The Vetiver System for Railway Batter Stabilisation in Madagascar

Dr. Dale Rachmeler

NATIONAL WORKSHOP ON THE VETIVER SYSTEM FOR SOIL & WATER CONSERVATION, ENVIRONMENTAL PROTECTION & REHABILITATION IN ETHIOPIA

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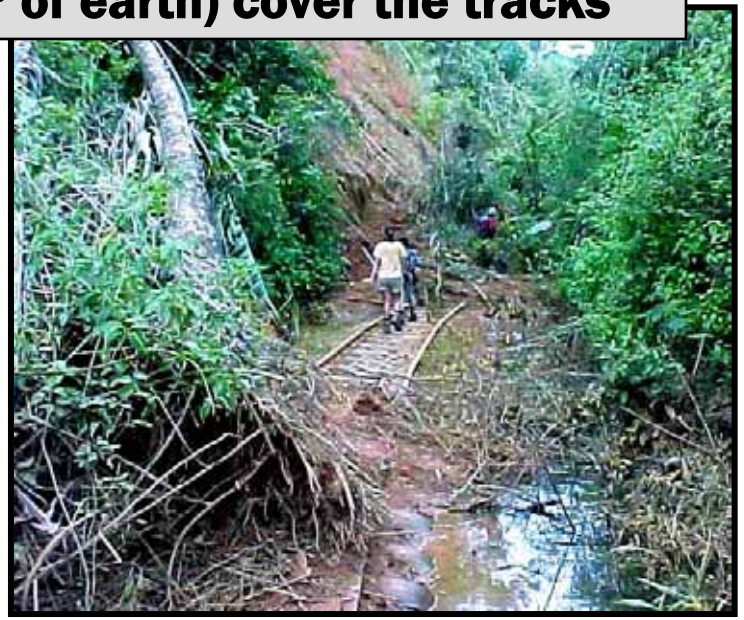
The FCE Railway Madagascar

It is the third steepest rail line in the world.

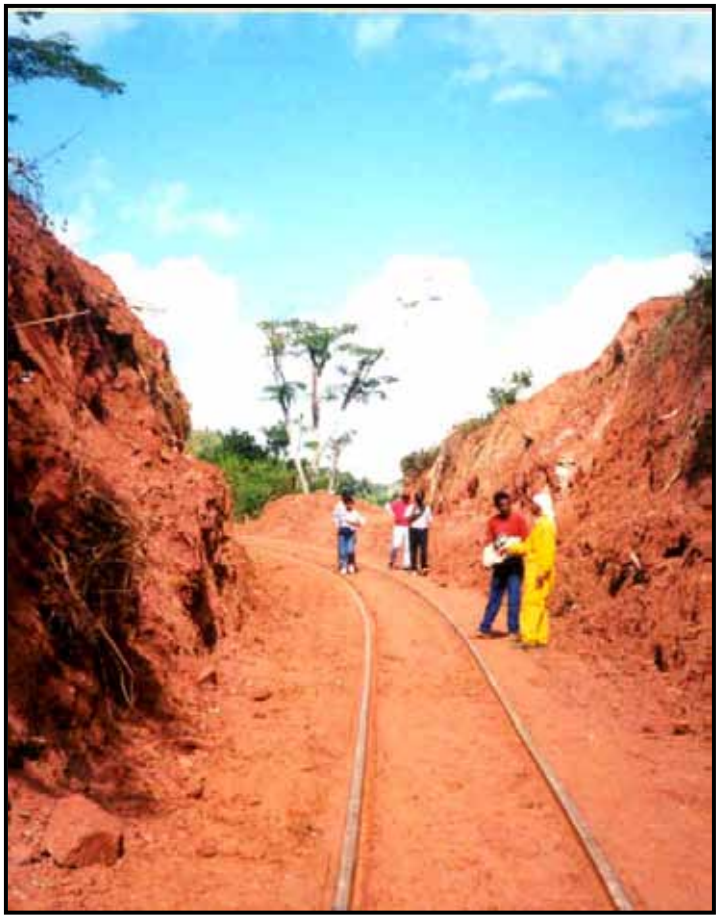
Disaster strikes: 2 cyclones hit Fianarantsoa province over a two week period in early 2000

280 landslides (150,000 m^3 of earth) cover the tracks



Eight washouts attack the FCE railway bed

1. **How to stabilize the many still unprotected slopes?**
2. **How to reduce FCE vulnerability to future cyclone damage?**



