Agrobiodiversity and agroecological intensification in Yunnan

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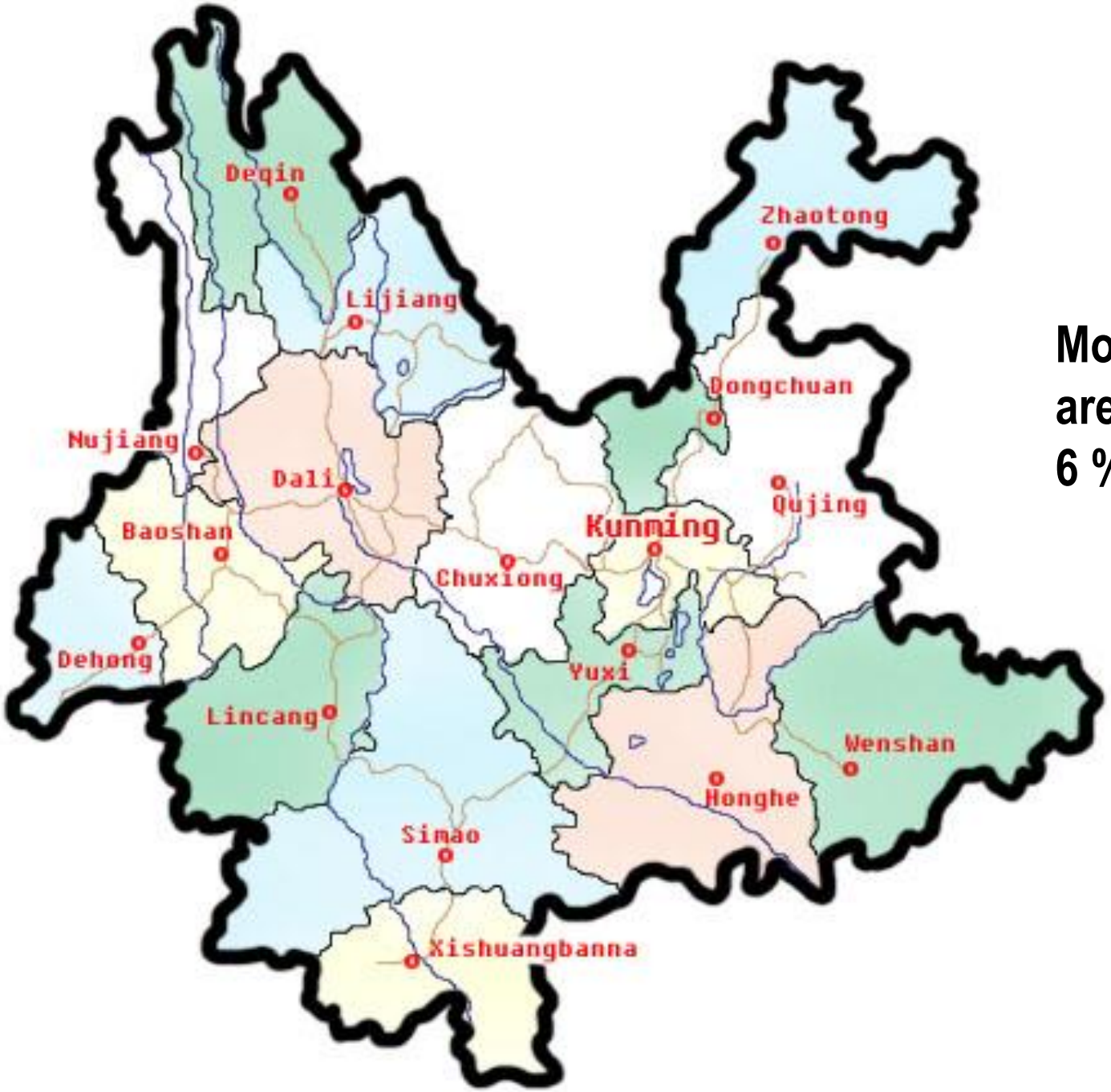
Map of China

Locations of provinces, autonomous regions and municipalities.

