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AFS4Food
Agroforestry for food security

Clove based systems and food security in Madagascar

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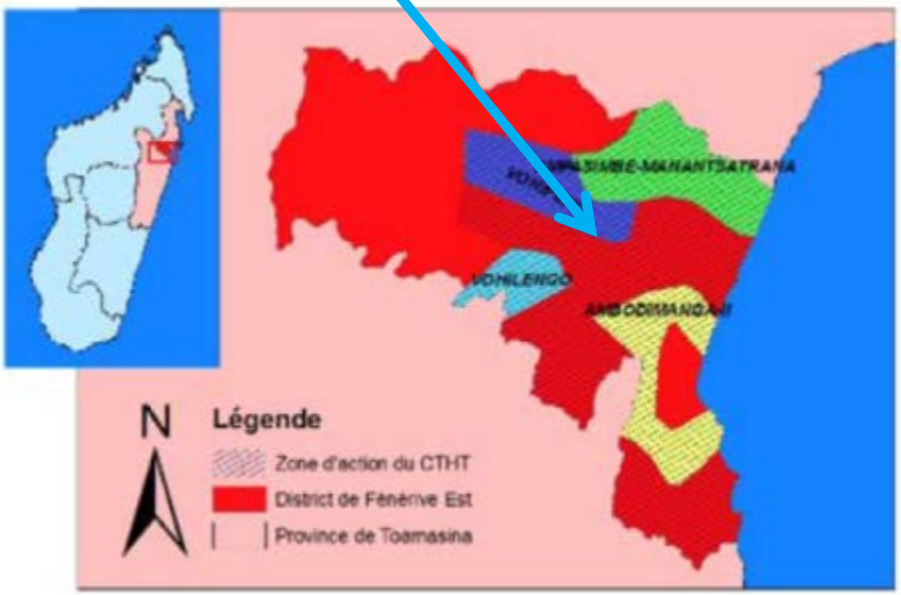
Selected areas:

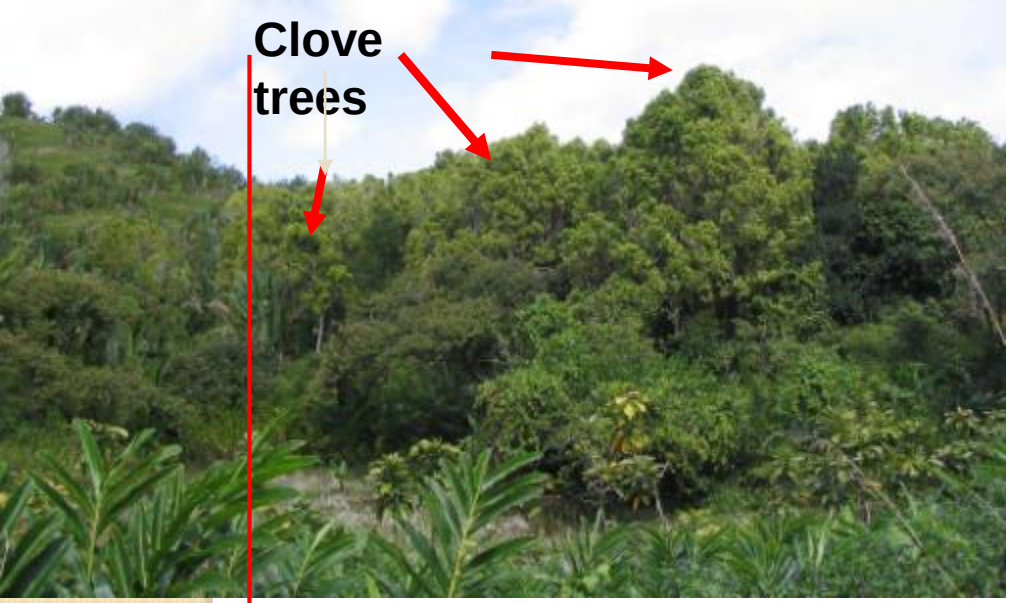
Fénérive Est and

Sainte Marie Island

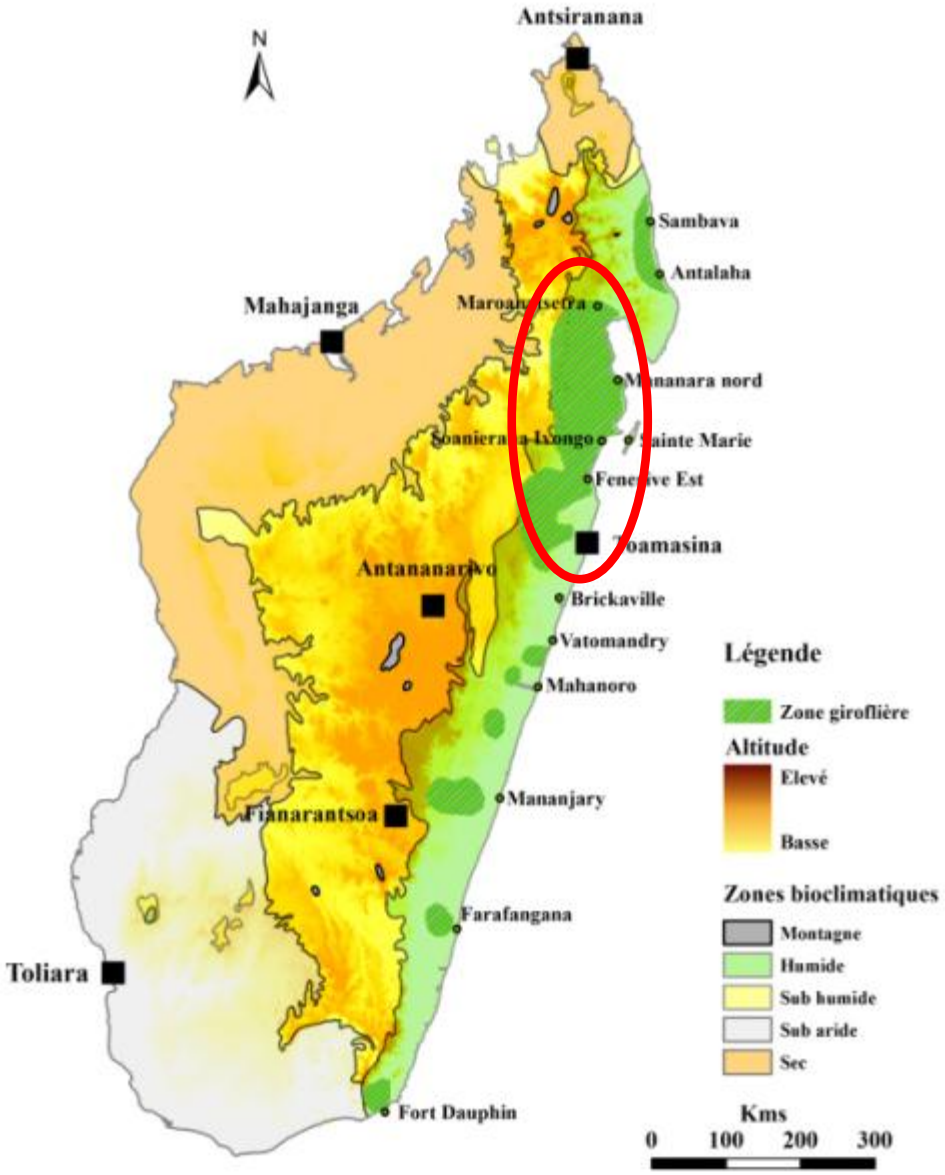
Fénérive Est area

Sainte Marie Island area





Sainte Marie Island : the cradle of clove industry

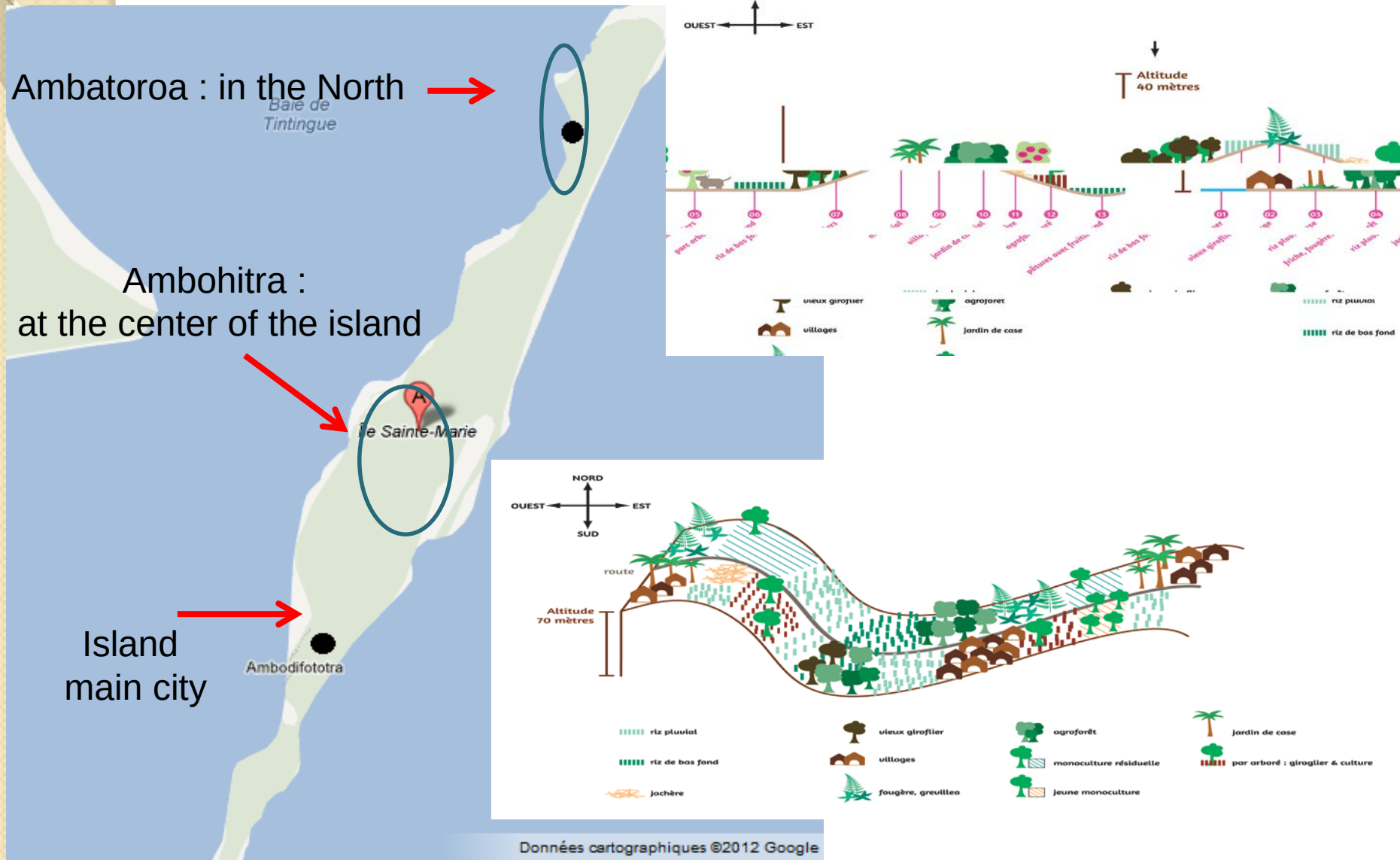


Clove area in Madagascar

Sainte Marie Island 2012/2013

- Farming system study (35) and typology (Sophie Levasseur/IRC), complemented in 2013
- 27 clove plots surveyed (Céline Crochot/Supagro-Montpellier)
- Farming system modélisation (7 representative farms) in 2013 (A Richard/ENSIAA) : income analysis
- Study of 3 old concessions from 10 to 90 hectares