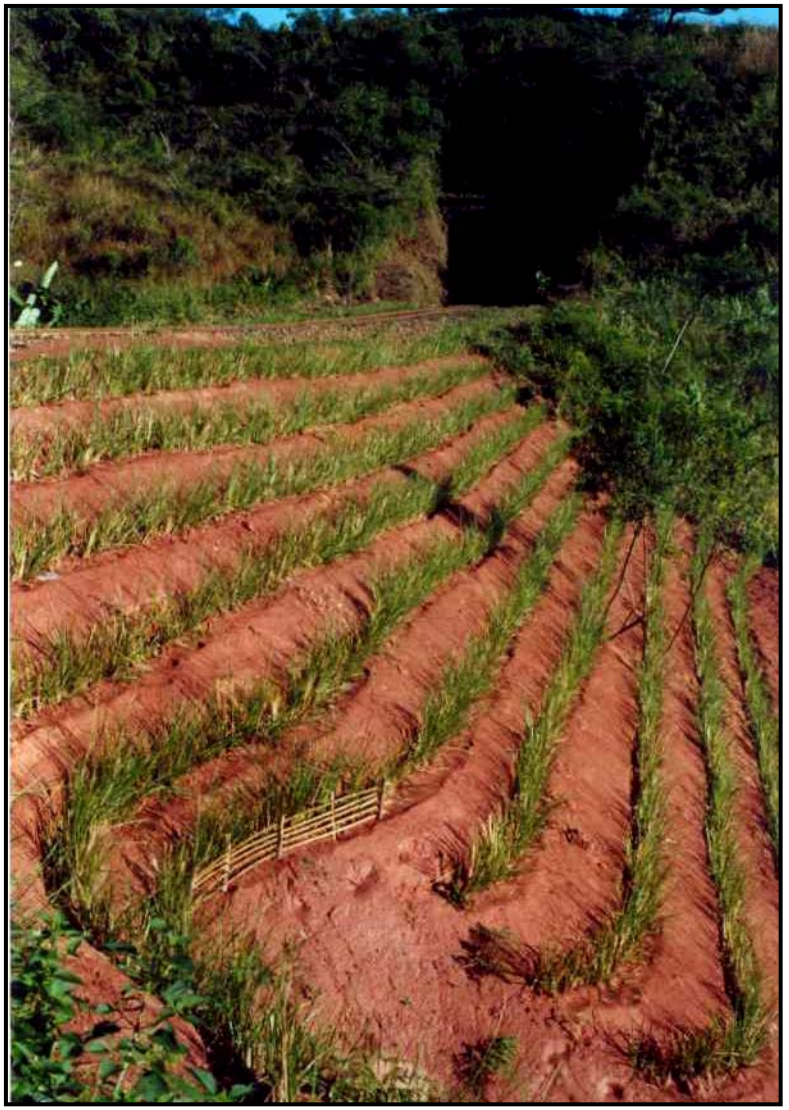
The Thai specialists and their partners in Madagascar devised a 2-pronged strategy.

1. Systematically use vetiver to stabilize all highly unstable points and drainage systems.

2. Institute a vetiver-based system to reduce erosion and landslides along steep farmed hill-slopes.

Technical Approach to Protecting the Rail Slopes

Slope stabilization protecting gabions where needed at the base of slope, with rows of vetiver on contours at 1 meter vertical distances



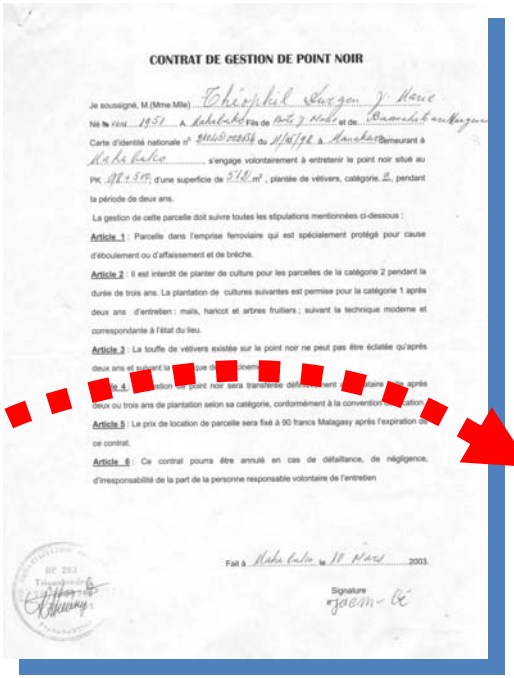
Mulching between the rows of vetiver

Fully stabilized batter and culvert

Culvert drainage protection

Community intervention at each of the critical sites

Each of these “technical intervention” points is now under contract with a local farmer responsible for its maintenance in exchange for access to vetiver for thatch or handicrafts.



CONTRAT DE GESTION DE POINT NOIR

Article 1 : Parcelle dans l'emprise ferroviaire qui est spécialement protégé pour cause d'éboulement ou d'affaissement et de brèche.

Article 2 : Il est interdit de planter de culture pour les parcelles de la catégorie 2 pendant la durée de trois ans. La plantation de cultures suivantes est permise pour la catégorie 1 après deux ans d'entretien : maïs, haricot et arbres fruitiers ; suivant la technique moderne et correspondante à l'état du lieu.

Article 3 : La touffe de vétivers existée sur le point noir ne peut pas être éclatée qu'après deux ans et suivant la technique [illegible]

Article 4 : [illegible] point noir sera transférée définitivement [illegible] après deux ou trois ans de plantation selon sa catégorie, conformément à la convention [illegible]

Article 5 : Le prix de location de parcelle sera fixé à 90 francs Malagasy après l'expiration de ce contrat.

Article 6 : Ce contrat pourra être annulé en cas de défaillance, de négligence, d'irresponsabilité de la part de la personne responsable volontaire de l'entretien

Fait à Maha Bato le 10 Mars 2003.