Islands of South China Sea

Islands of South China Sea

Heilongjiang
Jilin
Liaoning
BEIJING
Tianjin
Hebei
Inner Mongolia
Xinjiang
Gansu
Ningxia
Shanxi
Shandong
Qinghai
Henan
Jiangsu
Shaanxi
Shanghai
Tibet
Sichuan
Anhui
Hubei
Zhejiang
Chongqing
Jiangxi
Hunan
Guizhou
Fujian
Yunnan
Taiwan
Guangxi
Guangdong
Hong Kong
Hainan



Mountainous area 94 %, only 6 % basin areas

To alpine meadows of the Baima

Tropical rainforest of the Xishuangbanna

6740m

梅里雪山

高山草原

4,300

高山灌木林

4,100

針葉林

針葉闊葉混合林

3,200

常緑闊葉林

475m

版纳

Vertical ecosystem spectra of the Lancang Valley

Challenges in Yunnan Agriculture

◆To develop agroecological system with plateau characteristics

◆To explore a path of agricultural modernization with characteristics of Yunnan

Biodiversity of Yunnan

Biological diversity of Yunnan includes geographical landscape diversity, meteorological climate diversity, ecological diversity and ethnic cultural diversity.

25 ethnic groups (15 unique in Yunnan)

Miao, Hani, and Dai ethnic groups in Yunnan

Local policy support in Yunnan

◆To take full advantage of the unique Yunnan geographical advantages, advantages of climate, rich in species biodiversity

◆To build the competitive green brand of agricultural products

◆To enhance the power and vitality of agricultural development efforts with agricultural modernization in Yunnan plateau characteristics

Local policy support in Yunnan

Promote the " Plateau granary, featured crops, mountain animal husbandry, freshwater fisheries, efficient forestry, open agriculture" six specialized agriculture.

Paddy-upland rotation

Paddy -upland rotation (rice and wheat) has a long history of planting.The earliest detailed records appeared in Fan Shu, "the book of Yunnan" in the Tang Dynasty, Fan Chuo seven. (about AD 863).




The planting area of paddy- upland rotation in China is about 13 millionhm^2

YUNNAN 850 thousands hm^2

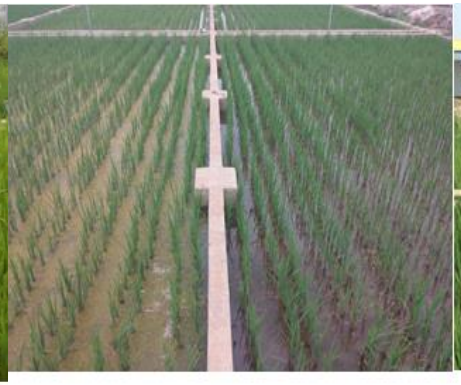
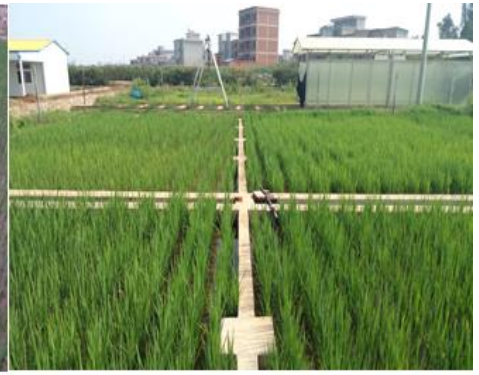
Paddy rice -upland crop rotation keep the farming system sustainabe