2 different sites selected on the island



Clove plot typology

Old plots from 1950's plantations:

- ***residual clove monoculture (230 kg/ha/year)***
- ***Clove »park*** » : residual clove trees with annual foodintercrops (rice, Cassava, Sweet potatoes „..) **(12 to 140 kgf/ha/year)**
- ***Clove agroforestry systems*** : clove + fruit trees and wood/firewood trees. ***monoculture (217 to 233 kg/ha/year)***

New plantations (since the 2000's):

- Mostly with agroforestry practices (shading)during immature period (the first 10 years)

Clove systems in Sainte Marie

Clove monoculture (young)

Clove agroforest

Clove park with food crops

Curent clove type distribution

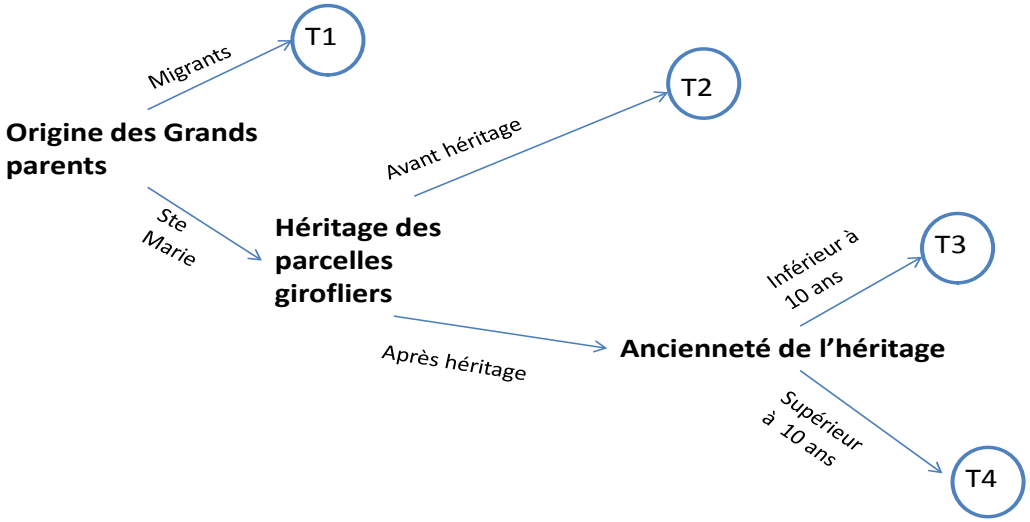
- **Ambatoroa (North)**
- 80 % of clove agroforestry systems
- 20 % of clove parks
- With new replanting

- **Ambohitra (center)**
- 30 % of clove agroforestry systems
- 50 % of clove parks
- 20 % of residual monoculture
- Few replanting

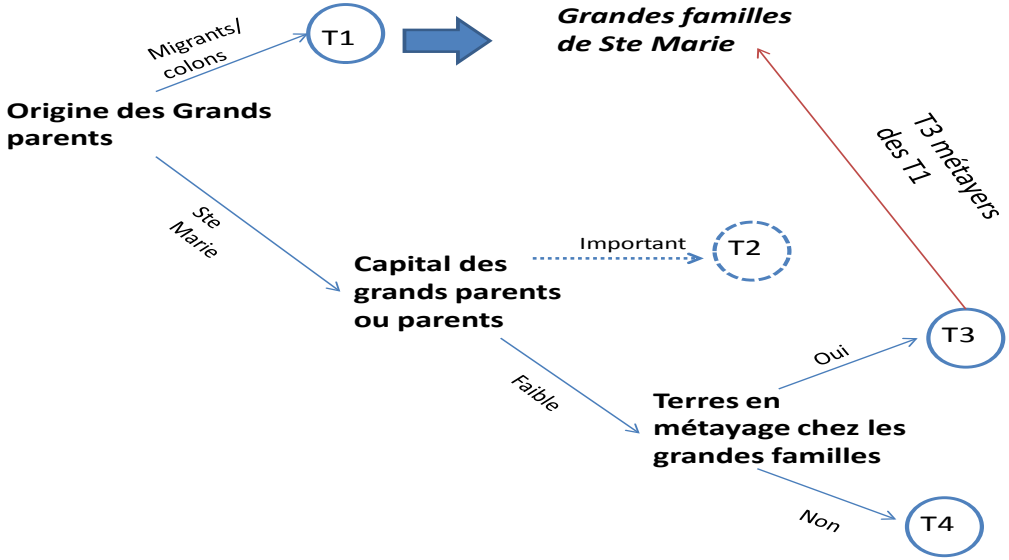
Clove cropping system by village

	AMBATOROA		AMBOHITRA			
	Agroforest	**Wooden Parc**	**Agroforest**	**Wooden Parc**	**Residual monospecific Plantation**	**Young monospecific Plantation**
Average Surface (ha)	0,5	0,2	2,5	1	1,5	de 1 à 35ha
Association with other species	Fruits, vanilla, pepper, cinnamom …	Cassava, sweet potato, pineapple, vegetables, sugar cane	A few fruit trees	Rice, Cassava, sweet potato, sugar cane		
Caracteristic of the tree population	Various states, all ages	Young cloves, Various states	Good state, old (> 60 years)	Old cloves, very bad state	Old cloves, very bad state	Young cloves (< 10 years)
Density of cloves/ha	**153**	**200**	**38,1**	**46,0**	**37,0**	
Density of producing cloves /ha	6	6,1	33,3	38,0	37,0	
Clove yields (kg/ha)	217	12	232,9	141,0	233,0	
% found in the zone (visual estimation)	80%	20%	30%	50%	15%	5%

