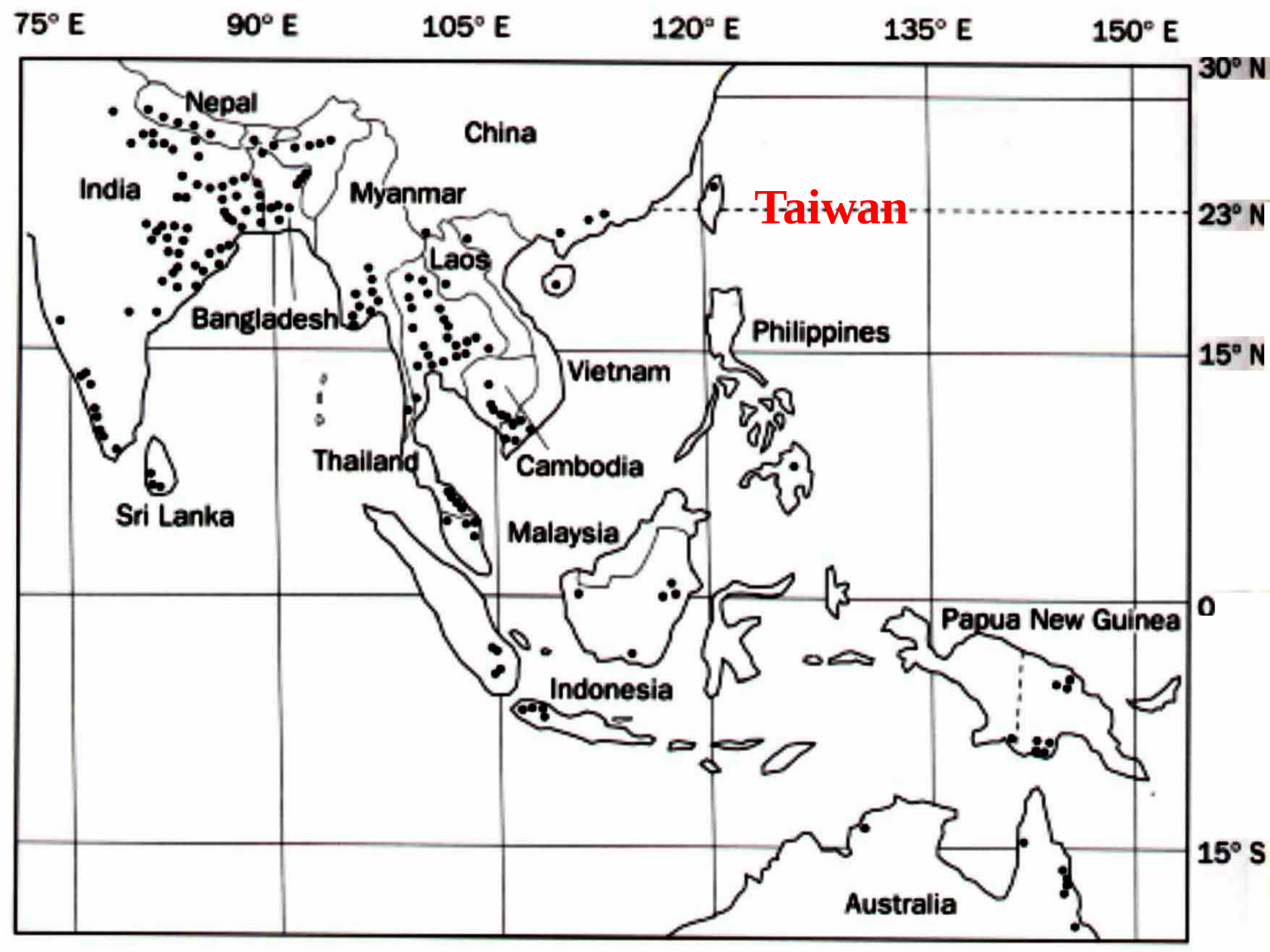
IRRI 研習水稻農業生態系中鼠害、蟲害及雜草之生態管理


75° E
90° E
105° E
120° E
135° E
150° E
30° N
23° N
15° N
0
15° S
Nepal
China
India
Myanmar
Taiwan
Laos
Bangladesh
Philippines
Vietnam
Thailand
Cambodia
Sri Lanka
Malaysia
Papua New Guinea
Indonesia
Australia

國際稻米研究所(IRRI)簡介

IRRI是一個獨立的非營利研究和教育機構，成立於1960年，總部位於菲律賓首都馬尼拉南方 62 公里處之 Los Baños，是聯合國國際農糧組織 (FAO) 最早且最大的國際稻米研究單位，在亞洲和非洲的17個稻米生產國設有辦事處，員工人數超過1,000人。

IRRI

成立最主要的目標乃在於藉由稻作試驗及品種改良以減少貧窮、飢餓，並改善農民及消費者之健康，透過國際合作推展農業研究、確保稻米生產之穩定、提供相關訊息及稻米知識的入口平台，並協助稻米研究人員，提供及保存相關之遺傳材料等。

IRRI

為了達到目標，IRRI已蒐集超過 40,000 份種原，包括地方品種和野生稻，以及累計高達 18 萬份雜交組合，作為水稻試驗改良之基礎。投入超過 1,100名研究及支援人員，合計執行 21 個計畫項目，並提供碩博士養成及短期研究人員教育訓練。IRRI為一非營利之農業研究單位，因此目前的經費大多由國際農業發展基金、世界銀行、會員國國家及私人基金會所提供。

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IRRI 每年都會舉辦有關水稻育種、栽培、收穫及病蟲草害防治技術之短期訓練課程，對象為來自世界各地面臨同樣挑戰的參與者。

國際合作緣由

藉由參加IRRI設計的水稻育種計畫課程，希能建立與國外研究單位群的合作及互訪機會，引進水稻抗逆境品種及害蟲偵測等技術，並將國外已建立的分子標誌輔助回交育種方法，迅速引入台灣育種研究中，期望增加國內水稻計畫對氣候變遷的因應措施。

國際合作目的

除了加速引進國際水稻抗逆境、抗病蟲害種原，並且研習水稻育種新技術與策略；也希望與該中心研究人員和各國參加人員進行交流，考察現行水稻育種策略規劃和實施技術，藉以提昇國內稻米生產及稻作育種之水準。



How to describe a rodent?

Animalia Chordata Mammalia Rodentia Muridae

動物界 脊索動物門 哺乳綱 嚙齒目 鼠科

主要特徵為上下顎各有一對門牙，但缺少犬齒

Rodents

42% of species of mammals are rodents

2,270 species

(Singleton *et al.*, 2001)

Is the only good rat a dead rat?