Paddy-upland rotation

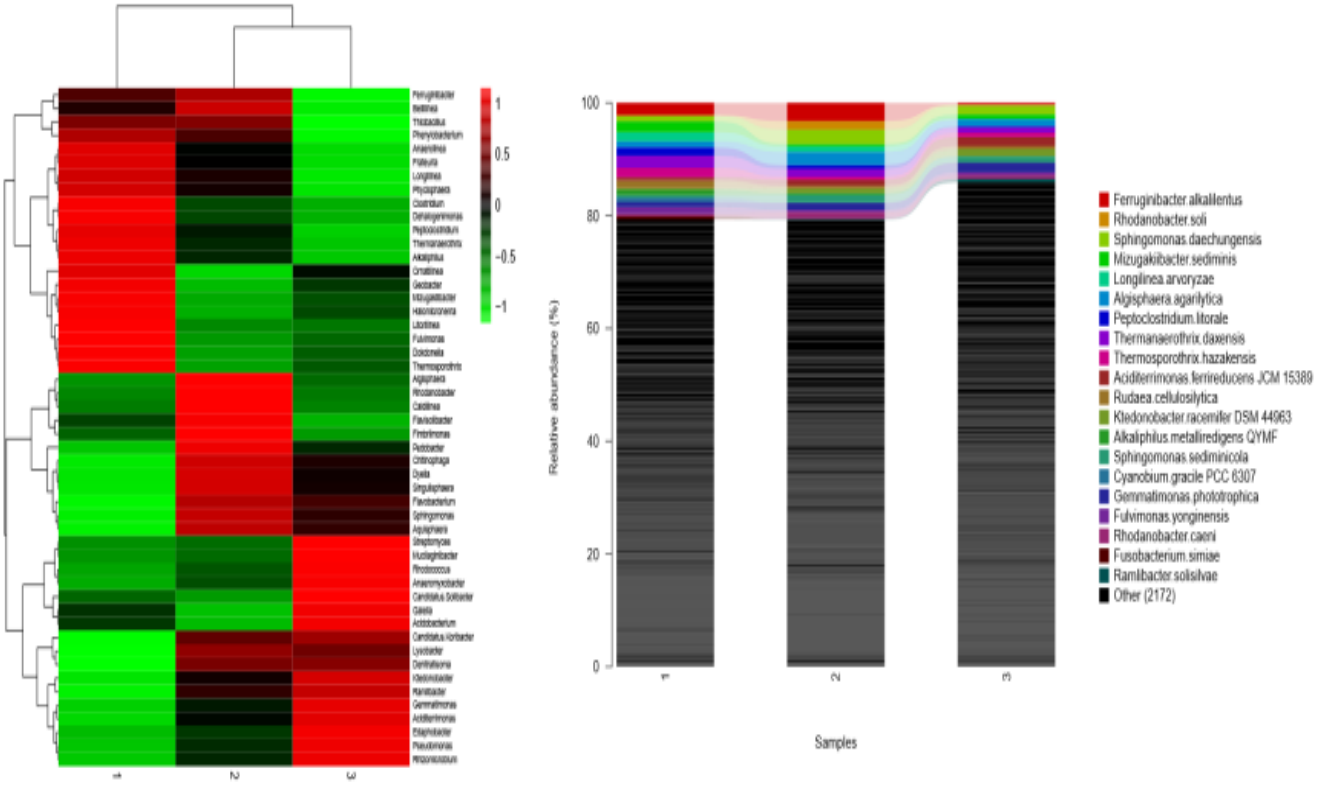
Effects of crop allocation and Optimization of fertilizer and water on crop yield and soil nutrients under the paddy rice-upland crop rotation

Five Research test sites for long-term positioning have been set up since 2012



Paddy-upland rotation can effectively reduce the incidence of some soil borne diseases（potato bacterial wilt）



Application of soil macrogenomics analyzed the dynamics of soil microbial community in rice and potato rotation region, Meanwhile, the pathogens of potato borne diseases were monitored.

Potato Ralstonia solanacearum

Rhizosphere soil microbial community structure analysis confirmed the presence of Rhizoctonia solani in the rhizosphere soil of the disease,and it is one of the initiating factors of the dead seedlings of potato.

Green manure is applied to fruit trees to reduce agricultural pollution

Orchard planting Vicia villosa Roth Var improves fertilizer utilization efficiency above 10%. Reduce the amount of fertilizer application by more than 35%; Total nitrogen, total phosphorus and ammonia nitrogen decreased by 25.06%, 20.86% and 27.27% in runoff respectively.