Farming systems typology



. Farming systems Typology at Ambatoroa

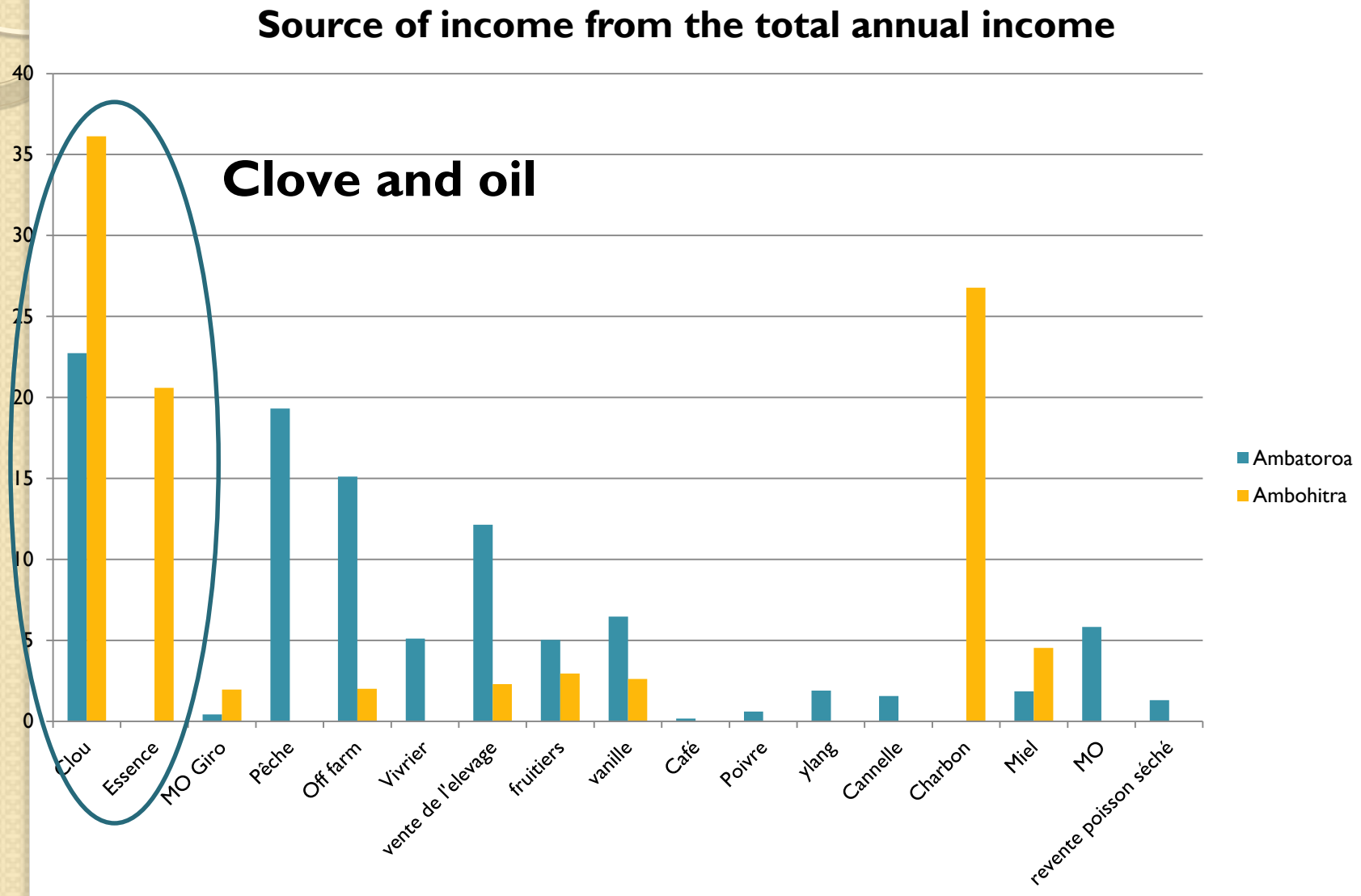


. Farming systems typology At Ambohitra

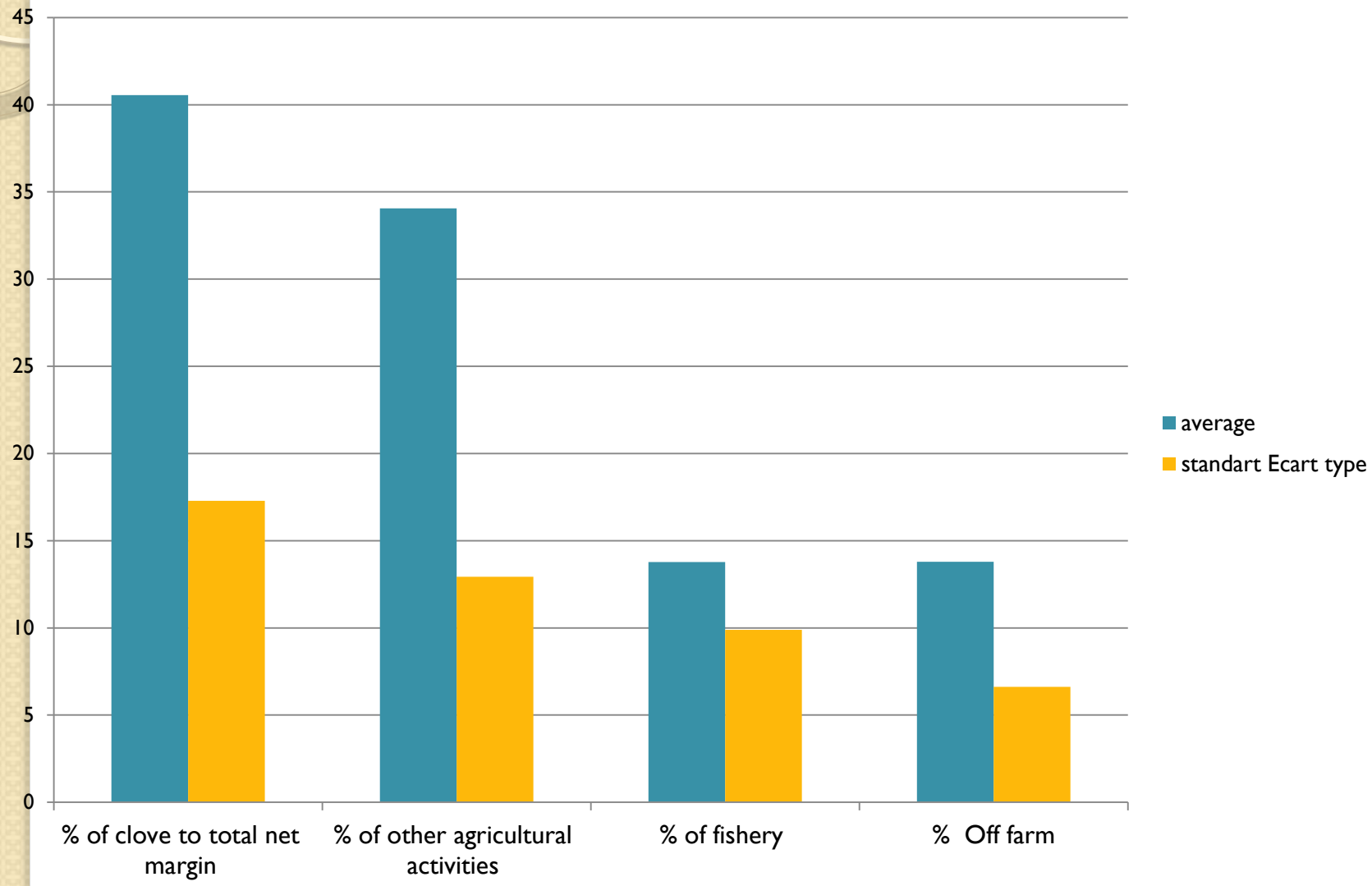
Final global typology

	Type 1	type 2	type 3	Type 4	Type 5
origin of F-2	Migrants colon	Migrants	from Ste Marie	from Ste Marie	from Ste Marie
land tenure	ownership	share cropping and ownership	share cropping	ownership	ownership
Capital	high	poor	poor	average	high
Links with land owners of Ste Marie	yes	No	sharecropping with parents young families		
type of plots	land available for share cropping	park with foodcrops	park with foodcrops	park with foodcrops	complex agroforestry systems
economical activities	lan owner large areas	off farm	production of oil	production of clove and oil	diversification sales of fruits, vanillla, pepper, etc

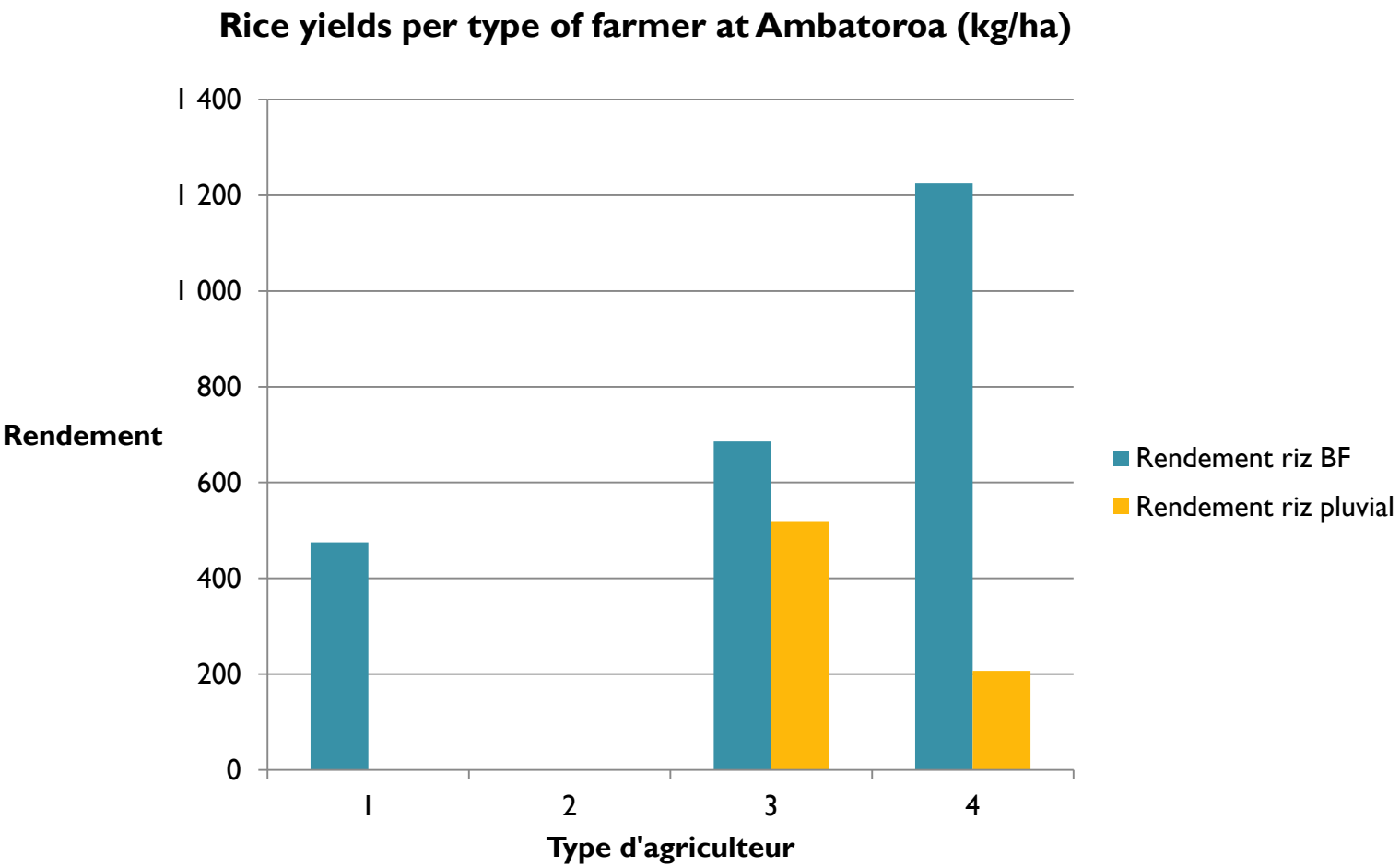
Importance of clove and oil in farmers' income generation