THE GOOD
– Medical & Biomedical research

(Singleton *et al.*, 2007)

Rodents: Ecosystem service

1. Influence nutrient cycling
2. Promote dispersal of seeds
3. Food for predators & scavengers

(Singleton *et al.*, 2004)

THE BAD

老鼠每天可取食相當其10-15%體重的穀物。


其排泄物所造成的穀物污染則更多，估計為其取食危害的3-5倍。
Post harvest losses

老鼠危害水稻田

Typical rat damage to rice

追蹤老鼠及記錄

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老鼠棲息地

捕鼠器

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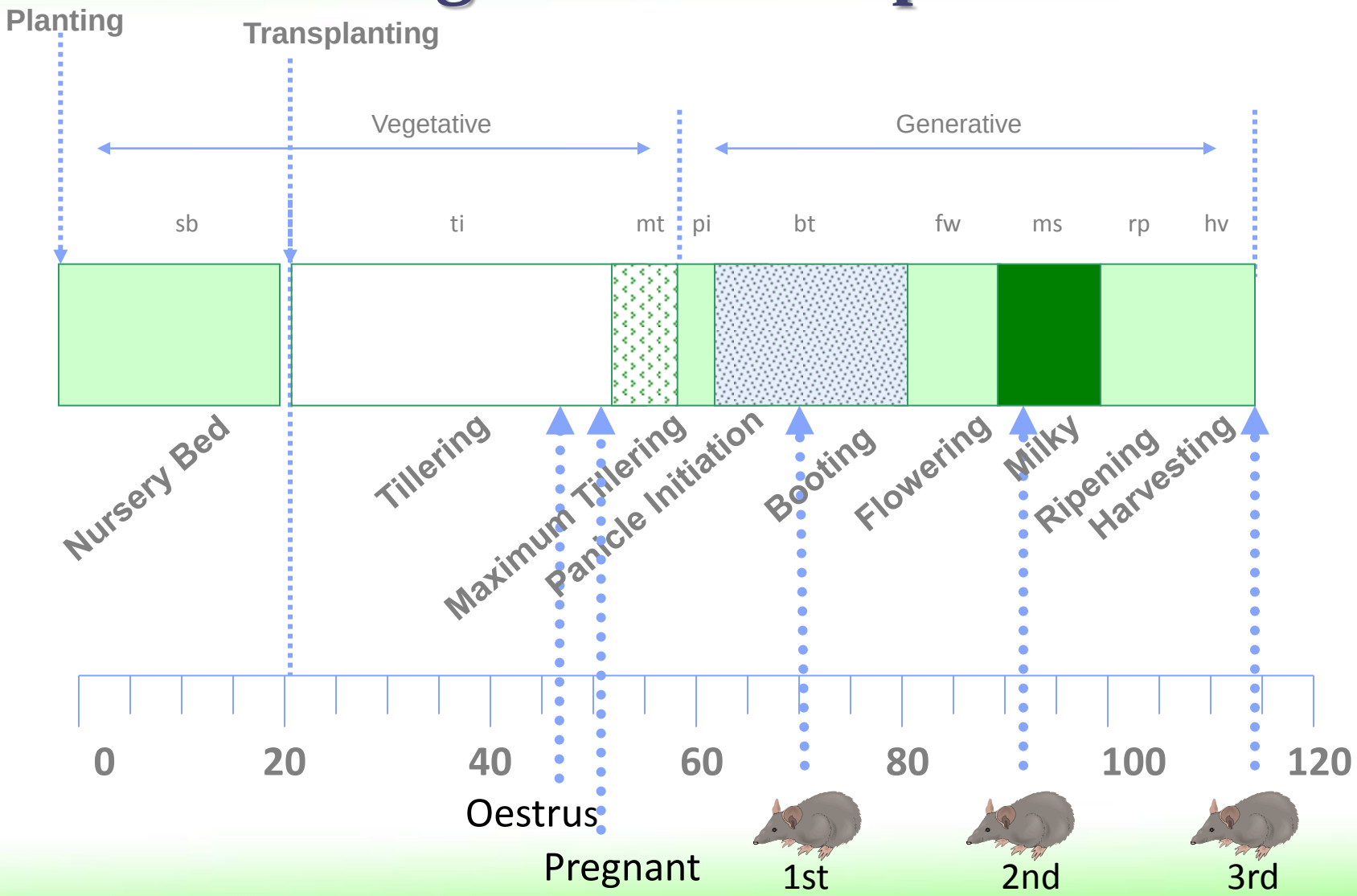
觀察老鼠

Breeding Vs Rice Crop Timeline



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陷阱阻隔系統

行政院農業委員會 桃園區農業改良場
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社區(區域)陷阱阻隔系統

https://sites.google.com/site/rodentmanagement/home

Rice agroecosystems

-太陽、石油

-人類選汰

-中至低等

Energy sources, Material flow, Energy flow, Interactions between components, Function/Service

“Almost overnight …”

Image: Sylvia Villareal, IRRI

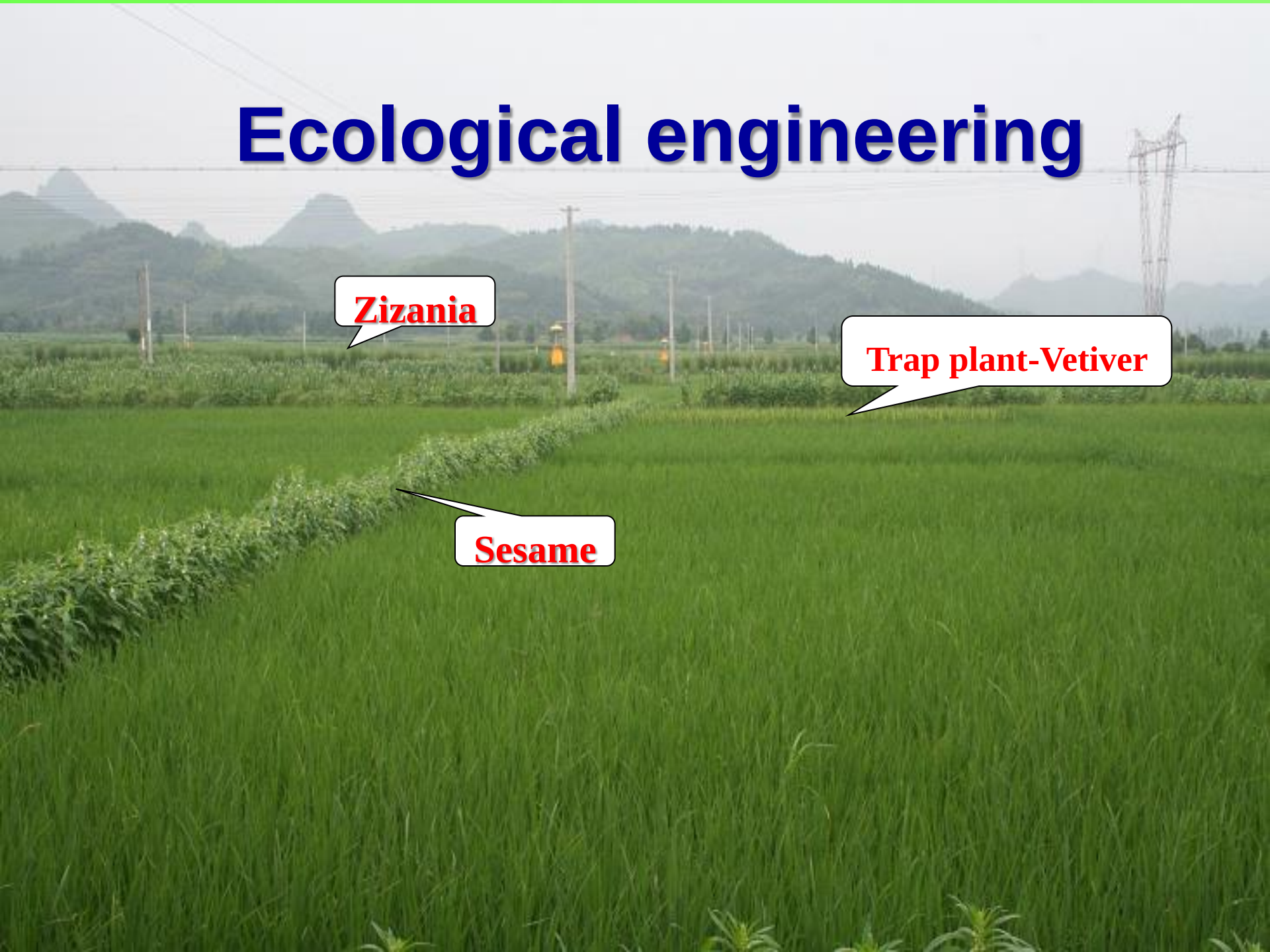
Complex habitat conserves natural enemies and, consequently, enhances pest regulation at field scale.