Green mannure to improve soil fertility and useful for other crops

Vicia villosa Roth Var(a kind of the winter season leagume green mannue, which was breeded by AERI,YAAS 40 years ago)

main nutrition content (Ranking according to N content)

No	NAME	TN(%)	TP(%)	TK(%)
8	Vicia villosa Roth Var	2.94	0.10	1.66
CK2	buckwheat straw	0.94	0.25	3.60
CK3	Mannure	1.98	0.49	1.43

Local policy support in Yunnan

◆Most areas of Yunnan are rich ecological advantage with poverty accompanying

◆The development of the use of biological diversity of ecological agriculture will remove poverty and increase livelihood for local people

Banana plantations significantly improve local farmer's livelihood

Zheng et al. (2018) FAO Proceedings of the International Symposium on Agroecology in China

Two types of banana production systems: flatland and sloping land

Zheng et al. (2018) FAO Proceedings of the International Symposium on Agroecology in China

Intensified banana production system

Zheng et al. (2018) FAO Proceedings of the International Symposium on Agroecology in China

Fusarium wilt (TR4) is one of the most crucial factors which affect China banana industry and the stability of agricultural ecosystem

In 2013 the direct economic losses reached 750 million Yuan in China, 250 million Yuan losses at Yunnan.

Case one: Yunnan

TR4 destroyed 11 hectares banana plantations

2011

2013

2014

Case two: Guangxi

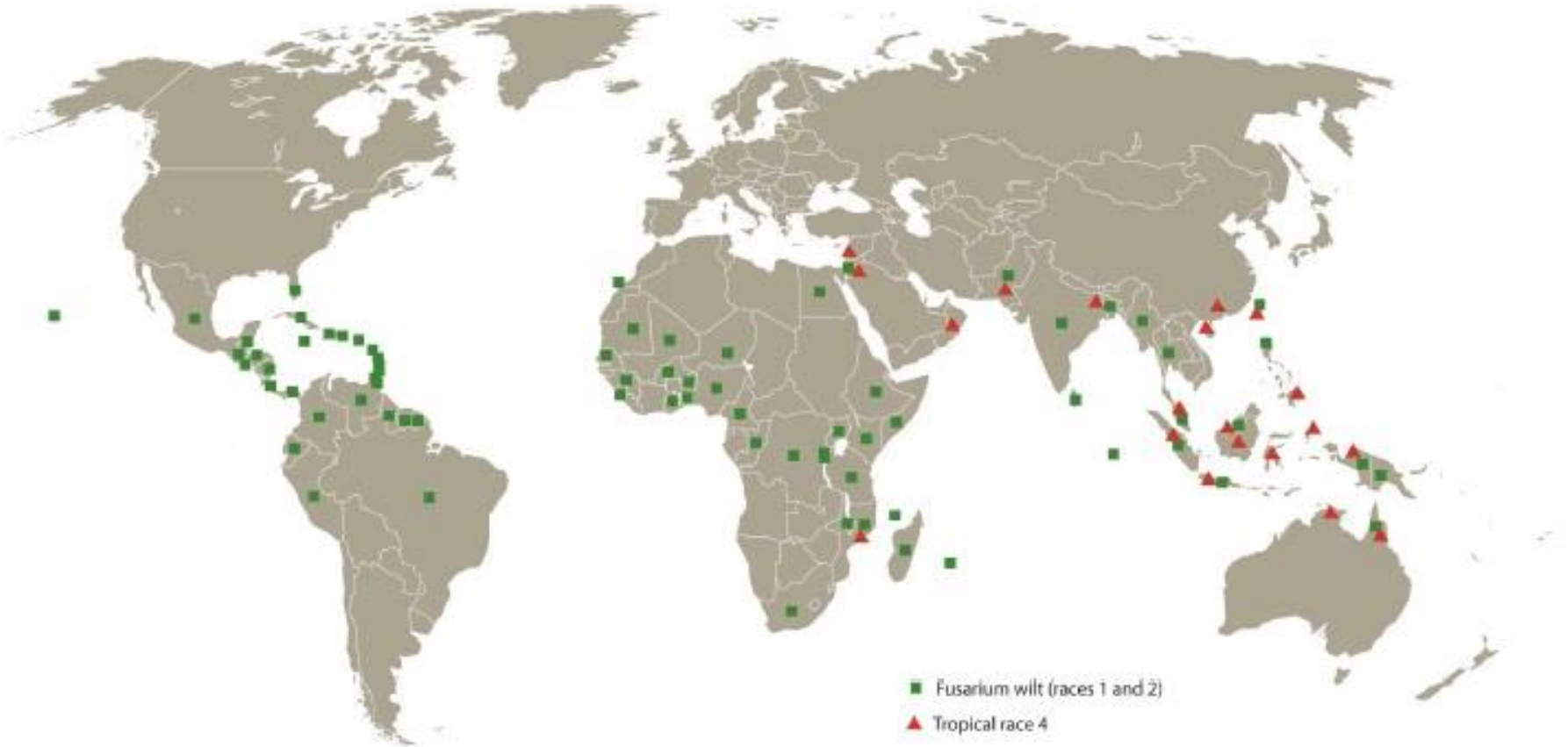
TR4 destroyed 60 hectares banana plantations