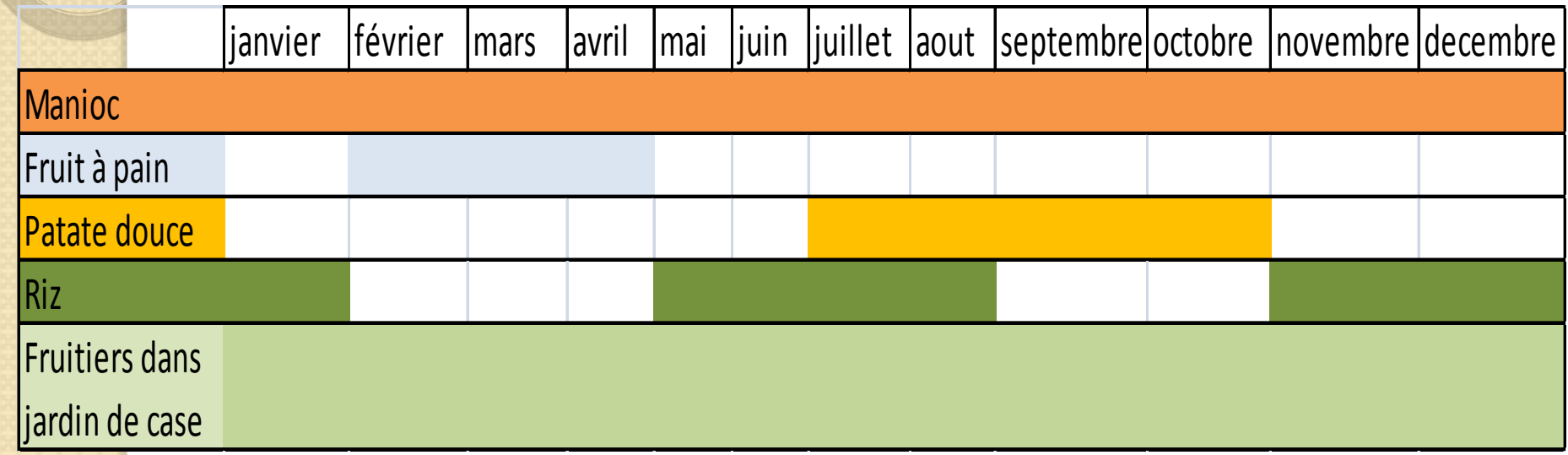
Origin of total annual income for all villages



Rice yields are very low



Most of the diet is provided by cassava, sweet potato and bread fuit tree

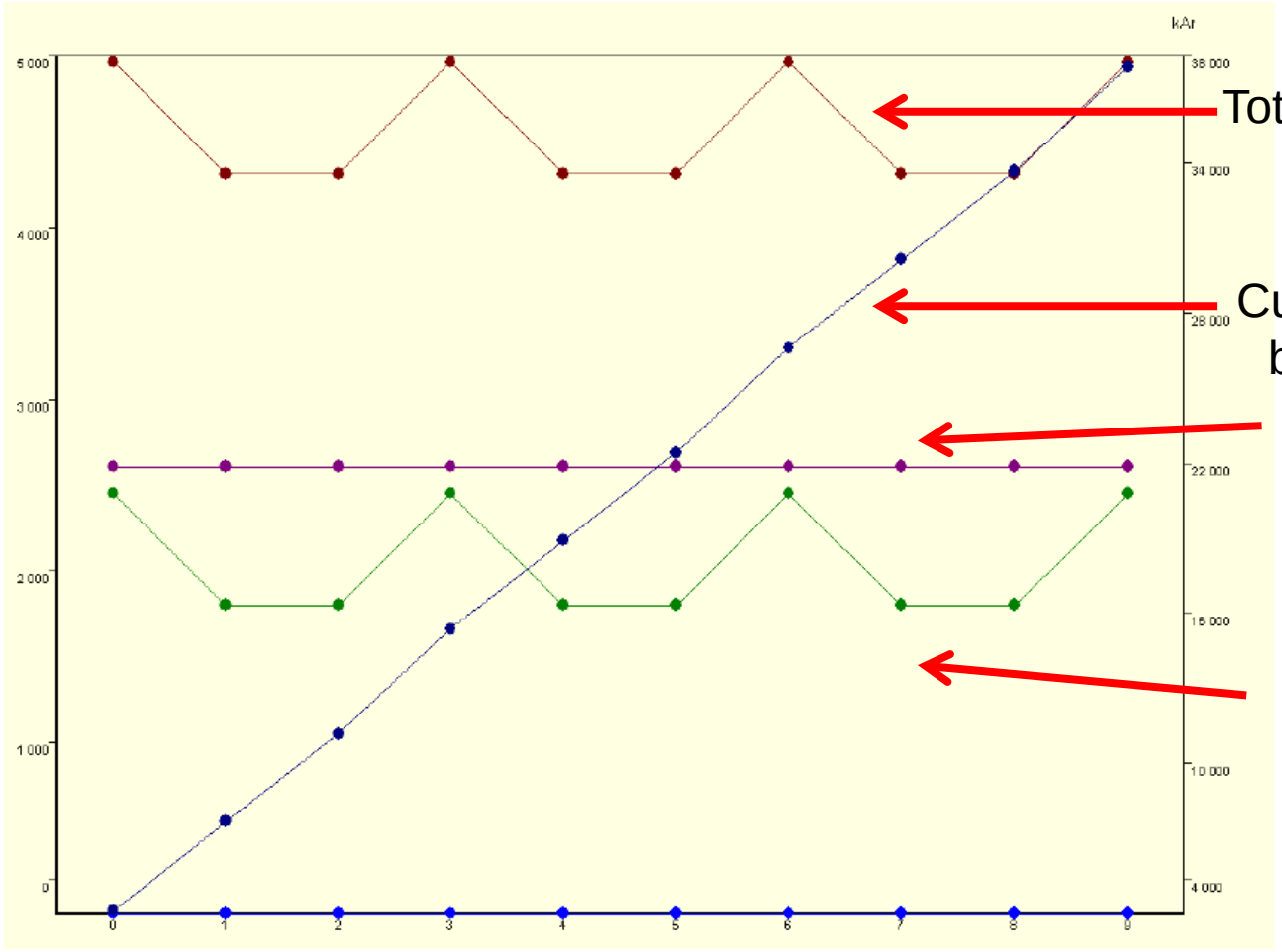


Roughly :

-1 to 2 month with rice
-3 months with sweet popato
- 3 months with bread fruit tree
-- 4 to 5 monts with cassava

-

Exemple of farming system modeling: origin of total annual income



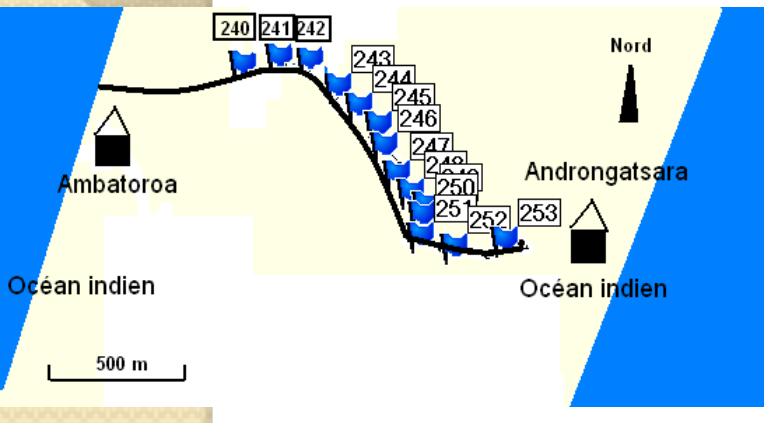
Total annual income

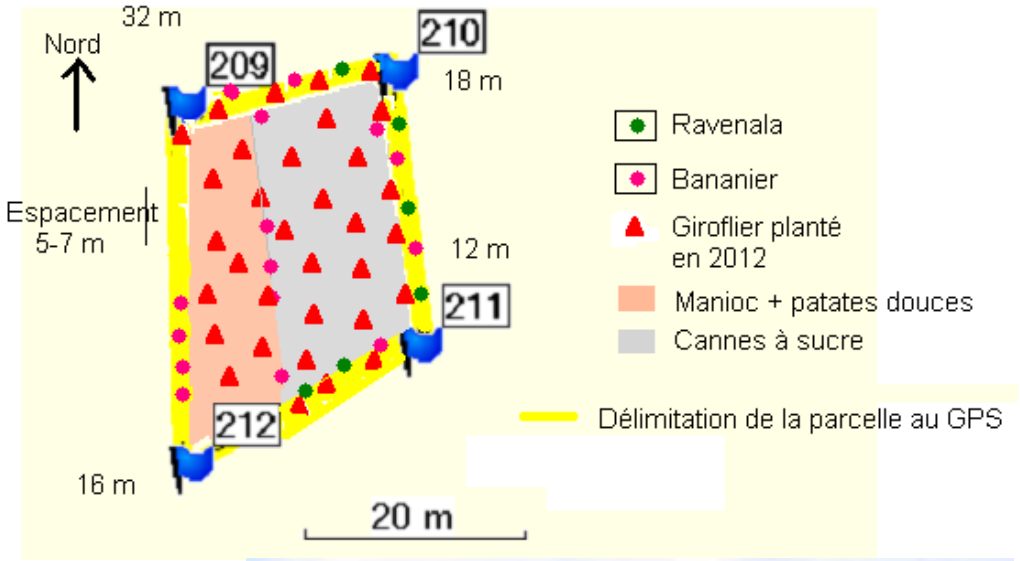
Cumulated balance

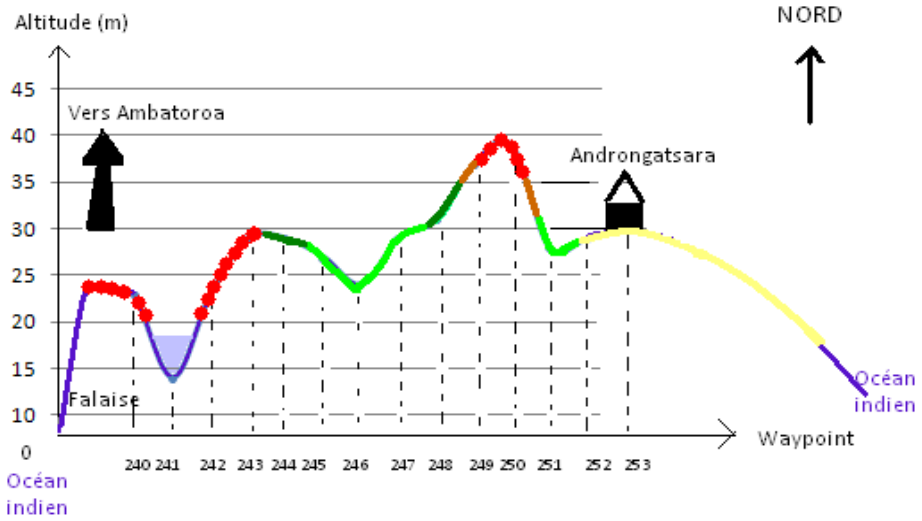
Other agricultural Activities

clove

Sainte Marie : 2012 (C Crochot/Supagro)
Island transects (4) and clove plot study (27)