Ecological engineering

Ecological engineering

Ecological engineering

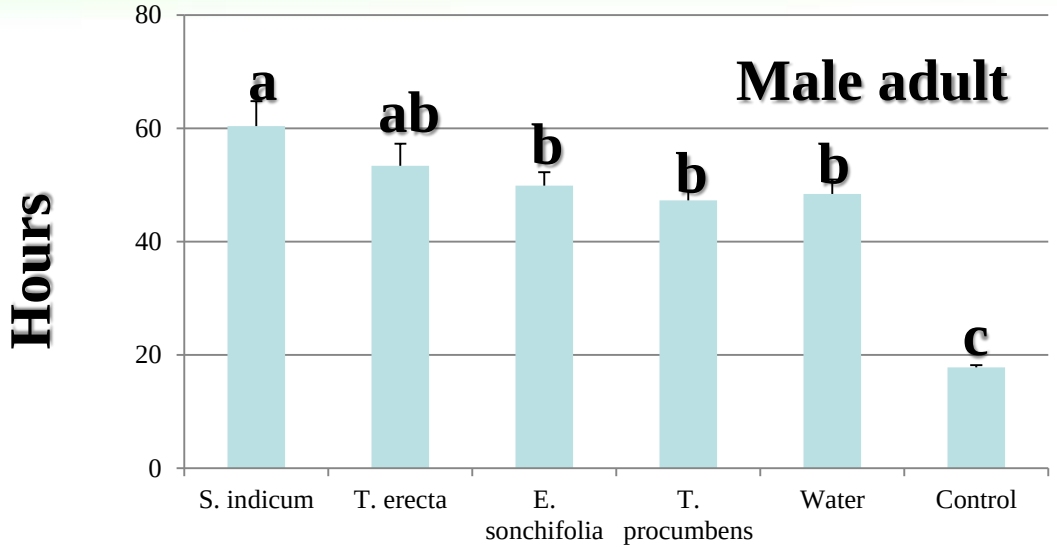
Ecological engineering

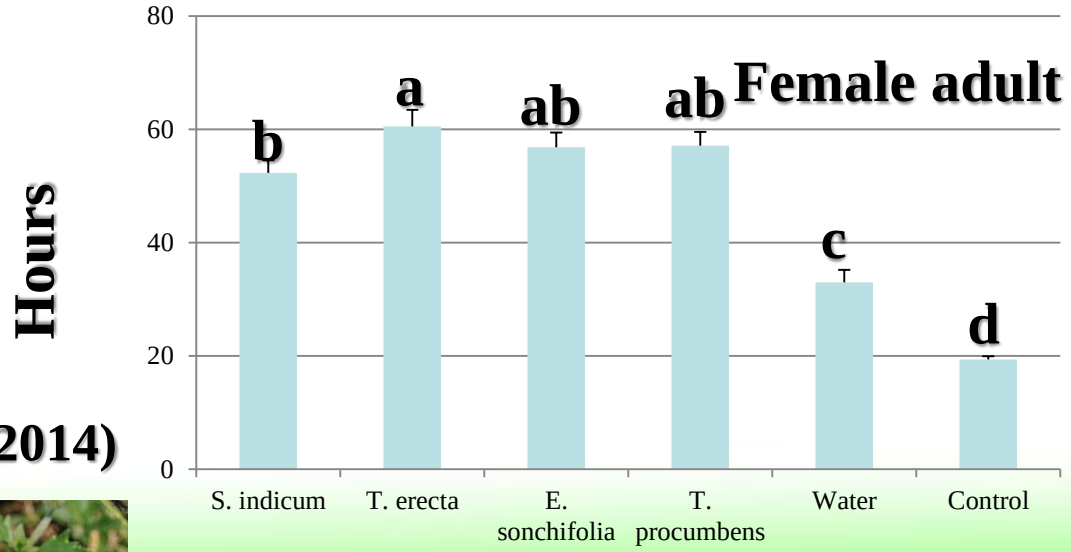


Flowering plants increased the longevity of *C. lividipennis*

Mirid bug

(*Cyrtorhinus lividipennis*)





(Zhu *et al.*, 2014)

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Vegetable flowers and rice natural enemies

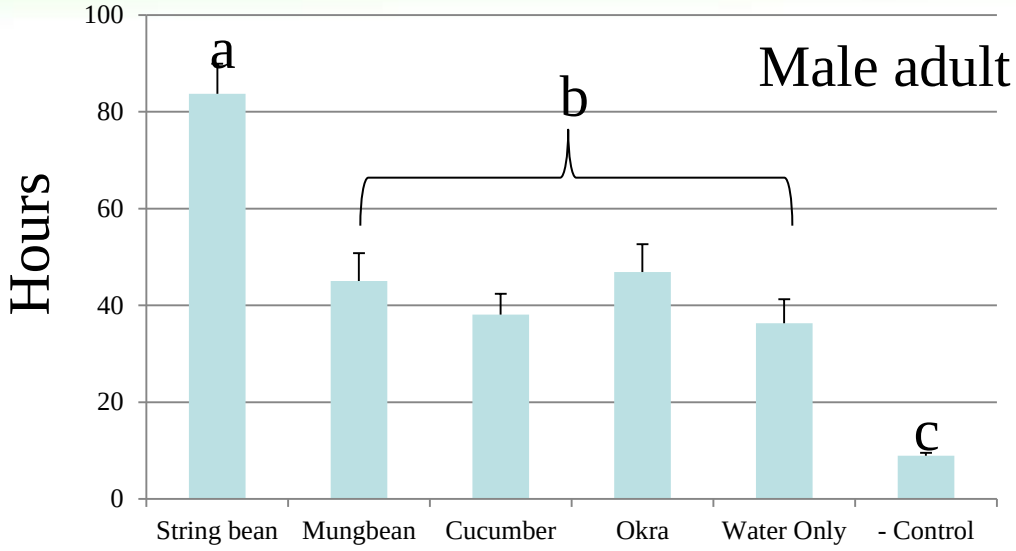
cucumber

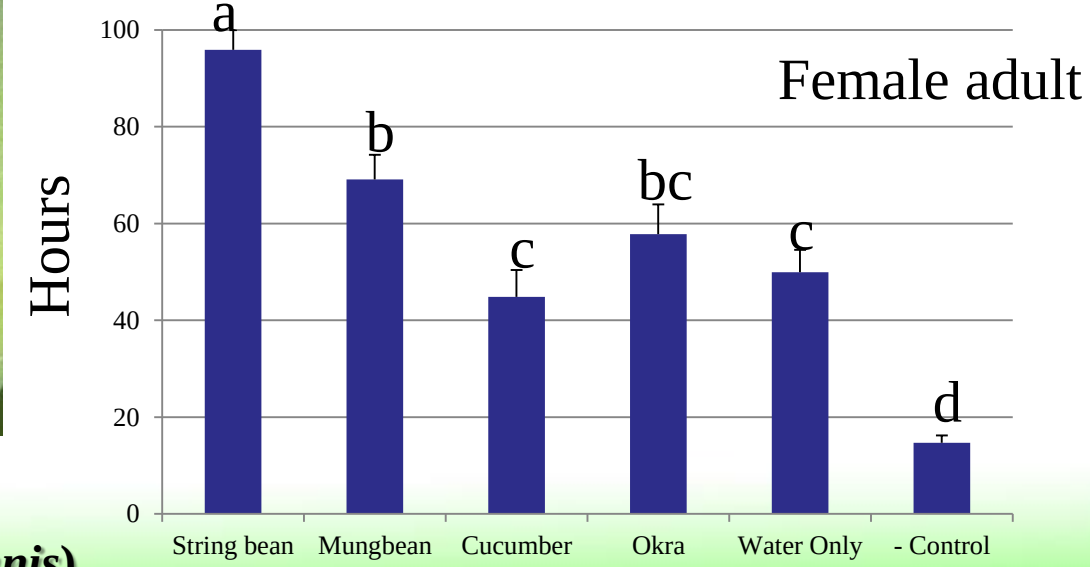
okra

string bean

Mirid bug

(*Cyrtorhinus lividipennis*)