2010

2011

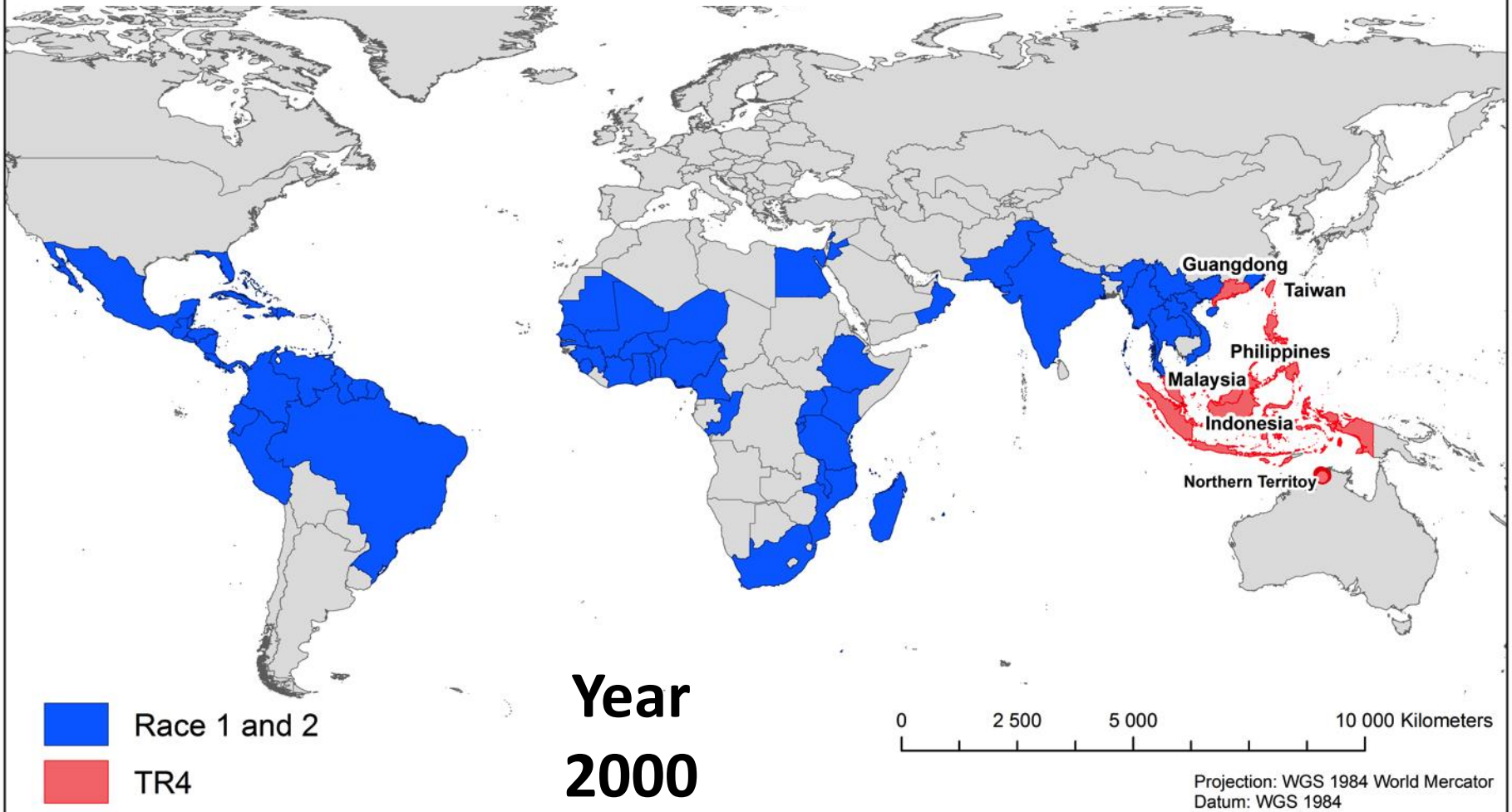
2014

Distribution of banana Fusarium wilt



TR4 keeps spreading in the banana world

- *Fusarium oxysporum* f. sp. *cubense* (Foc or Fusarium wilt Tropical Race 4) highly destructive with a long residence time in the soil