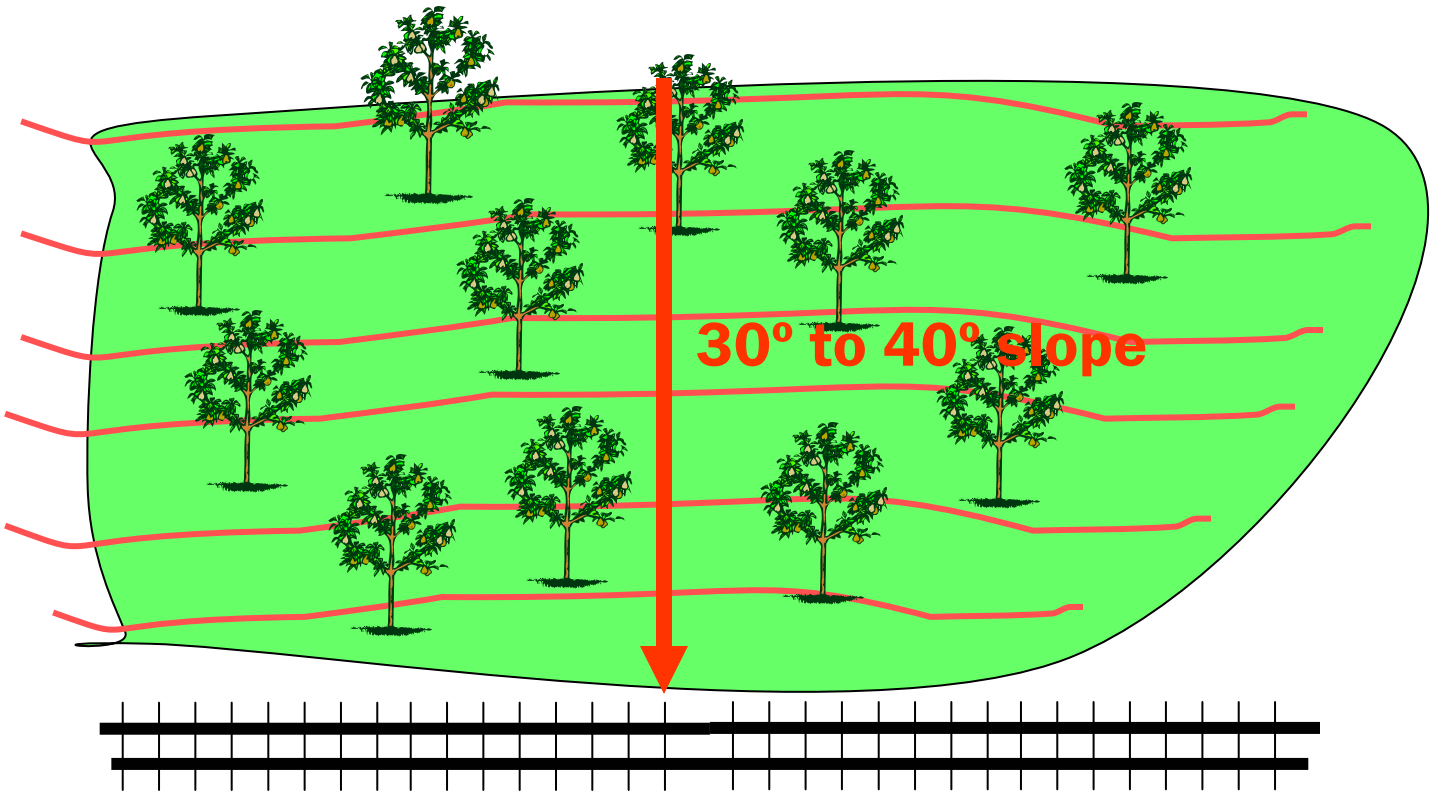
Signature

Farmer Intervention to Protect the Rail Embankments

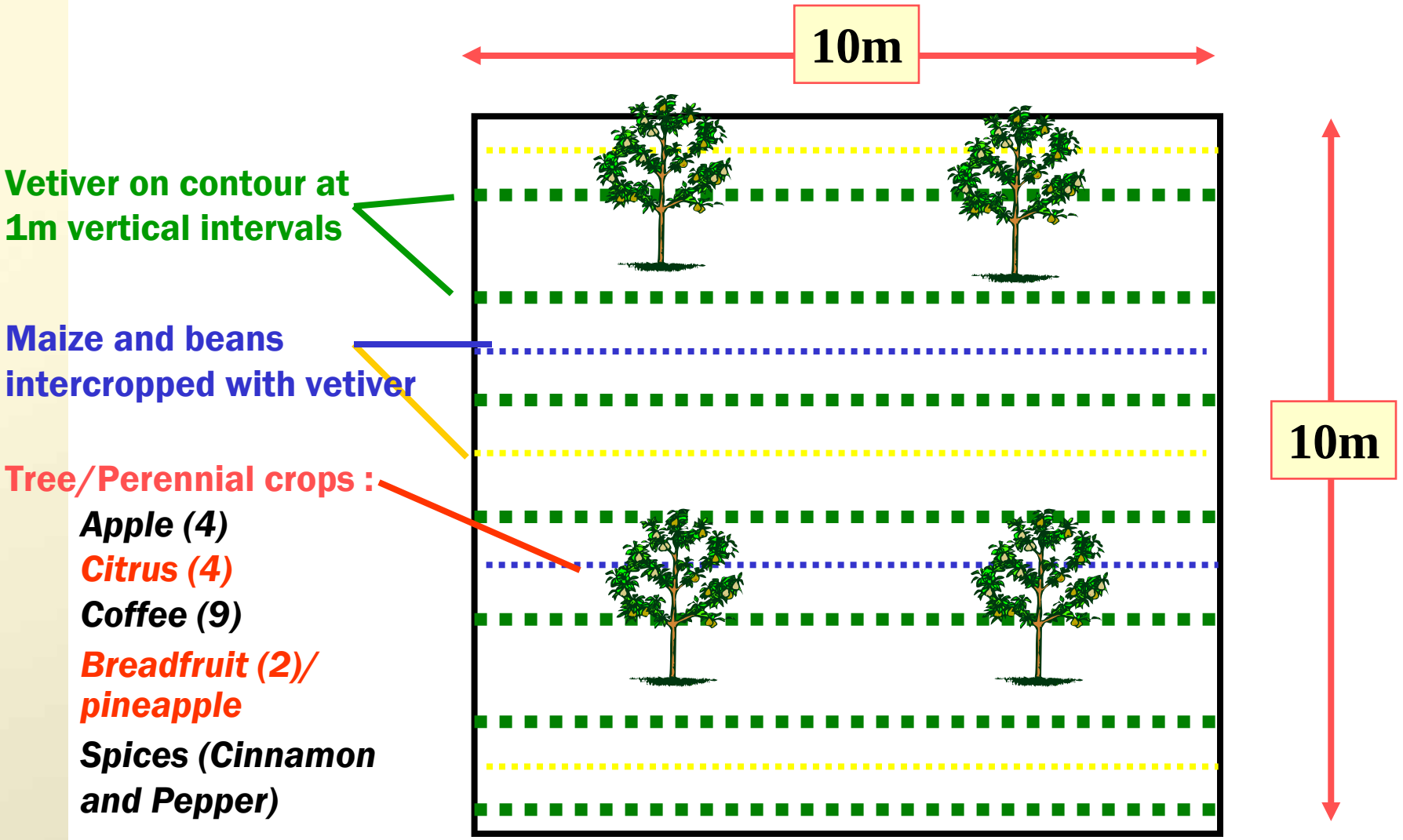
The problem: hundreds of farmers cultivating steep slopes along the railway with erosion-inducing crops (e.g. rice and cassava)