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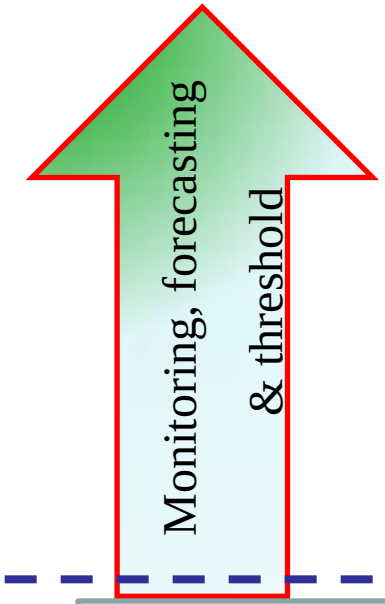
水稻害蟲綜合管理體系架構



4th phase: Selective insecticides (e.g. juvenile hormones, microbials, botanicals)

3rd phase: Inundative and inoculative biocontrol (e.g. entomopathogenic fungi, nematodes and viruses)

As needed (infrequent)

2nd phase: Habitat manipulation to enhance natural enemy impacts on pest populations (ecological engineering)

1st phase: Cultural practices that prevent economically damaging levels of pest injuries (e.g. resistant and tolerant varieties, planting date and water level manipulation, Nitrogen fertilizer management, trap cropping etc.)

Standard practice

(Zehnder *et al.*, 2007)

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田間蟲體調查

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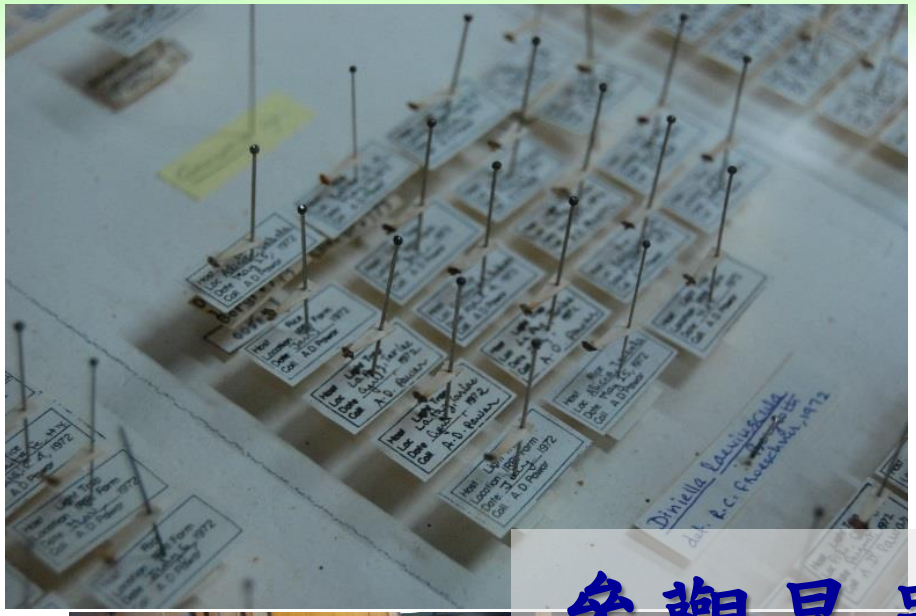
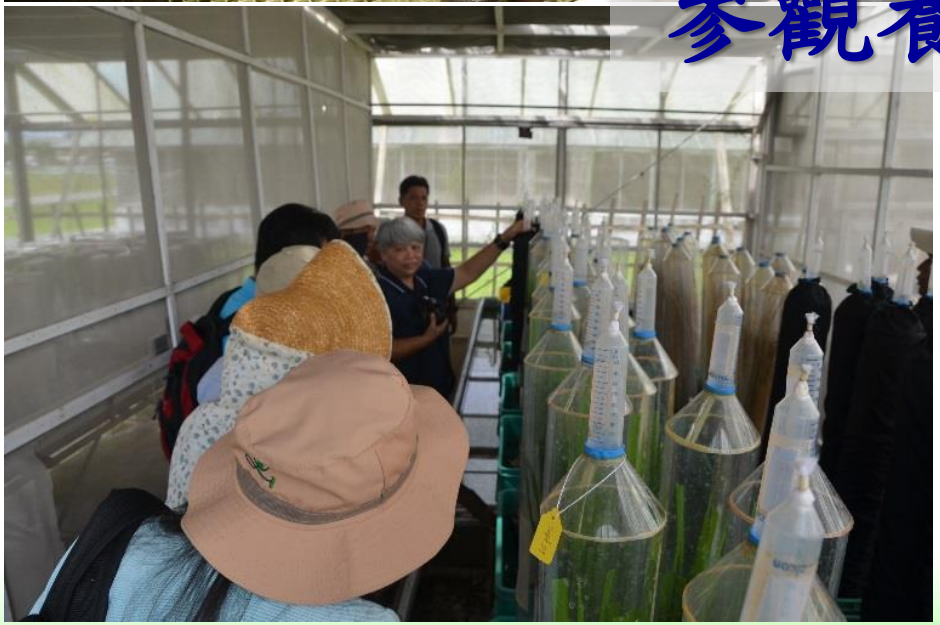
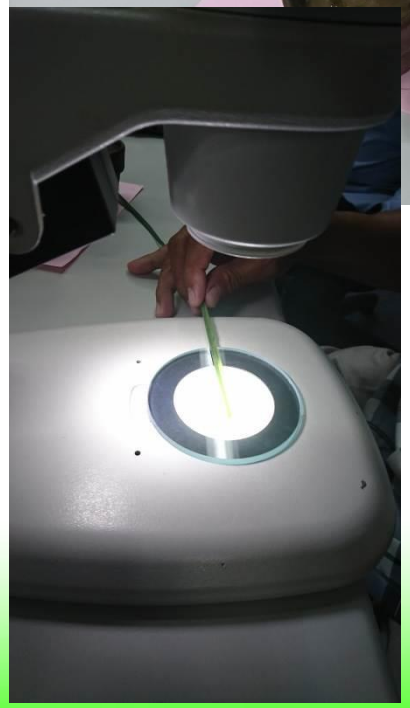


參觀昆蟲研究室

參觀養蟲溫室



觀察卵寄生蜂



雜草是什麼?