Clove /cassava Association

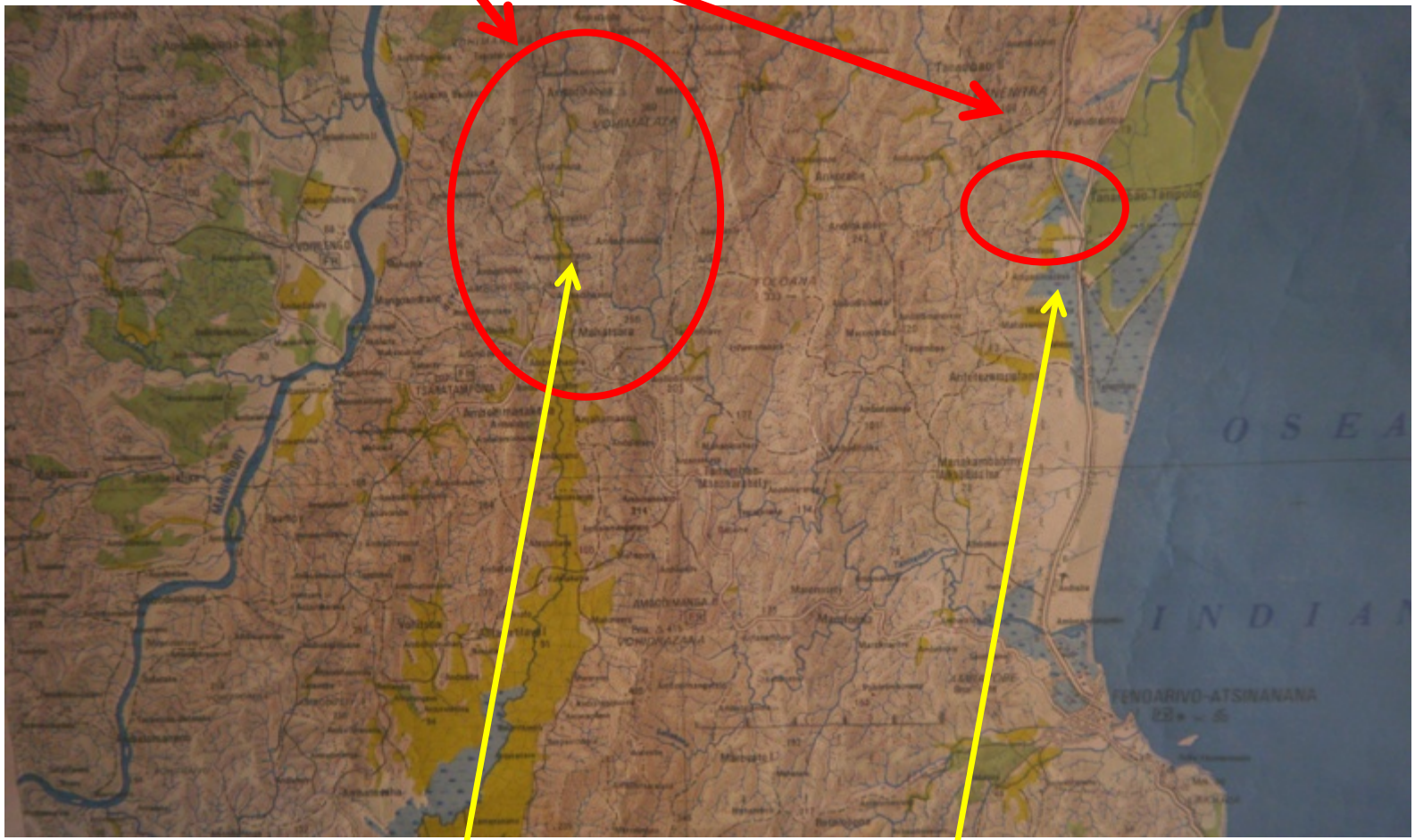
« Alambic » distillation device at Ambohitra

Clove park : With rice and maîs

New 3 years old plantation at Ambatoroa

Aquatic lowland rice at Ambatoroa

Fénérive Est area: surveys 2013 in 2 villages.



2013 activities in Fénérive-Est

WP2

- Farming system survey and typology (Mélanie Lobieti/IRC)

  → looking to differences compared to Sainte marie situation

WP3

- Study on knowledge , know-how and practices on various clove based systems (Marta Panco/IRD)
- Study of clove copping system : 72 plots (Francisco/CTHT)
- Study of biodiversity and age assessemnt on 24 selected clove plots (Natacha Arimalala Lydia/ESSA) with dendometric analysis (age) (14 farmers)

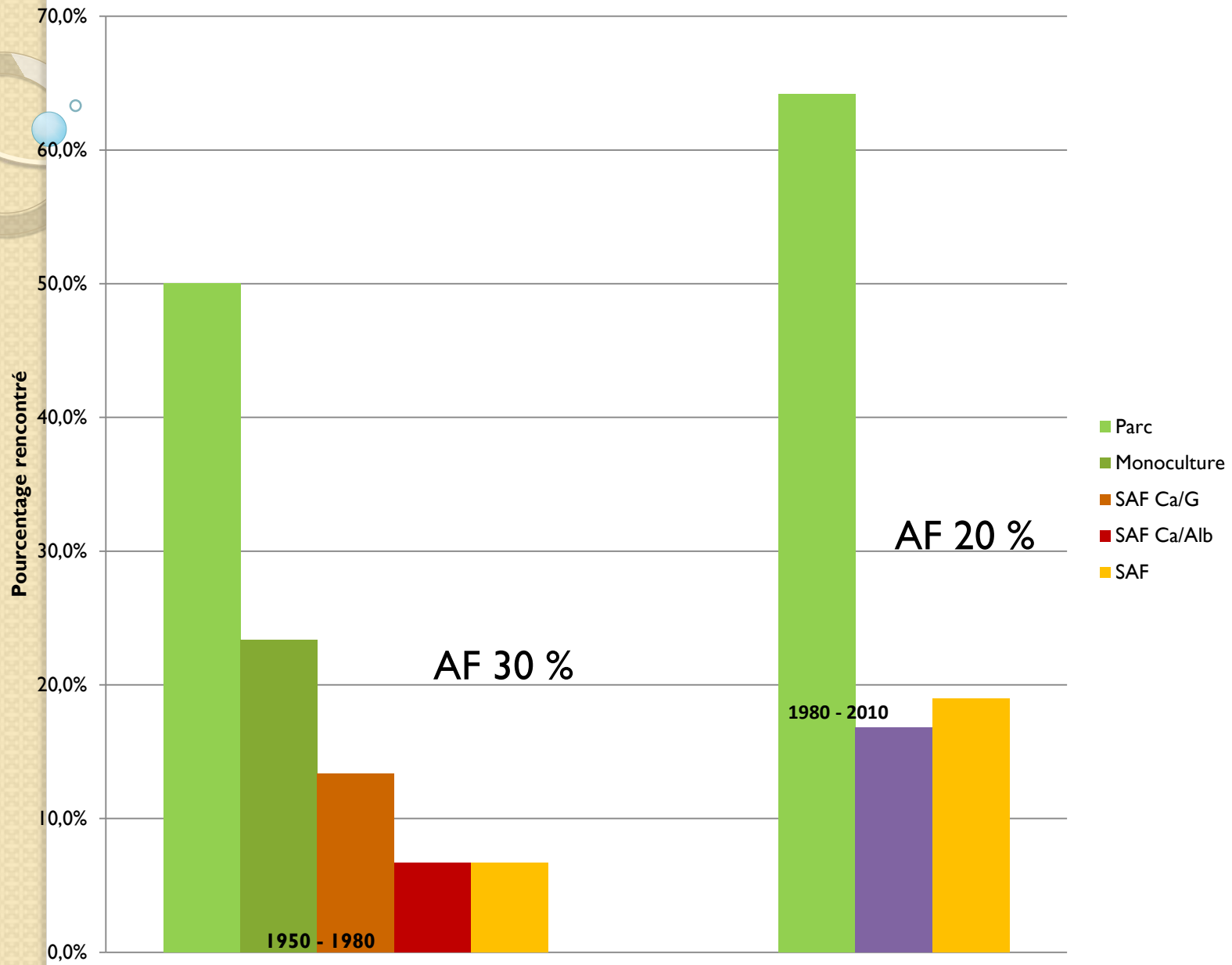
Clove systems in Fénérive-Est

Clove residual monocuture -from 1950 plantation)

Clove park with foodcrops

Clove agroforest

Clove systems distribution in Fénérive



Farming system survey and typology (WP2): Working hypotheses

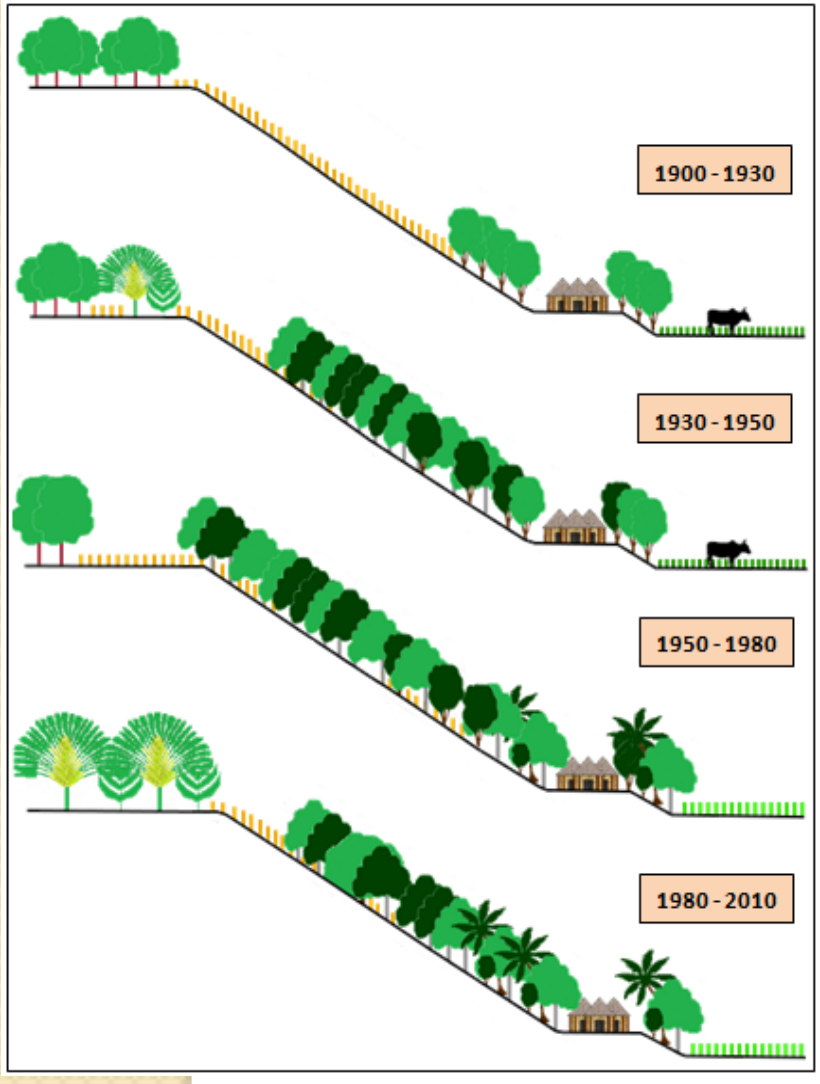
- Hypothese 1: Macro factors (price, climate, social and political context ...) have an impact on the evolution of clove systems and partial renewal/replanting.