This map is an approximation of the distribution of FOC for academic purposes.
It is not based on scientific studies and should not be used by authorities for decision making purposes.

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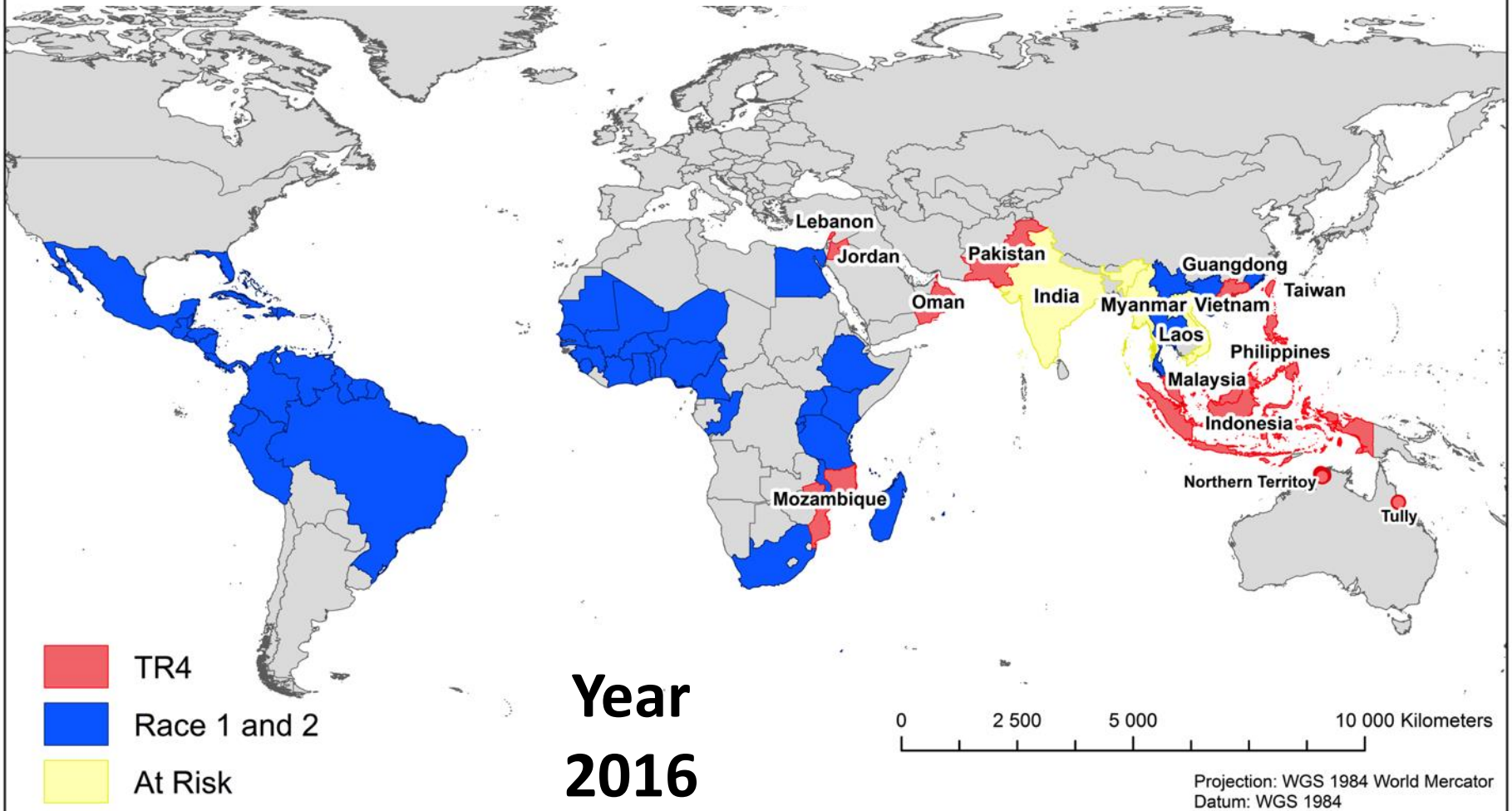

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How to manage Fusarium wilt?