從生態的立場，雜草只不過是尚未被人類有效利用的植物，與一般生活在大自然環境的植物並無不同，人們不應該將雜草視為異類除之而後快，雜草是環境中生物多樣性的一環。

雜草根據葉型態分類

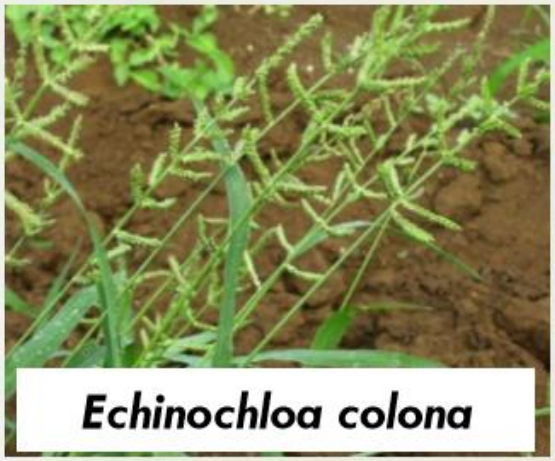
認識雜草


BROADLEAF WEEDS
SEDGES
LOWLAND WEEDS


BROADLEAF WEEDS
GRASSES

Major Weeds of Rice-Grasses

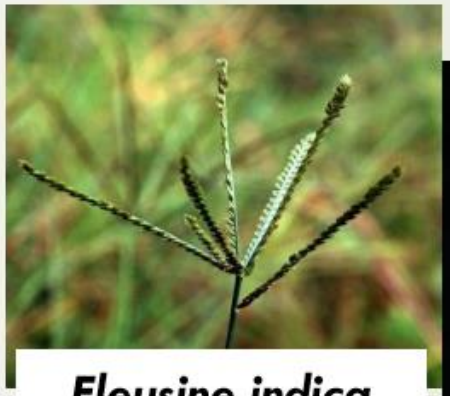
Echinochloa crusgalli



Echinochloa colona

Paspalum distichum

Leptochloa chinensis



Eleusine indica

Ischaemum rugosum

Dactyloctenium aegyptium

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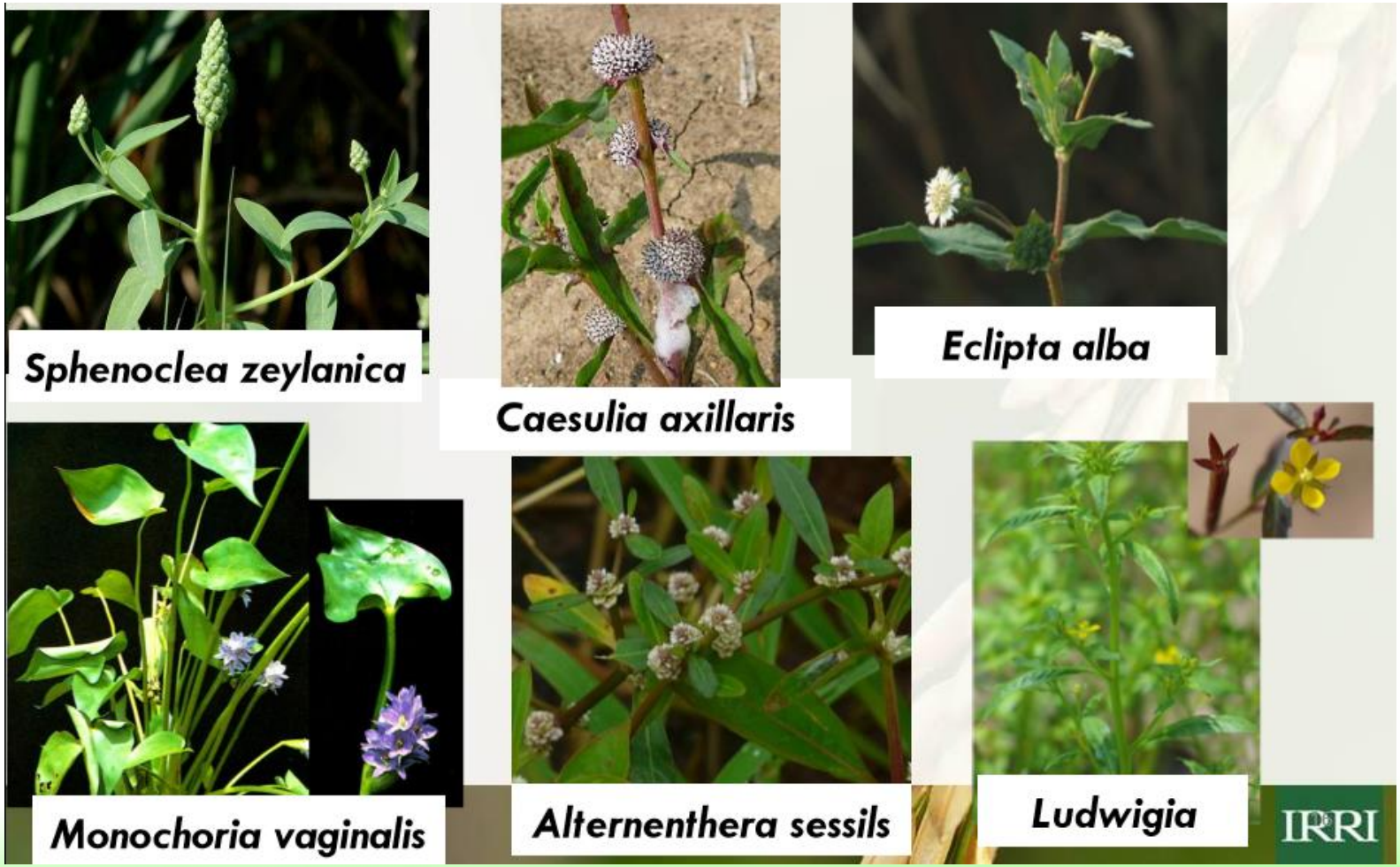
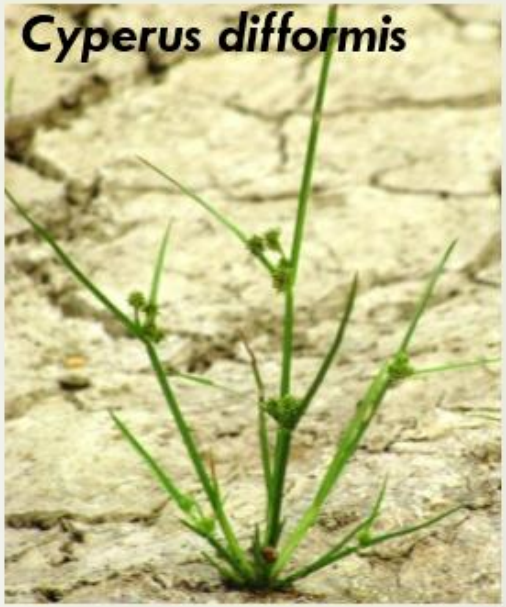
分辨稗草與水稻