The solution: work with farmers to replace erosion-inducing annual crop systems with a vetiver-based, sustainable crop system that protects and stabilizes vulnerable batters

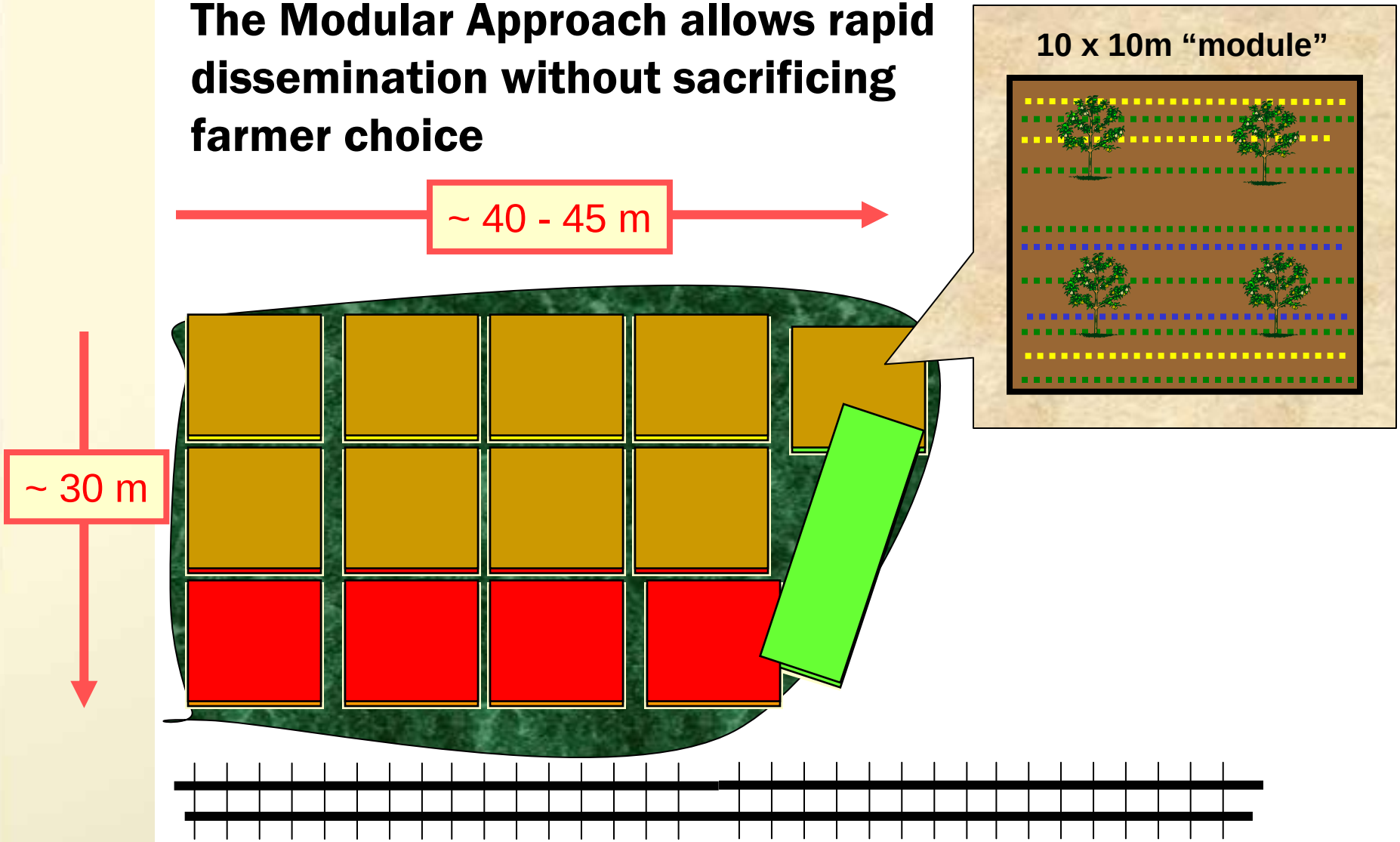
Overall Goal: **stabilize steep hill-slopes adjacent to the railway line with vetiver and fruit trees**