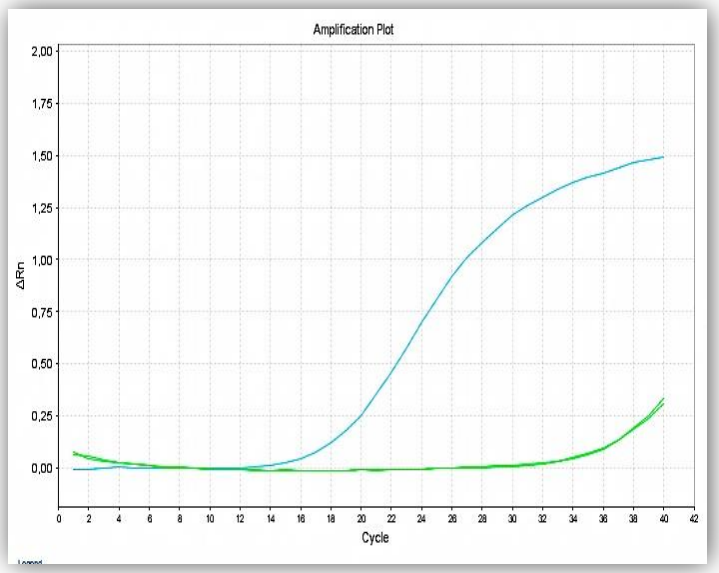
Siamak and Zheng (2018) Horticultural Plant Journal 4（5）：208-218

How to manage Fusarium wilt?

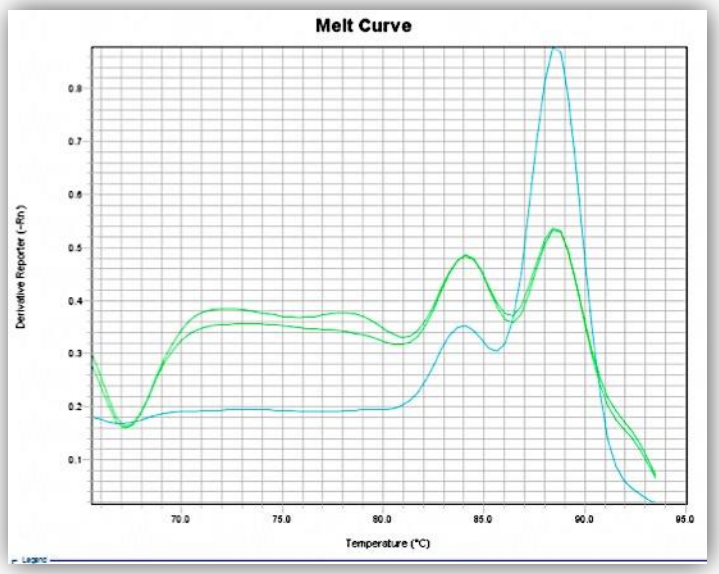
Banana from Laos, Myanmar and Vietnam to China via Yunnan custom, Vehicle disinfection

Foc TR4 Detection

Amplification curve



Melting curve



Ave. Ct value[a]	Calculated # of spores/g soil[b]
36.487	**142**

How to manage Fusarium wilt?