Major Weeds of Rice-
Broadleaved

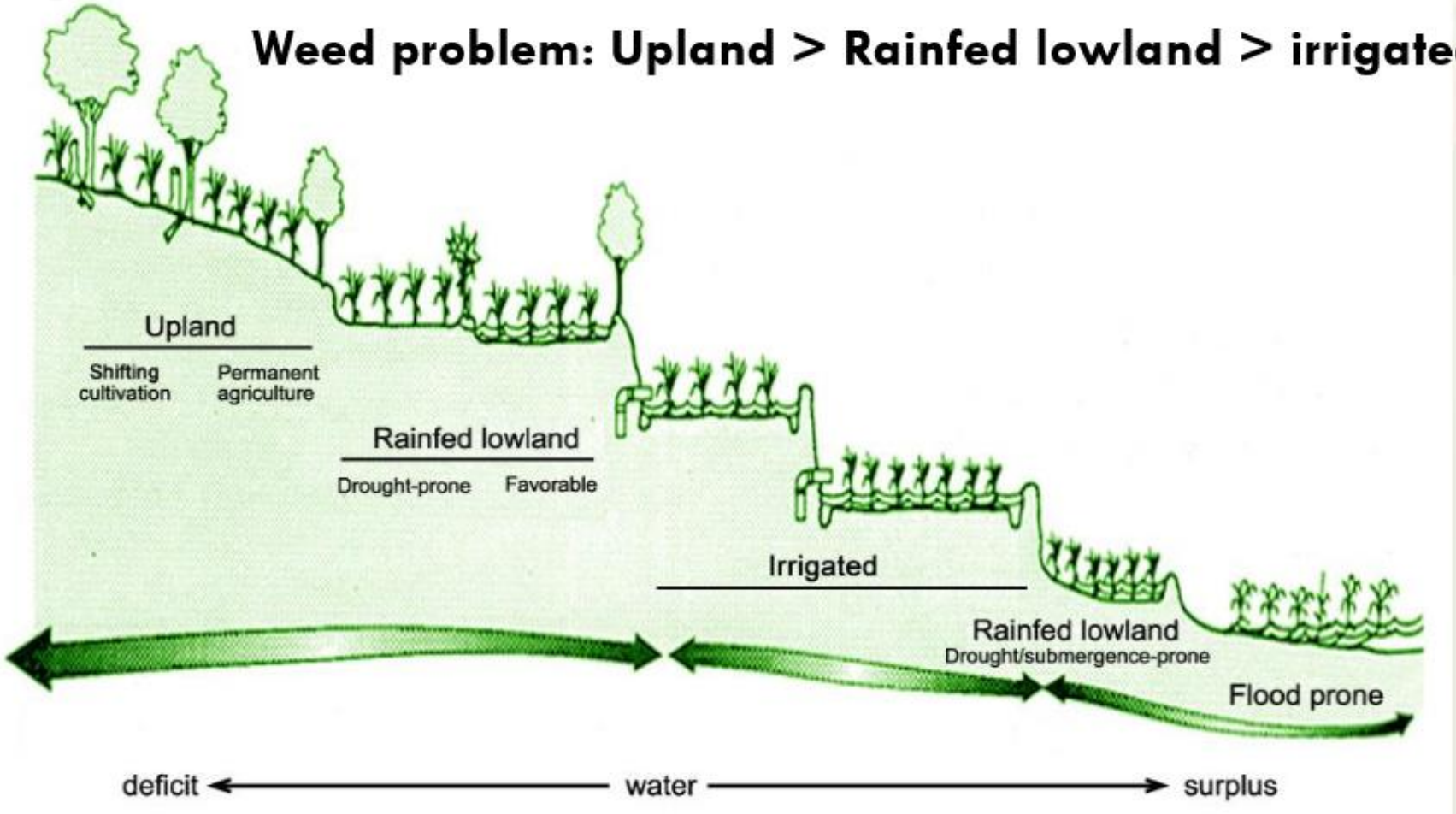


Major Weeds of Rice-Sedges



Fimbristylis spp

Rice environments and weed problem



Rice established methods and weed problem

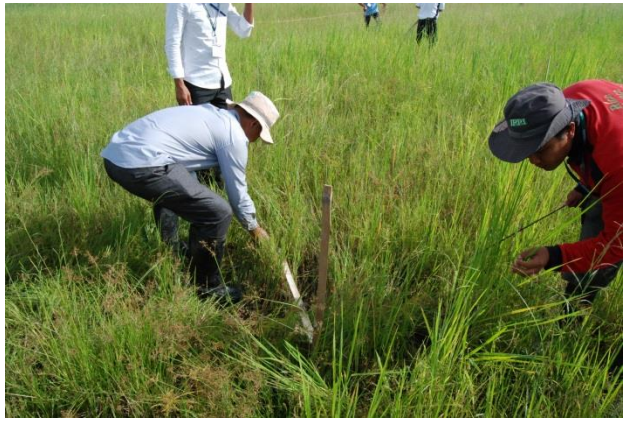
- Transplanted rice
  - Manual transplanting
  - Mechanical transplanting
- Direct seeded rice (DSR)
  - Wet-DSR
  - Dry-DSR

Weed problem:

- DSR > TPR
- Dry-DSR > wet-DSR

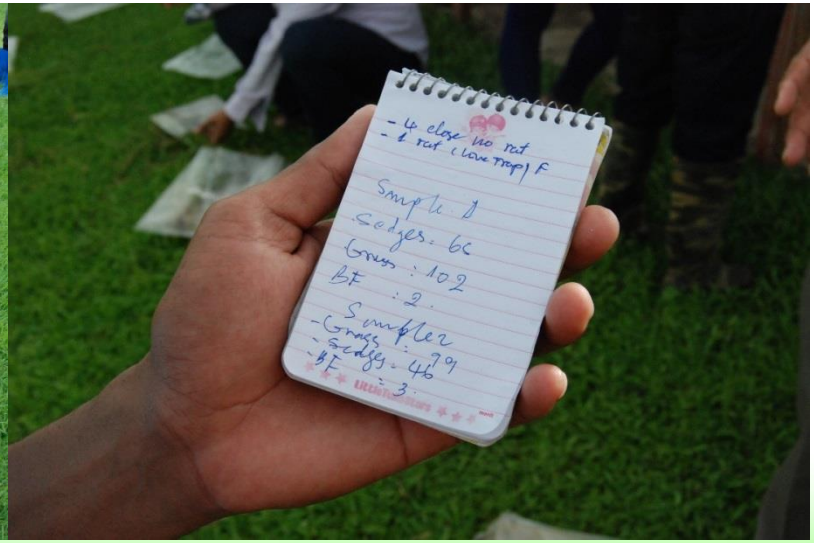
田間雜草取樣調查






雜草調查


Rice
Science
for a Better
World


Sedges: 66
Grass : 102
BF : 2.
Grass : 79
Sedges : 46
BF : 3.

World's Worst Weeds (Holm et al. 1977)

香附子 *Cyperus rotundus* L. (超級雜草)

狗牙根 *Cynodon dactylon* (L.) Pers.

稗草 *Echinochloa crus-galli* (l.) Beauv.

芒稷 *Echinochloa colona* (L.) Link

牛筋草 *Eleusine indica* (l.) Gaertn.