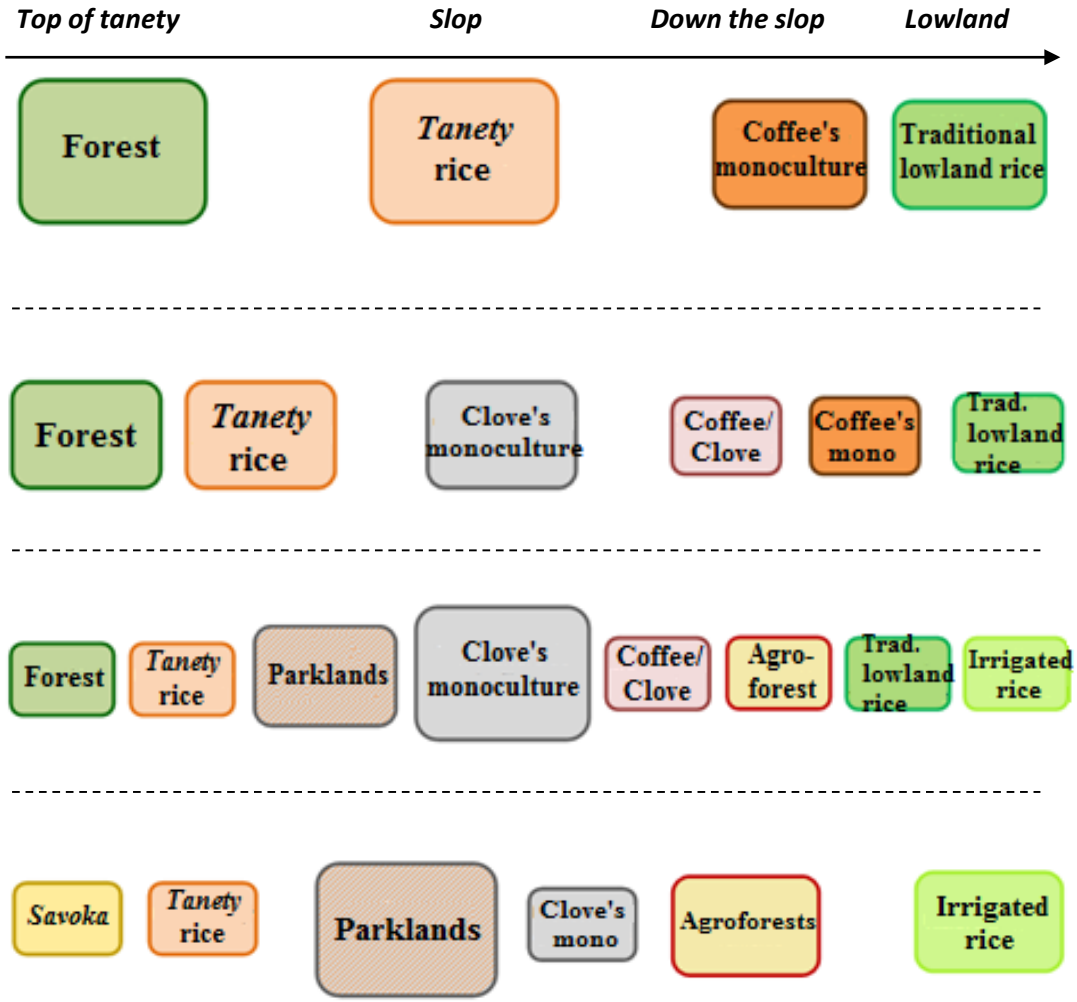
- Hypothese 2 : There are several types of cropping systems based clove leading to a diversification of agricultural production (foodcrops). This diversification is linked to household needs and their economic and social capacities to meet those needs. Therefore clove production and systems are linked with food security

- Hypothese 3 : There are a variety of farms and strategies that are related to the origin of the farmers (indigenous, Founders's descendants) and the life cycle.

With Mélanie Lobieti/IRC

Evolution of farming systems based clove





Typology of cropping systems

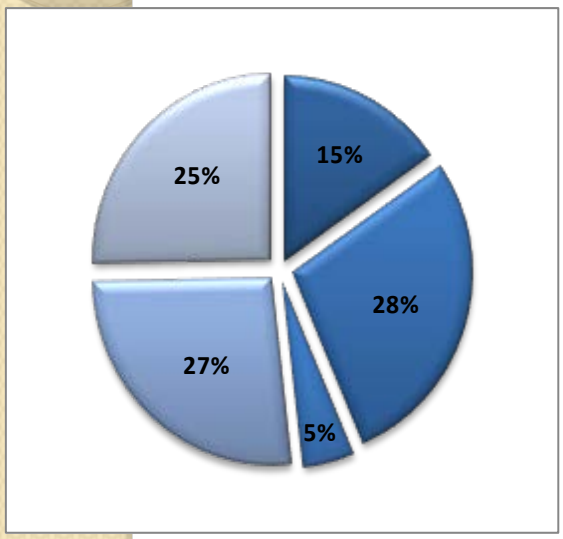
Criteria 1:
Total average density

Criteria 2:
State of the lower layer (cultivated, grazed, nothing)

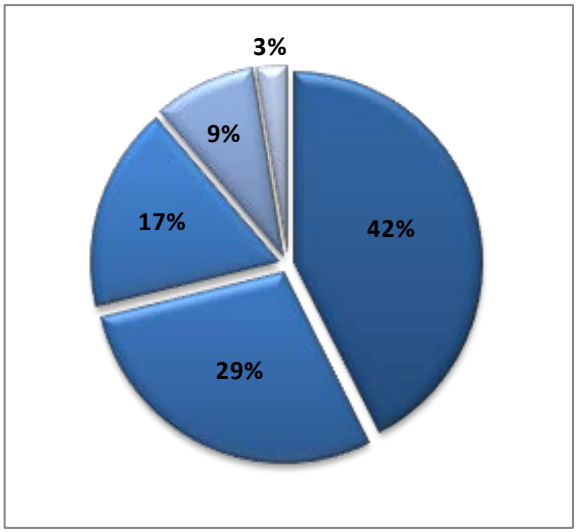
	Parkland	Clove's monoculture	Agroforest
Average size (ha)	0,2	0,2	0,2
Proportion of cloves in the shurb layer (%)	62,8%	85,2%	50,2%
Average density of cloves (foot/ha)	179,7	239,0	202,0
Total average density (foot/ha)	302,3	313,0	429,0

