23	62.88	43.6	43.63	37.87	
linear equation	y = 22.26x (1)	Y = 14.49x(4)	y = 0.57x(5)	y = 397.4x(2)	y = 650x(3)	y = 0.2664x (6)	y = 0.1878x (7)	

	Canopy volume x load rate		Canopy volume (CV) + load rate (LR)	
Tree production	n= 65	n=64 (without the biggest tree)	n= 65	n=64
R ²	0.87	0.91	0.84	0.9
RMSE (n=65)	51.55	121.8	45.37	56.92
RMSE (n=64)	49.51	27.58	37.29	28.84
The linear equation	1.21x (8)	y = 2.23x (9)	0.48CV +1.02LR (10)	0.32CV +1.14LR (11)

CONCLUSION

Structure variables

- particularly effective when completed with a fruit load rate estimation
- Subjective estimations of the load rate

Bunch count

- increase accuracy
- time consuming

Image analysis

- most convenient tool
- allows faster estimation
- more objectivity

- The fruit production of a lychee tree could be estimated using **simple techniques**.
- Helpful to **forecast the available production** for the market for a better organization of the campaign.
- Supplementary information needed: the lychee tree distribution on plots over the production area (not yet been available in Madagascar).