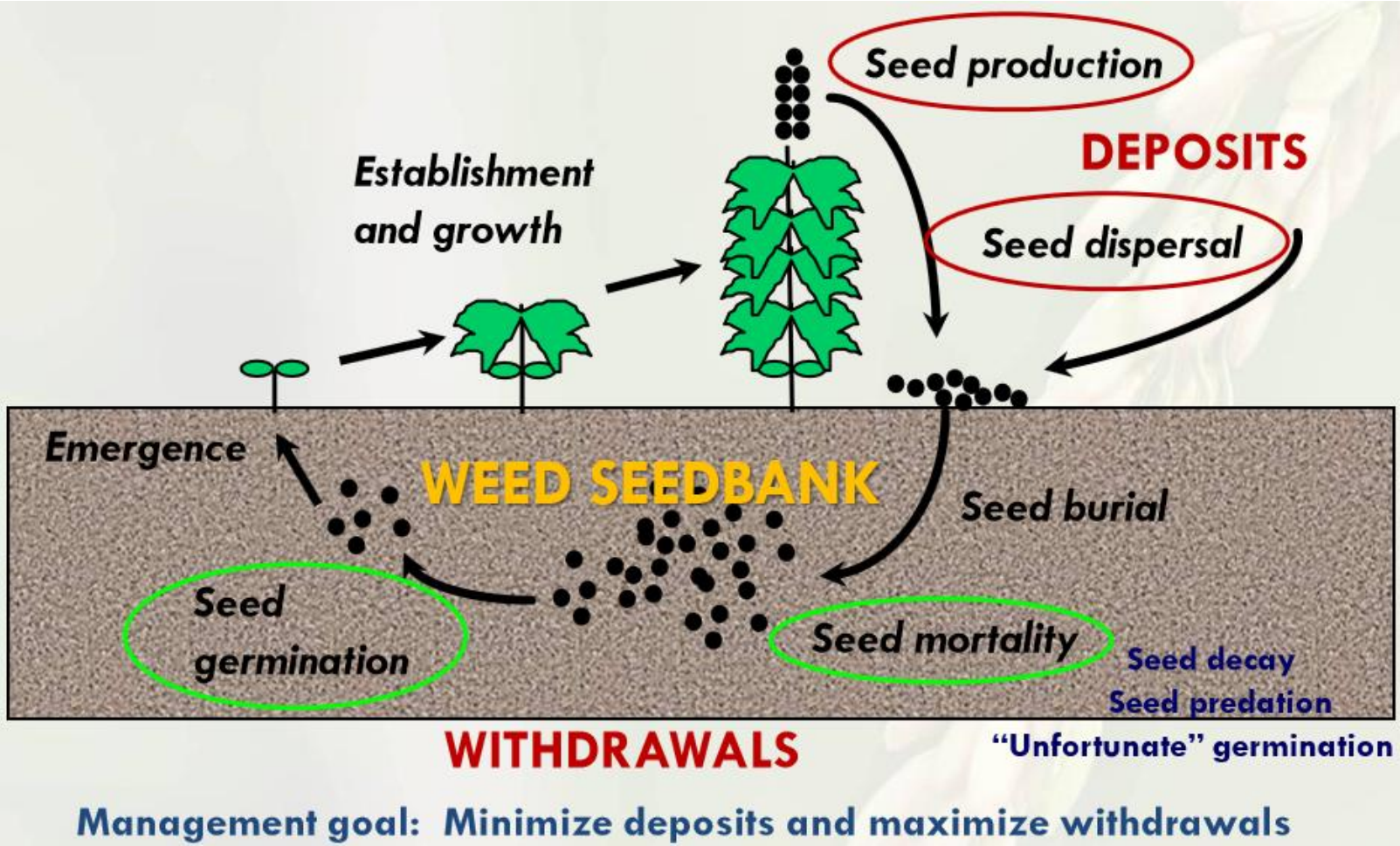
假高粱 *Sorghum halepense* (L.) Pers.

白茅 *Imperata cylindrica* (L.) Beauv.

布袋蓮 *Eichhornia crassipes* (Mart.) Solms

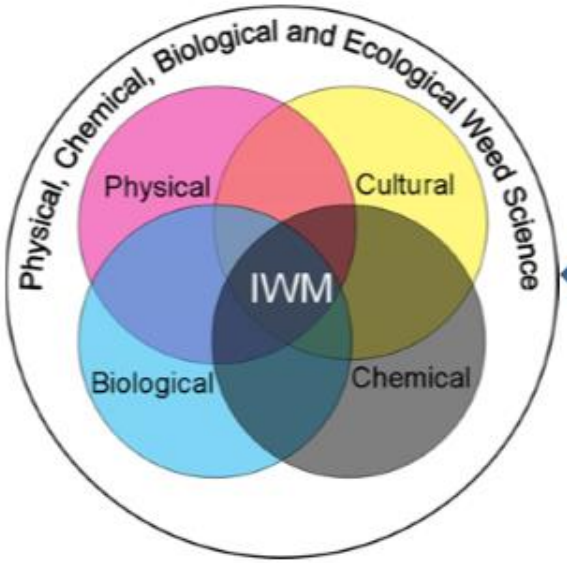
馬齒莧 *Portulaca oleracea* L.

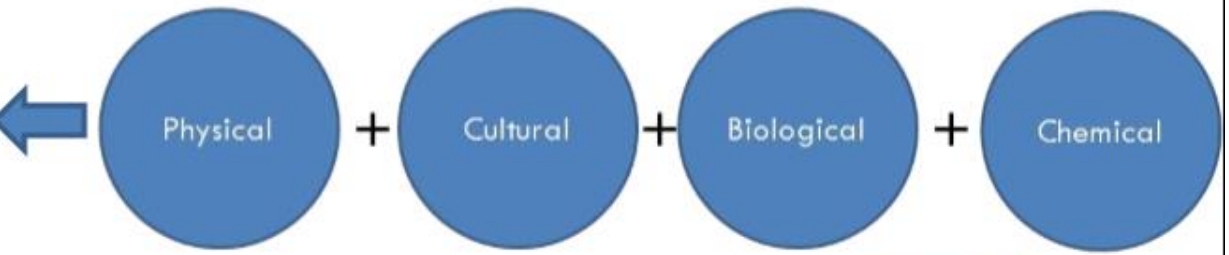
Weed Seedbank Dynamics Framework



Integrated Weed Management (IWM)

Many little hammers: more sustainable and effective

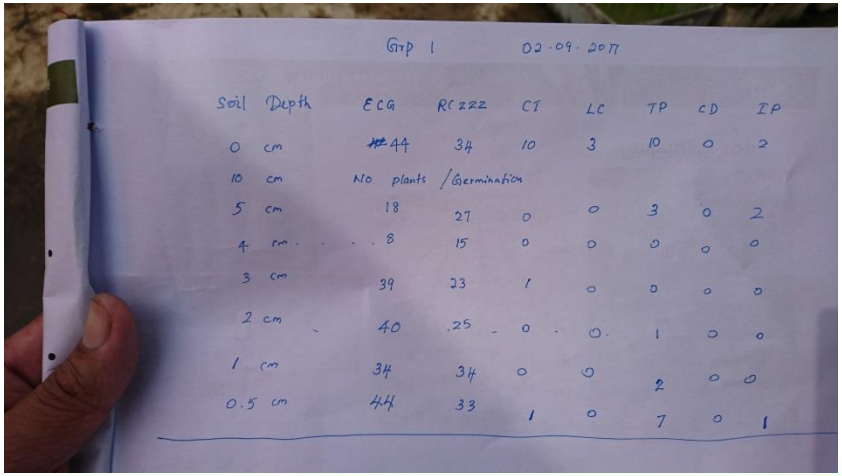




A large hammer (e.g. Chemical only): Not sustainable

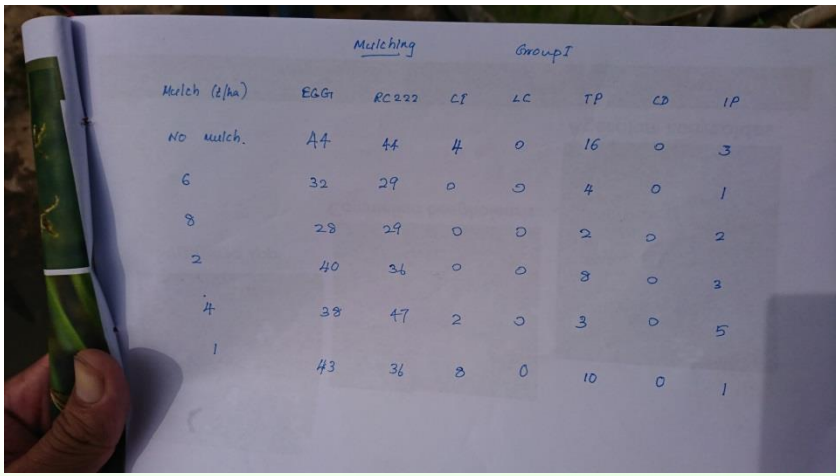
淹水高度對雜草發芽之影響

播種深度及覆蓋對雜草發芽之影響



Grp I 02.09.2017

Soil Depth	ECG	RC222	CI	LC	TP	CD	IP
0 cm	44	34	10	3	10	0	2
10 cm	No plants / Germination						
5 cm	18	27	0	0	3	0	2
4 cm	8	15	0	0	0	0	0
3 cm	39	23	1	0	0	0	0
2 cm	40	25	0	0	1	0	0
1 cm	34	34	0	0	2	0	0
0.5 cm	44	33	1	0	7	0	1