Modular Approach: use of 10m x 10m modules that allow each farmer to customize his/her intervention according to individual needs and preferences



The Modular Approach allows rapid dissemination without sacrificing farmer choice



Farmer A :
4 spice, 4 citrus, 4 apple, 2 breadfruit

Farmer B :
9 coffee, 1 breadfruit, 4 apple

The Vetiver-for-Vetiver Loan Scheme

Problem: the cost of vetiver was very high at the beginning because few supplies available locally

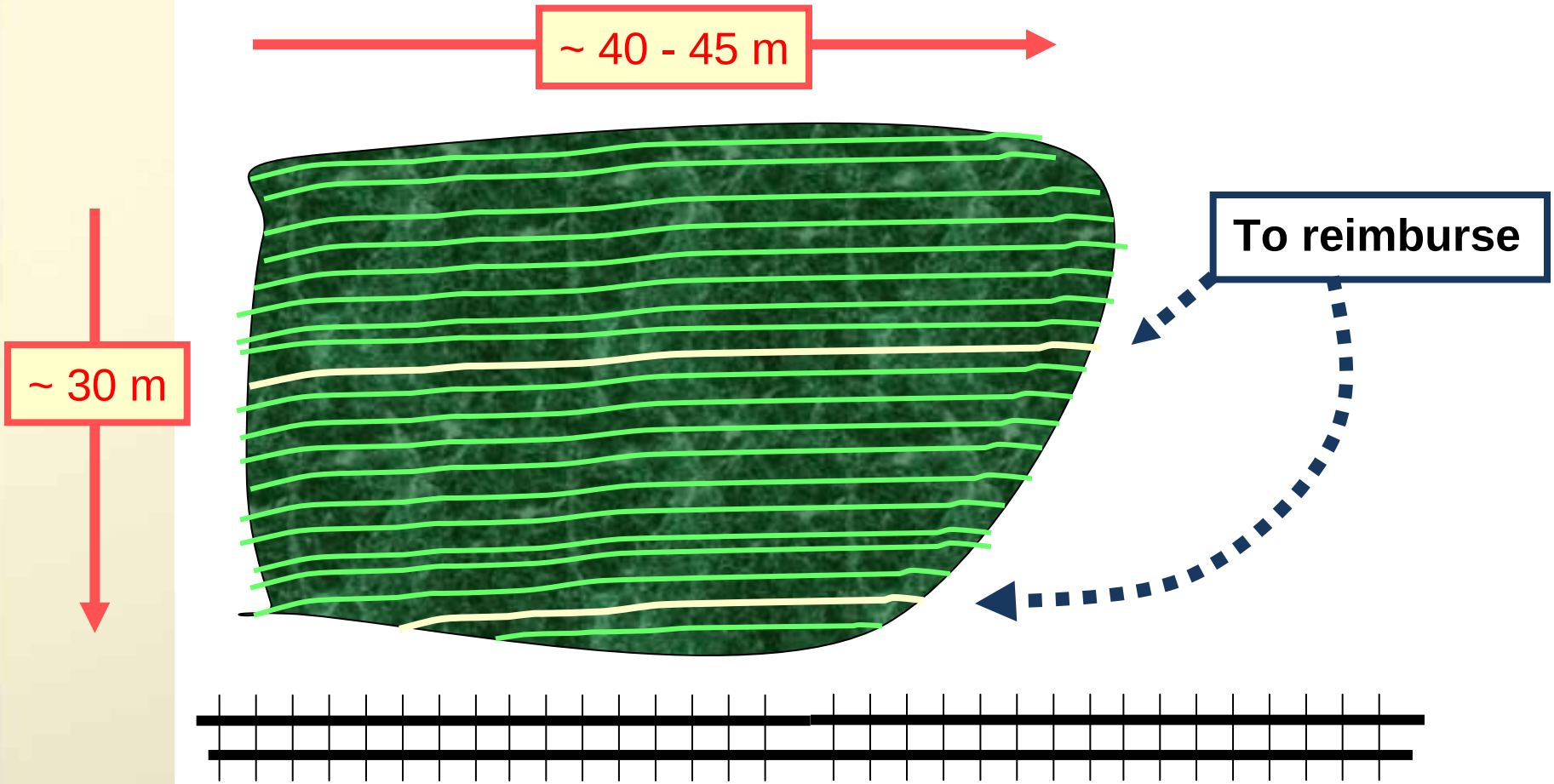
Solution: the project lends the farmer the vetiver in the first season. The farmer reimburses the vetiver in the 2nd season, passing the vetiver on to a new farmer who is joining the program … who will in turn reimburses the vetiver to another farmer the following season.