Typology of cropping systems according to type and age

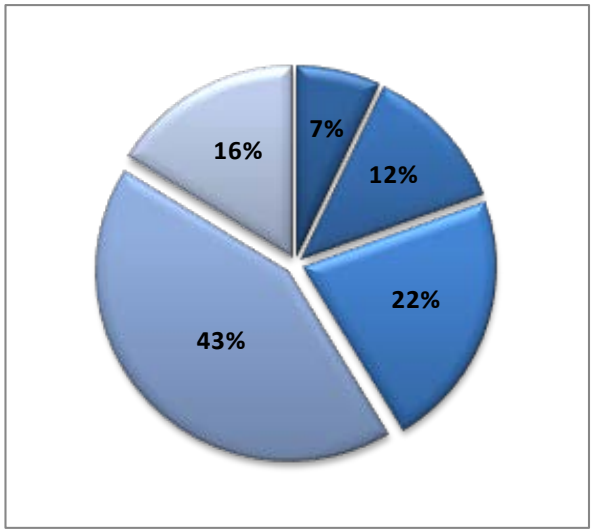
Parklands



Cloves monocultures

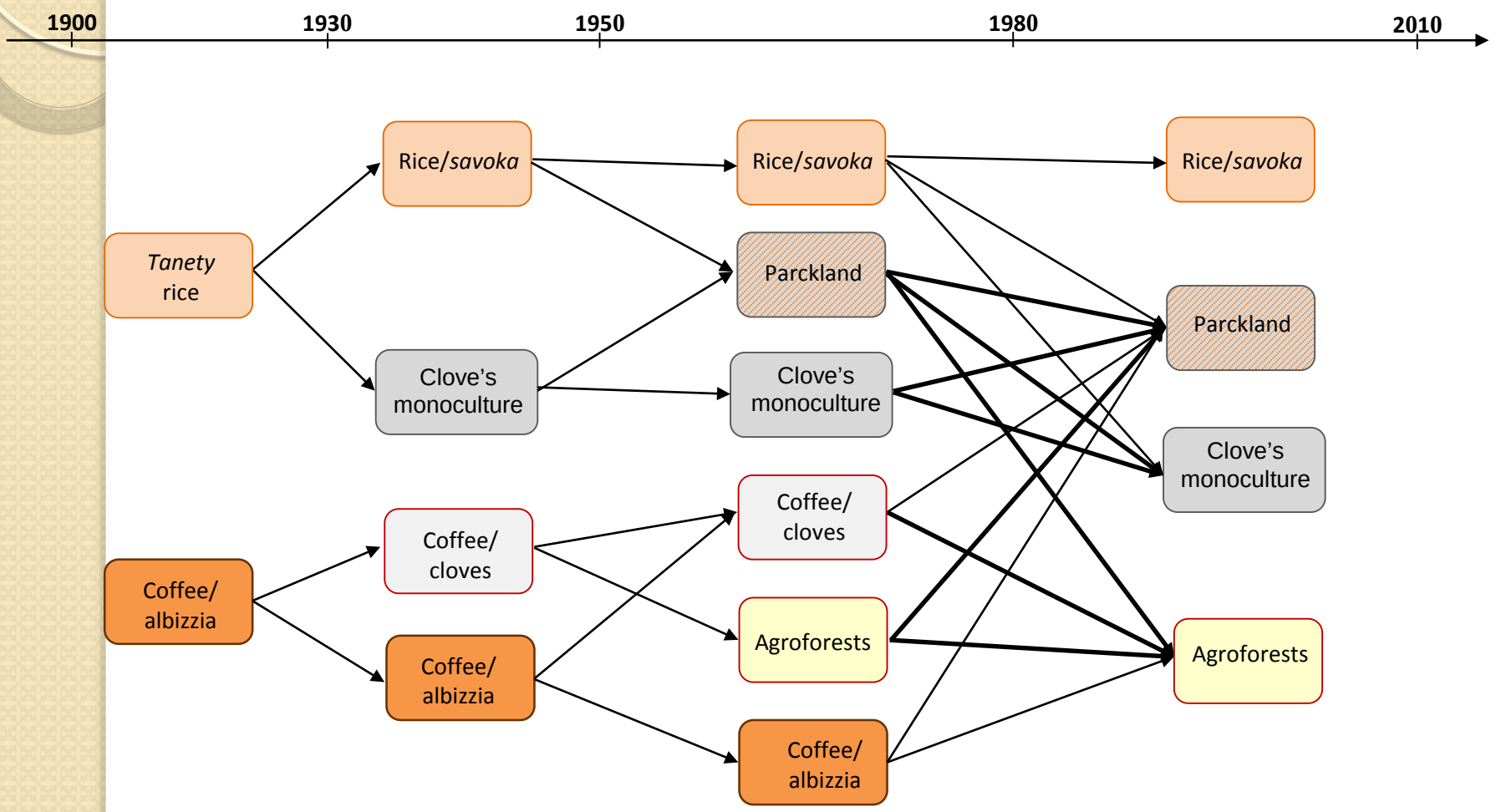


Agroforests



plus de 50 ans | entre 30 et 50 ans | entre 10 et 30 ans | entre 3 et 10 ans | moins de 3 ans

Historical evolution of cropping systems



Farm typology

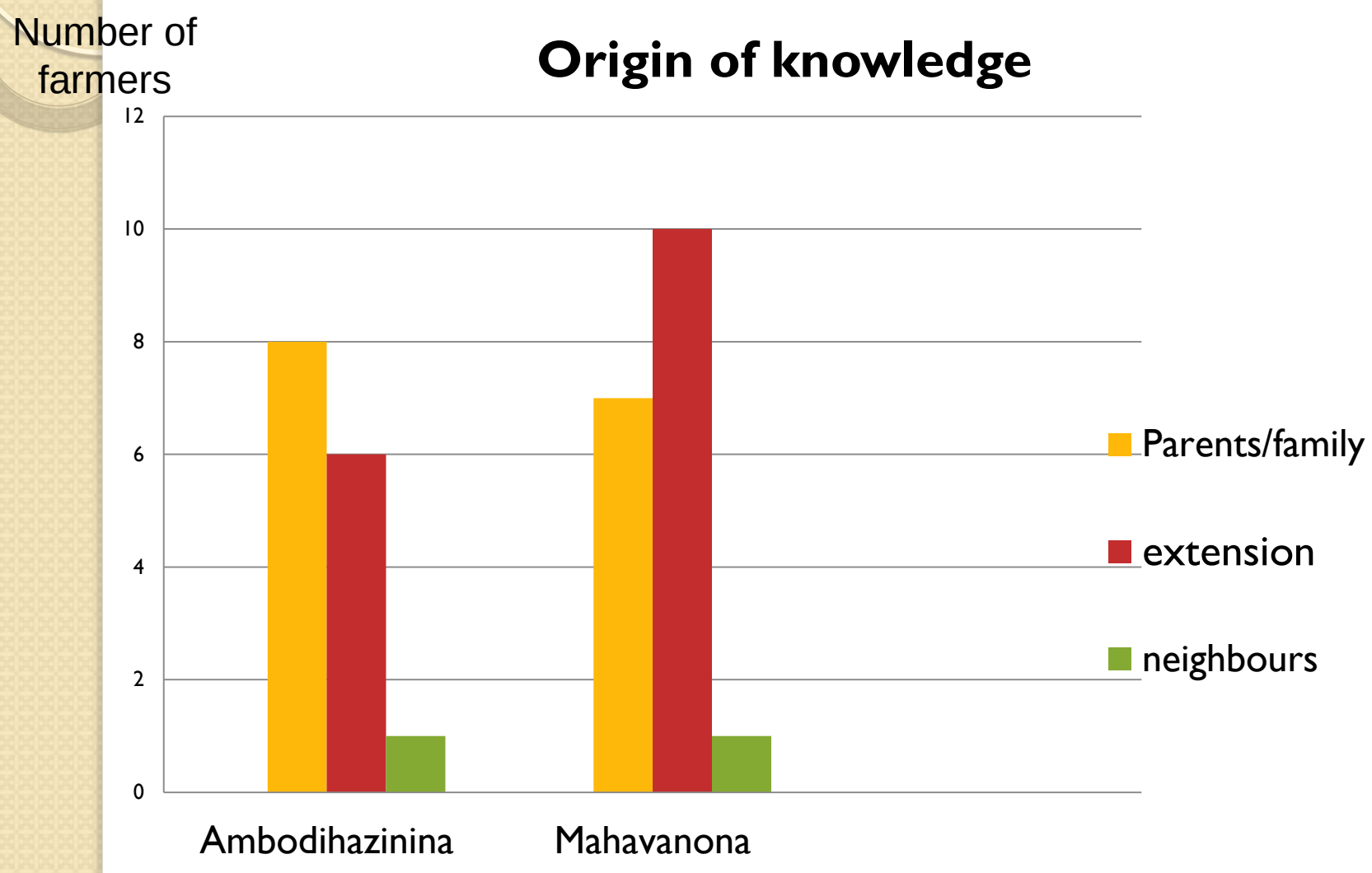
	Type 1	Type 2	Type 3
Farmer origin	native	native	migrant
Generation	G2	G3	-
Average age of farm (years)	45	30	25
Principal tenure	owner	owner	owner
Foodcrops average area (ha)	1,1	1,2	0,8
Clove Average area (ha)	1,9	0,9	2,2
Number of farmers	15	7	7

Strategies:

-Focus on food crops

-Focus on cash crops

2013 knowledge, know-how and practices study
With Marta Panco/IRC



Knowledge, know-how, pratices and strategies

- A history of public policies on clove in the area
- A time frame analysis « périodisation »)
- A study on farmers' strategies, knowledge and know how
- A SWOT analysis
- An analysis of cropping paterns vs knowledge and strategies
- An analysis on replantation

Some results : knowledge and strategies

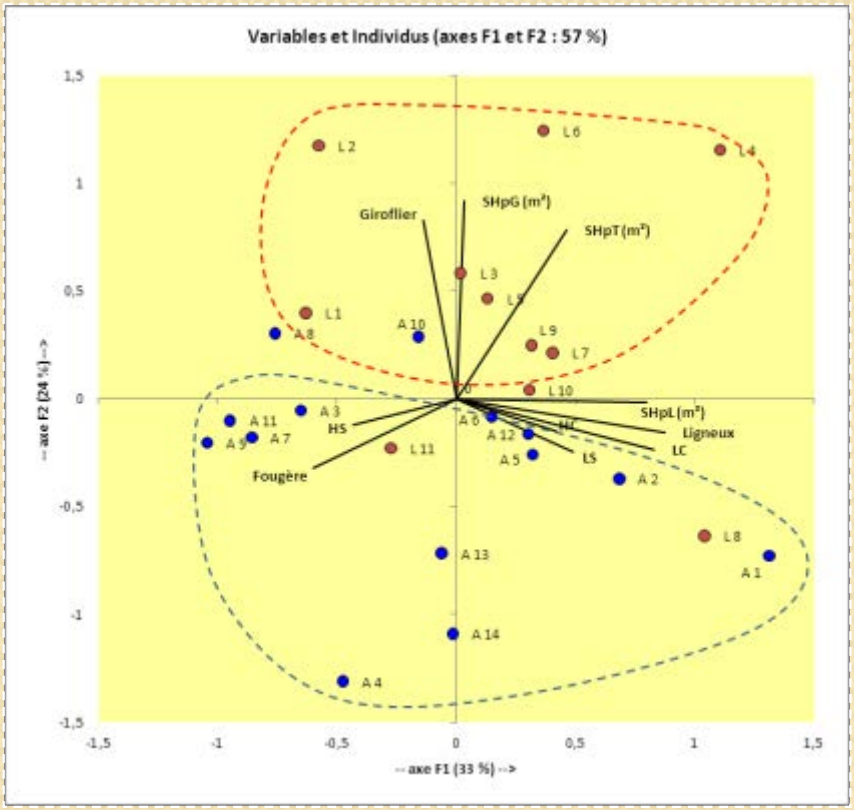
Thème	Sous thème	Typologie	Facteurs	Description
I. Choix de SC	Typologie de producteurs sur savoir et pratiques	**Expert** (monocultures et parc) **Transitoire** (tous les types de SC) **Novice** (SAF et parc)	Origines de savoir	• hérité de parents- type empirique • copie voisins ou villageois/ partage intracommunautaire
			Type de savoir	• Formel (formation) -Offrir formation théorétique et pratique par Contremaitre de service agricole(1975)/ techniciens de PNUD/LDI/ ERI/ PPRR et CTHT (<2000).
				• Informel (empirique) Reçu des parents/ en observant les voisins ou empirique
			Passage de savoir et savoir-faire	a. En période coloniale : • Suggérer par l'Etat colonial pour le payement des impôts • Information et Pression par l'école
				b. Apres l'indépendance : • techniciens de SA (>1975), plus récent PPRR (<2000) et CTHT(2009) • observant les voisins (copy) • transmit par de parents et en les accompagnants aux champs (pour les jeunes)
	Stratégies lies aux pratiques	1. Stratégie prioritaire de satisfaction des besoins alimentaire par l'autoconsommation		• pour assure la sécurité alimentaire : priorité aux cultures vivrières (riz, manioc). • pas diversification en culture de rente • éventuelle activité off-farm journalier pour compléter le revenu
		2. Stratégie de diversification des sources de revenu		• Culture de rente : (café, litchi, vanille, poivre, cannelle) • Amélioration des cultures vivrières (riz, igname, manioc) • Diversification : riz (2 cycle) et maraichage (sur tanety ou a cote de rivières) • Diversification des activités off farm : menuiser, charpentier, artisanat ou petite commerce de village. Diversification d'élevage : volailles, porcins, zebus (travail et viande). • Migration (saisonnier) pour la récolte de clous en autre région : Activité of farm .
		3. Stratégie d'amélioration de la culture du girofle		• production de plant en pépinière individuelle. • amélioration technique : taillage et désherbage. • Amélioration pour la croissance en utilisant compost