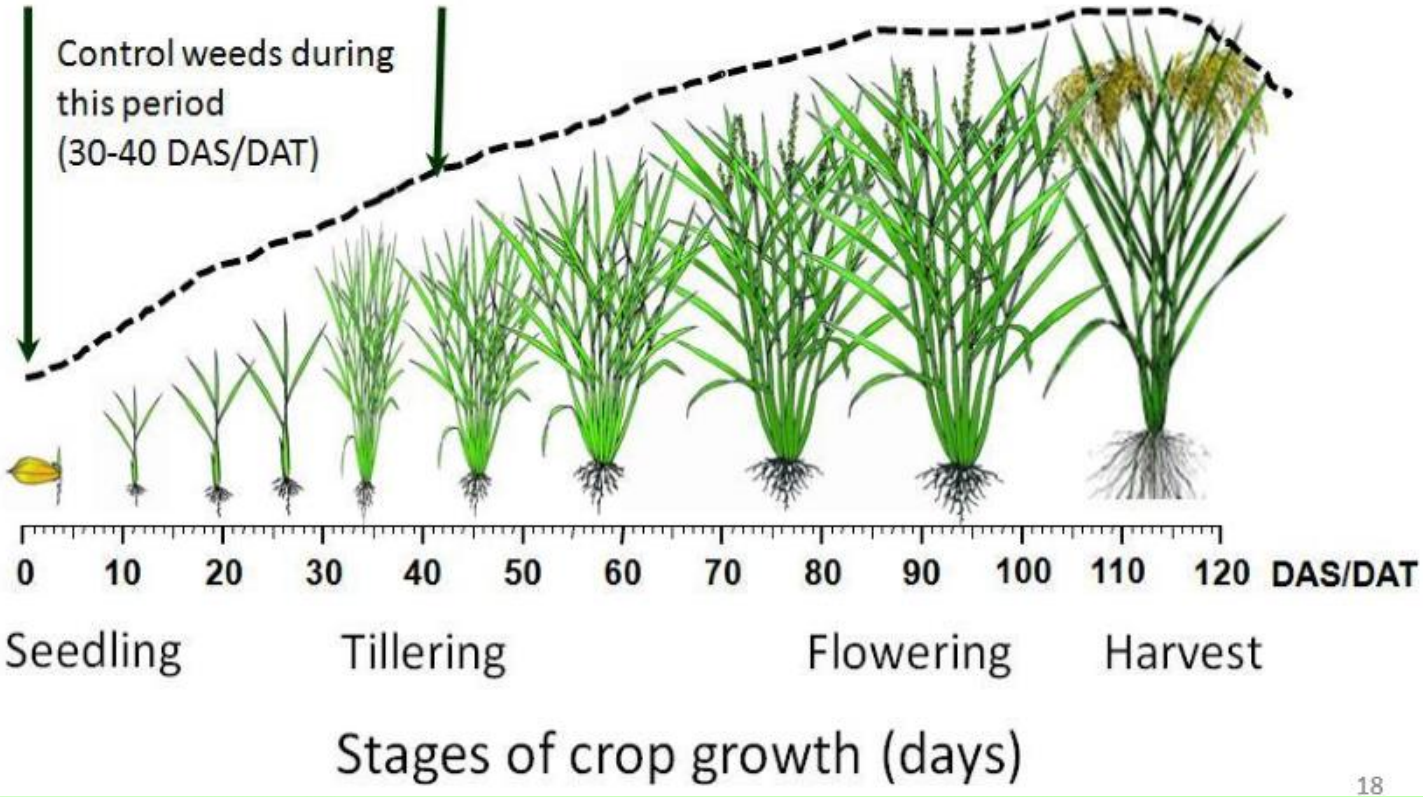


Mulching Group I

Mulch (t/ha)	EGG1	RC222	CI	LC	TP	CD	IP
No mulch.	44	44	4	0	16	0	3
6	32	29	0	0	4	0	1
8	28	29	0	0	2	0	2
2	40	36	0	0	8	0	3
4	38	47	2	0	3	0	5
1	43	36	8	0	10	0	1

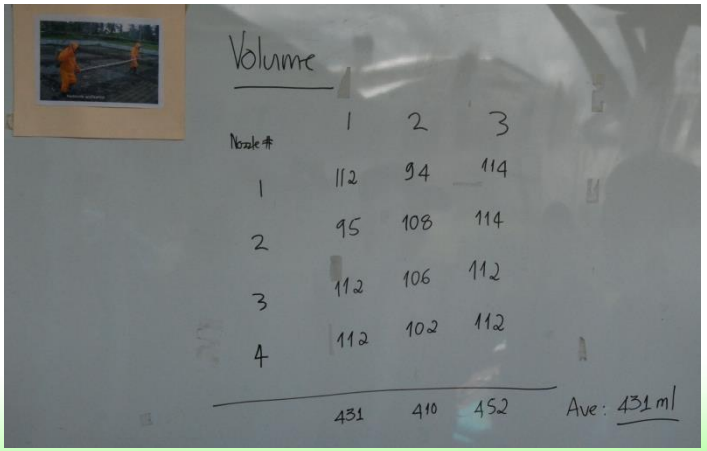
When is the Best Time to Control Weeds?

Avoid any competition from weed during this period (30% of crop cycle)

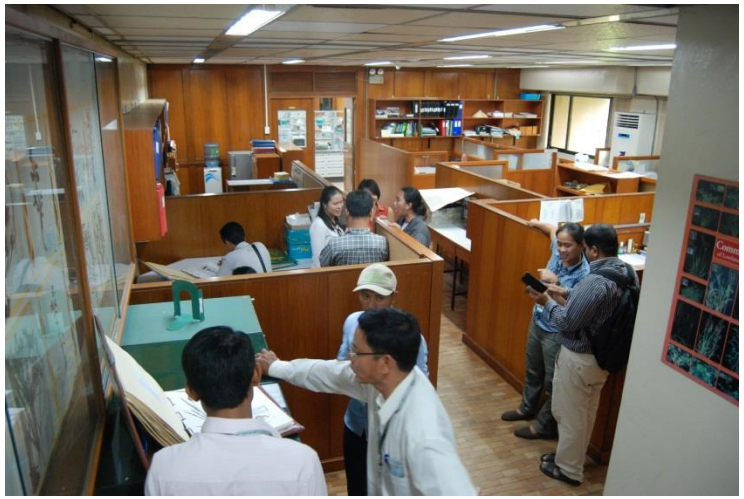


除草劑噴施技術


*Essential components
of spray application technology
nozzle body
strainer
spray tip
nozzle cap
*Other nozzles
Single Double
*Pressure regulation


Volume
1 2 3
Nozzle #
1 112 94 114
2 95 108 114
3 112 106 112
4 112 102 112
431 410 452 Ave: 431 ml

參觀雜草科學實驗室




感謝聆聽，敬請指教!