Plant 1 slip every 10 cm

In one year, slip becomes a clump of 20

Lift the clump of 20, reimburse 19 and replant 1 … until loan has been fully reimbursed

Example:
Farmer borrows 9,800 vetiver slips; will reimburse ~ 490 clumps = 1 to 1½ lines in his field of vetiver hedges



Result:

- **Project has few, if any, costs to purchase vetiver after the first year**
- **Farmers understand that they can "vetiverize" their own fields away from the train line, or help others in the village, at low cost**

Steps to Successful Farmer Slope Management on the Rail Right-of-Way

Step 1: Inform the farmers of the relationship between farming activities and landslides on the railway line and explain the proposed vetiver intervention

NB : Careful economic analysis was done to determine that the farmer would gain at least the same level of revenues from a vetiverized field as she or he had before joining the intervention

Step 2: Fields to be stabilized are identified with farmers (priority given to those that are most erosion prone and where rice or manioc was planted the previous year)

Step 3: Farmer obtains 10-year use rights to field from FCE company (all land belongs to the 50 m railway right-of-way), with clearly defined rights and responsibilities of the farmer and the FCE

Step 4: With the village agent, farmer measures the field, determines how many modules s/he can use, and selects modules according to personal choice (subject to certain technical constraints)

FICHE D'AMENAGEMENT
(Tolongoina)

Razanatsoa, Jeannette

Village VOLOHOS

PK 67+400

Dimension de la parcelle : Longueur 40 (m)hauteur 20 (m)superficie 800 (m^2)modules 08

Dessin de la parcelle :

2 citrus 2 apple 2 coffee 2 spice

Besoins en plantes :

Vétivers : 08 modules x 700 pots/mod. 5600 vetiver

Modules agrumes	02 x	1 thomson 1 Valencia 1 Clementine 1 Dancy		30 m maïs		20 m haricot	
Modules pommes	___ x	2 Anna 2 Dorsett		20 m maïs		30 m haricot	
Modules café	02 x	12 Robusta 1 Ombrage		XXX	XXX	30 m haricot	
Modules Fruits à pain	02 x	12 Robusta 1 Ombrage		30 m maïs		30 m haricot	
Modules épices	02 x	5 cannelles 10 poivres 5 tuteurs poivres		20 m maïs		20 m haricot	

Total maïs _____m _____kg Total maïs _____m _____kg

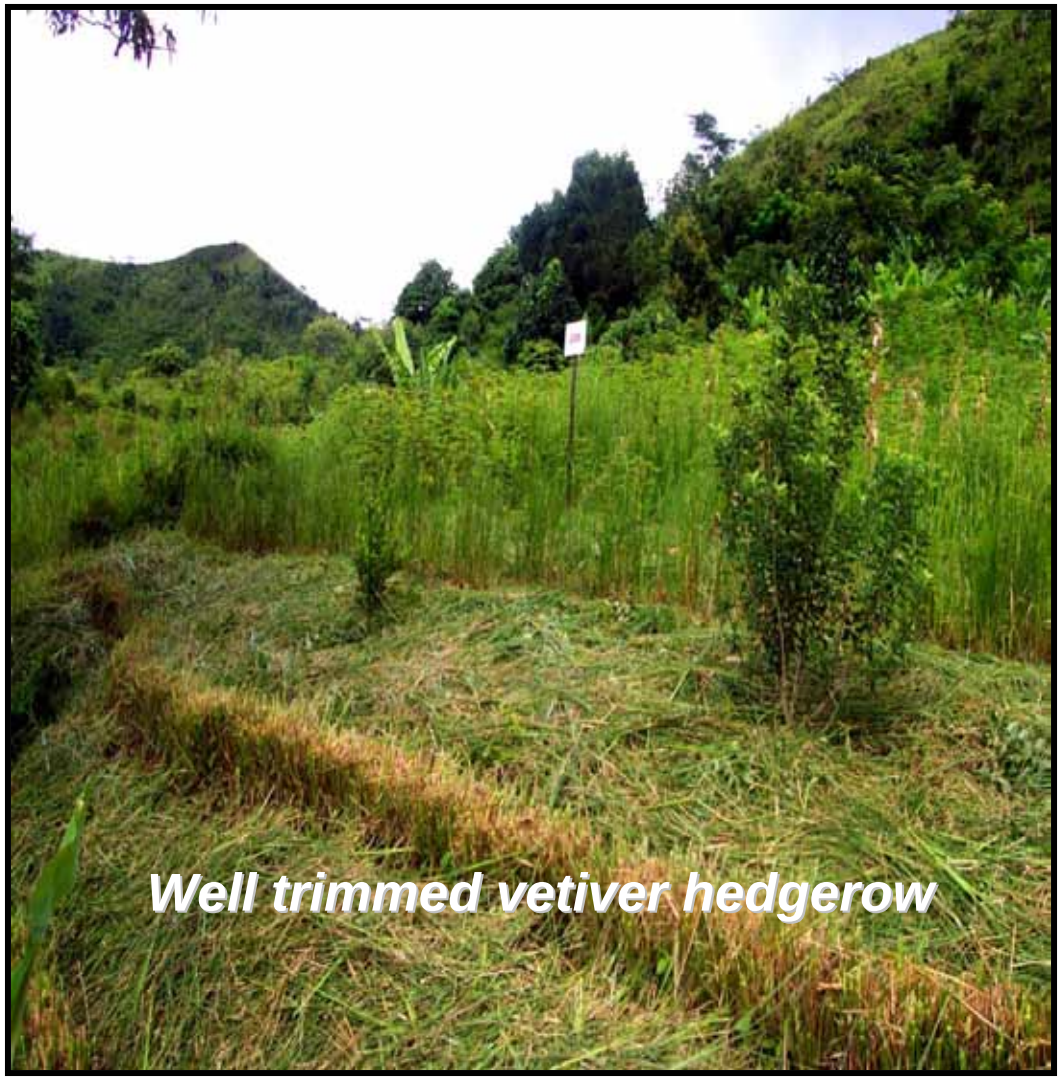
Le paysan veut emprunter les graines de maïs NON