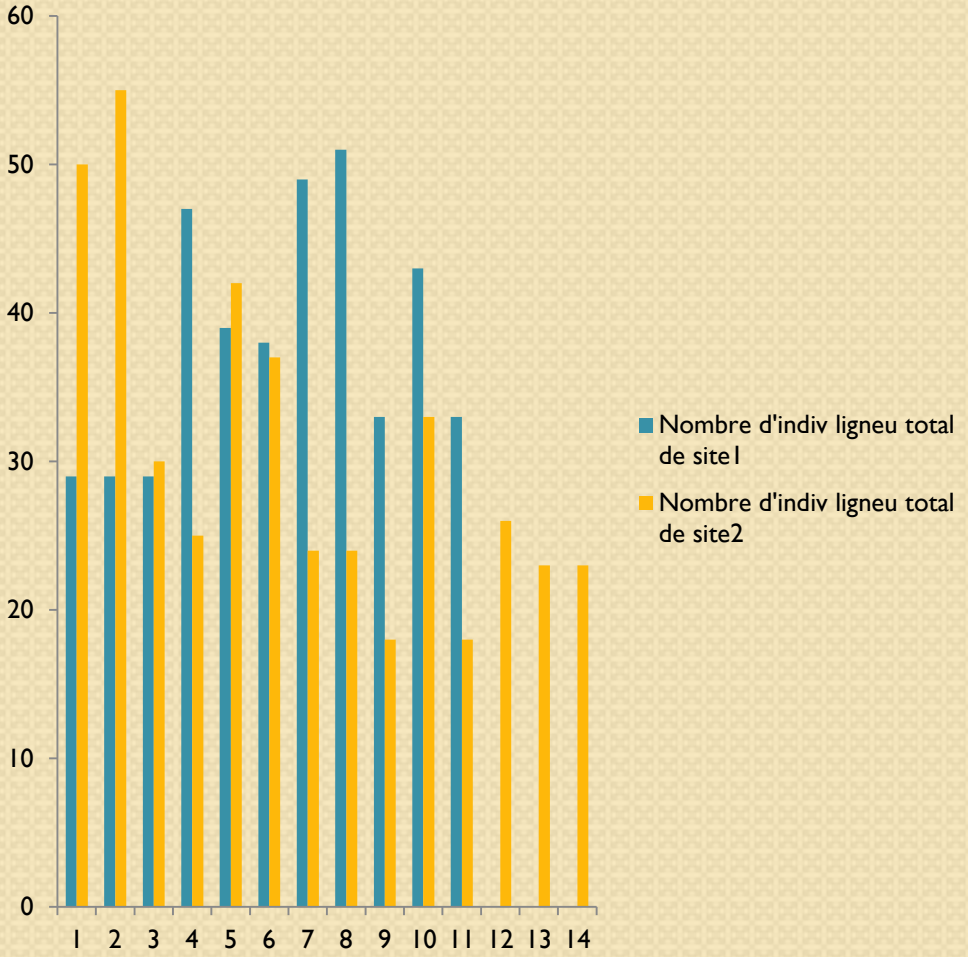
Example of clove plot biodiversity charaterization

Espace	Famille	Native/ exotique	Rejet/ plante	Construction /bois de chauffe/charbon	Consommation /épices	Médicine	Vente	Fertilisé le sol	Autres
Acacia	*Fabacées*	Native	Rejet	X					x
Albizzia	*Fabacées*	Native	Plante	X				x	x
Ananas (Ananas comosus)	*Bromeliaceae*	Exotique	Plante		x		x		
Arbre a pain (Artocarpus altilis)	*Moracées*	Native	Rejet	X	x		x		
Bambous (Ochlandra capitata)	*Poaceae*	Native	Rejet	X					x
Bananier	*Musacées*	exotique	Plante		x		x		
Café (Coffea canephora)	*Rubiacées*	Exotique	plante		x		x		
Canne à sucre (Saccharum officinarum)	*Poaceae*	Native	Rejet		x		x		x
Cannelle (Cinnamomum verum)	*Lauraceae*	Exotique	Plante		x		x		
Cocotier (Cocos nucifera)	*Cocotae*	Exotique	Plante		x		x		x
Corossolier (*Anona muriacata)*	*Annonaceae*	Exotique	Plante		x		x		
Eucalyptus (Eucalyptus robusta)	*Myrtaceae*	Exotique	Plante	x					x
Grevillea banskii	*Proteaceae*	Native	Rejet	x				x	x
Goyaver (Psidium guajava)	*Myrtaceae*	Exotique	Plante		x		x		x
Haronga (HARUNGANA MADAGASCARIENSIS)	*Clusiaceae*	Native	Rejet	x			x		
Hintsina (Afzelia)									
Jaquier (Artocarpus integrifolia)	*Moraceae*	Exotique	Plante		x		x		
Litchi (Litchi chinensis)	*Sapindaceae*	Exotique	Plante		x		x		x
Litchi chinoise- Rambutan (Nephelium lappaceum)	*Sapindaceae*	Exotique	Plante		x		x		

AFC analysis on plant content

Number of associated trees by sites
For 1000 m2 plots





Clove plot analysis (14) 2013

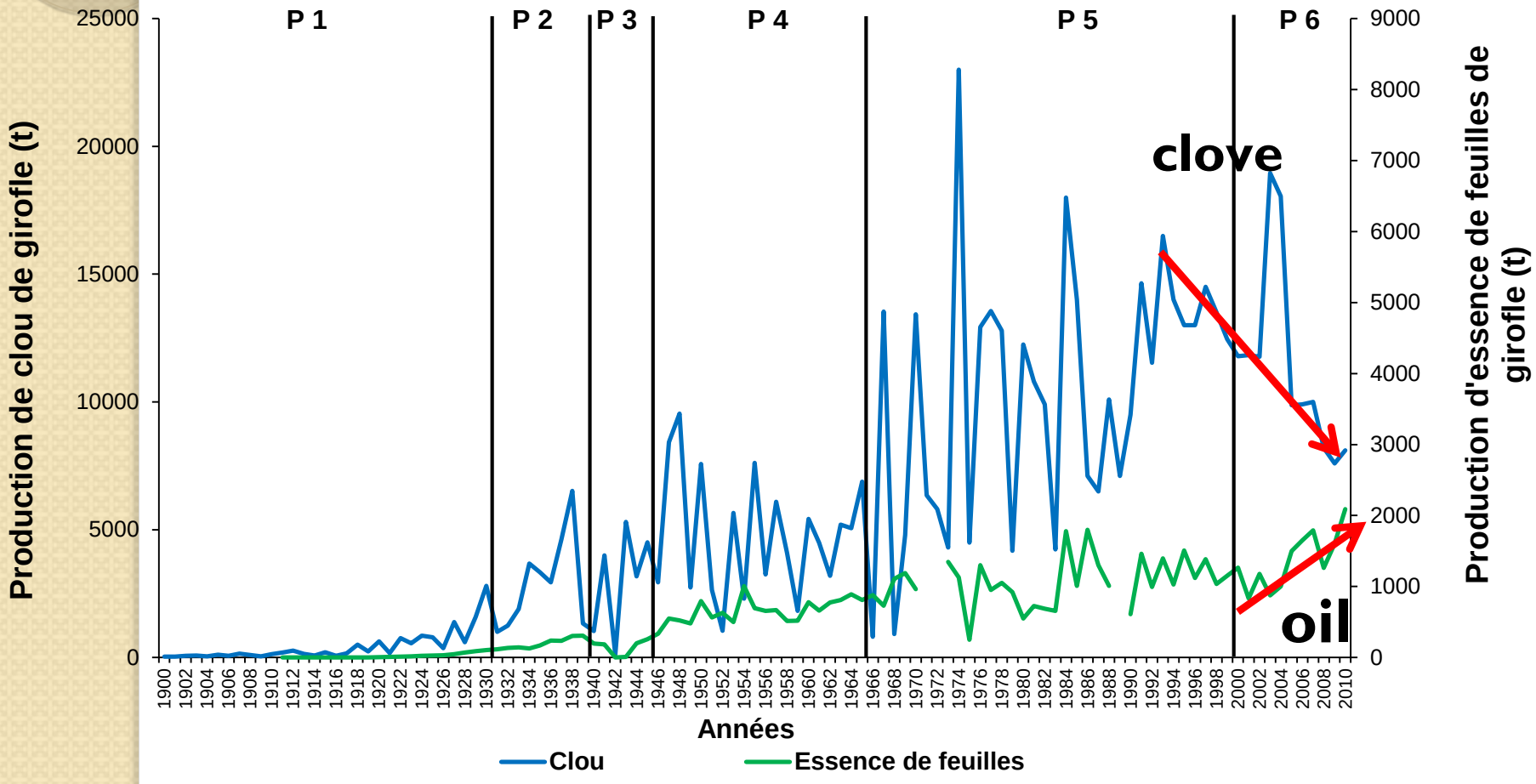
With Natacha Arimala/ESSA

Replantation and new planting

- **Replantation in old plots** : never done : clove plot have been managed (since the 1950's) as extractivism without replanting of dead trees→ evolution to parks and agroforests

- **New planting** : very recent, since the 2000's,
- Few spontaneous planting
- Failure of replanting programme

Replantation is not sufficient to renew the ressource
Replanting is a major concern : what are the main factor that might triffer replanting



Thanks for your attention