Fusarium wilt and its prevention and control

▲ **Indoor and outdoor workshops for training local farmers**

Banana-livestock integrated system

Zheng et al. (2018) FAO Proceedings of the International Symposium on Agroecology in China

Livestock – Waste – Banana ecological recycling production system






Zheng et al. (2018) FAO Proceedings of the International Symposium on Agroecology in China

Breeding New Variety for TR4 Resistance

Selection best plants in TR4 heavily infected field

Breeding New Variety for TR4 Resistance

Meristem culture

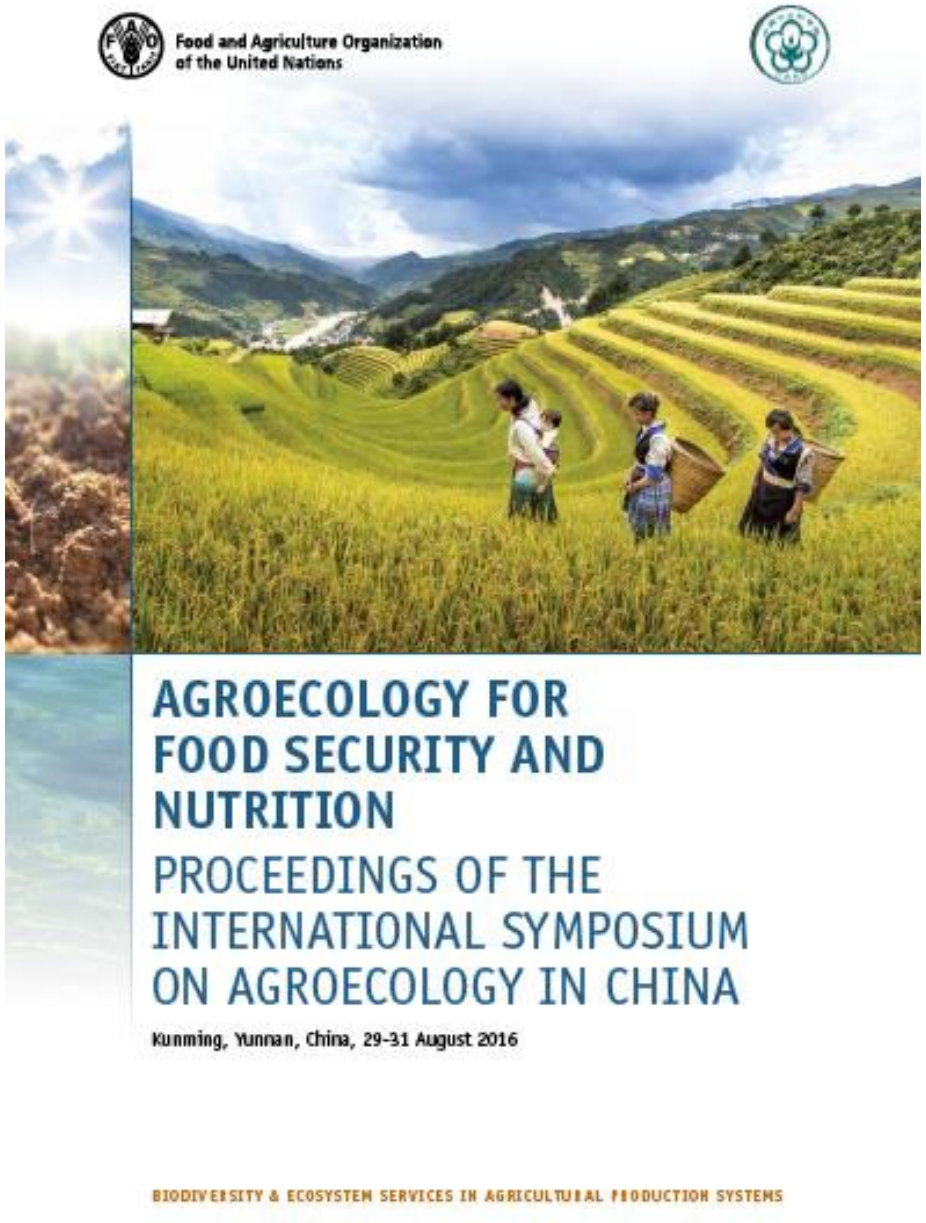
In -vitro propagated seedlings

Breeding New Variety for TR4 Resistance

Banana seedlings

growing in nursery

New resistant line performance in the field



"Agroecology for food security and nutrition. Proceedings of the International Symposium on agroecology in China"

You can find the document here: http://www.fao.org/3/CA0153EN/ca0153en.pdf

Thank You!

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Science and Technology Department of Yunnan Provincial Government