Le paysan veut emprunter les graines de haricots NON

Step 5: Farmer clears field and plants vetiver (received as a loan from the project) on contour lines at 1-meter vertical intervals

Step 5: Farmer plants annual crops and perennial tree crops between the vetiver rows according to module “map”

Follow-up: Farmer reimburses (and replants) vetiver in second season, keeps vetiver well-pruned, correctly maintains tree and spice crops



Well trimmed vetiver hedgerow

The Results


PK 75+900

The Results

- 627 farmers participated in intervention (with waiting list)

- 2.6 million vetiver slips planted in 3 ½ years

- Farmers away from the line now beginning to adopt techniques on slopes away from the railway

- Each stabilized field along the line now serves as vetiver nursery" if the railway or other projects need to buy vetiver

(farmers can sell their vetiver after reimbursing the loan as long as they replant a slip for every clump removed)

- The price of vetiver in the province has dropped from approx US $4 per clump of 25 slips to ~ $0.30/clump.

In 2004, despite torrential rains, the FCE had *no landslides* that closed the line for > 1 day.

Farmer Jaonary Ralaivao before:

- deep poverty, no cattle, food insecure for several months a year
- erosion on field meant annual landslips with loss of crops

Farmer Jaonary after:

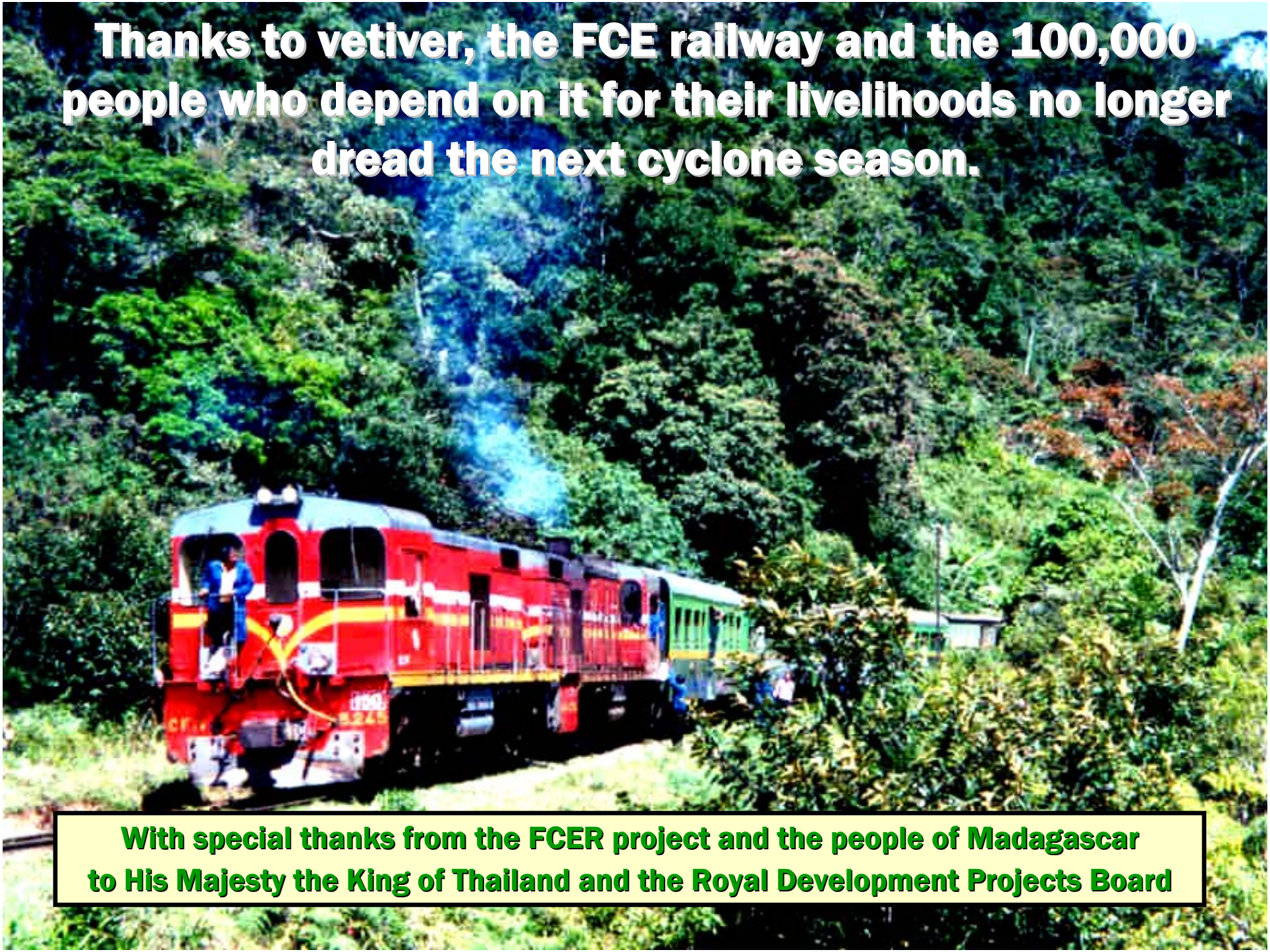
✓ family is food secure

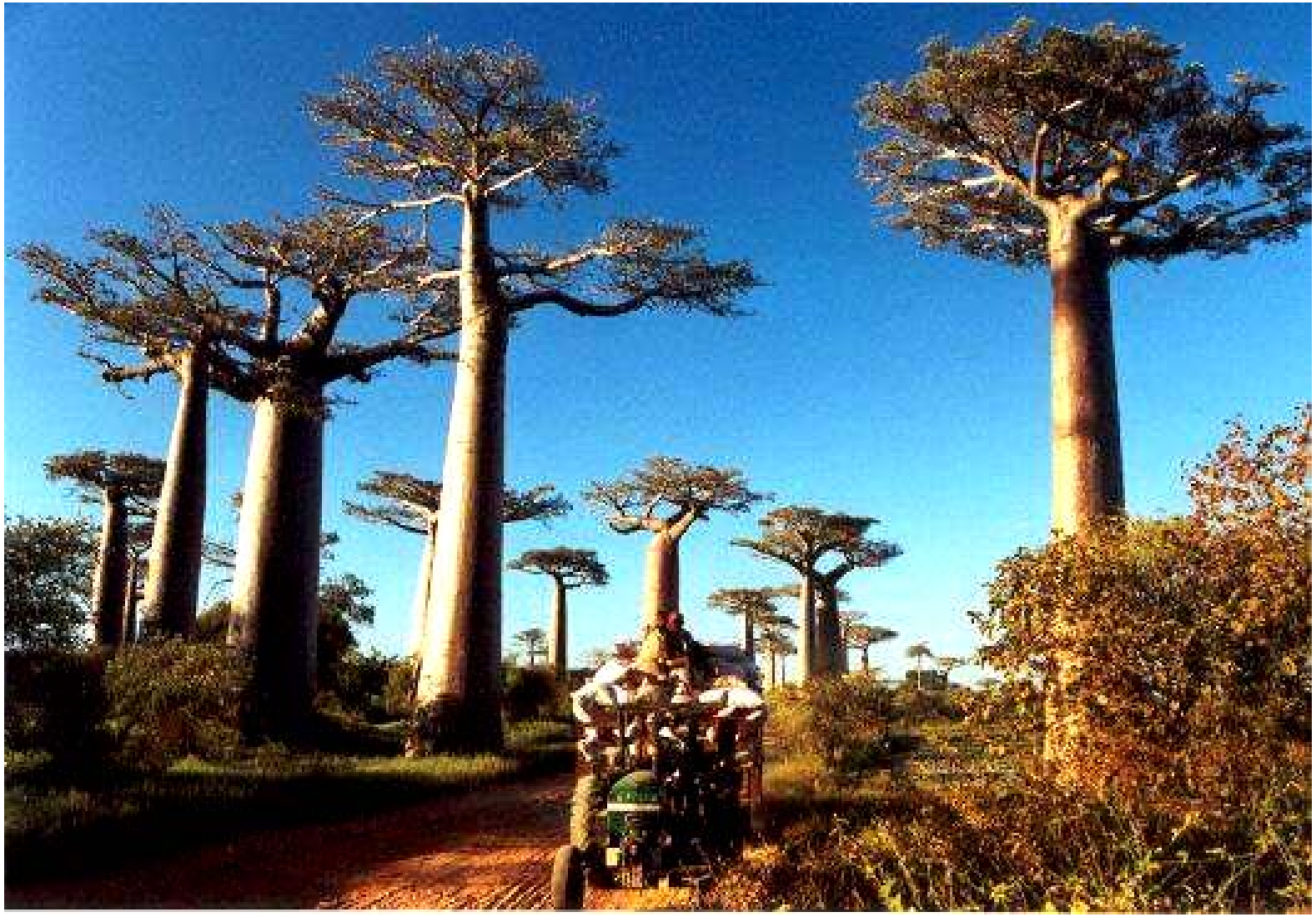
✓ has sold vetiver to buy a cow; his wife now sells milk in the village

✓ has had no landslips or loss of crops since the field was vetiverized

✓ has on his own initiative vetiverized a cassava field away from the train line

✓ has become a respected local farmer due to his leadership in vetiver


Thanks to vetiver, the FCE railway and the 100,000 people who depend on it for their livelihoods no longer dread the next cyclone season.
With special thanks from the FCER project and the people of Madagascar to His Majesty the King of Thailand and the Royal Development Projects Board



Thank You