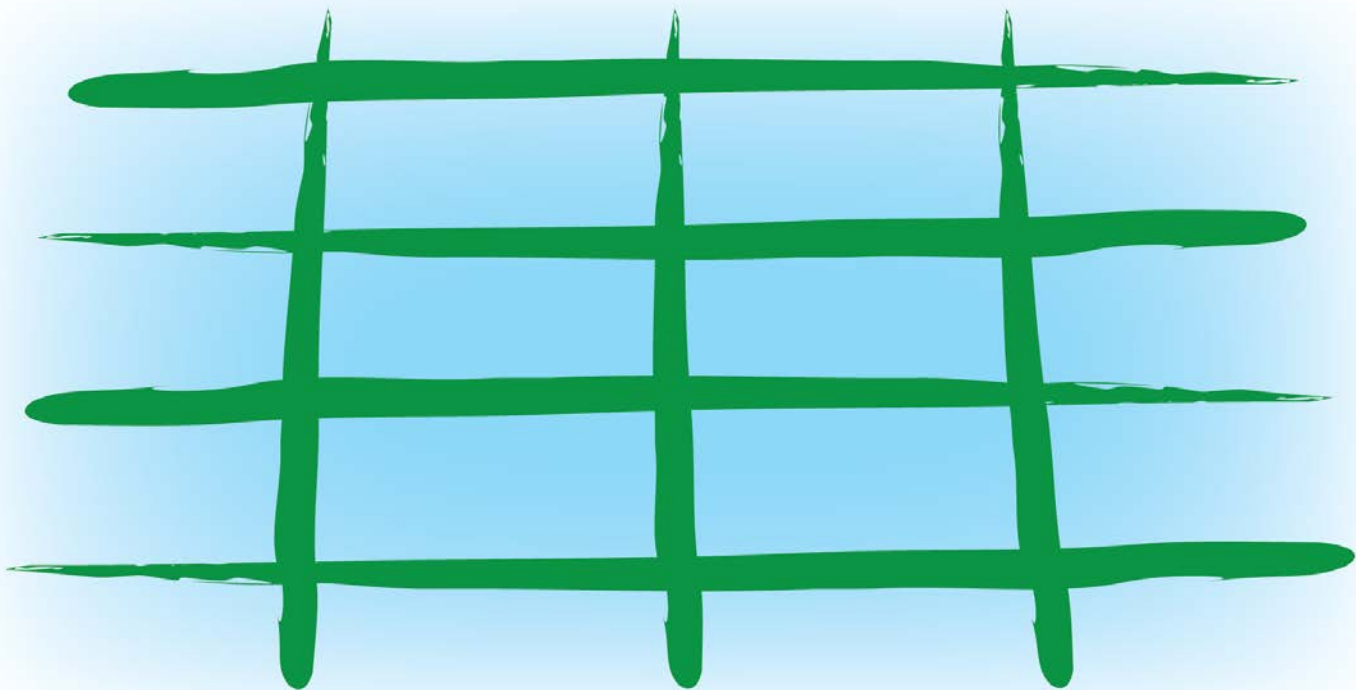


LEGATO

RICE ECOSYSTEM SERVICES



Ecosystem Services and Ecological Engineering in Asia's rice production: the LEGATO project

**by the
LEGATO consortium
c/o Josef Settele
Tokyo 11 June 2013**



Sustainable land management – a BMBF funding campaign



Module A:

„Interactions between land management, climate change and ecosystem services“

Ecosystem Services – the baseline of the LEGATO approach

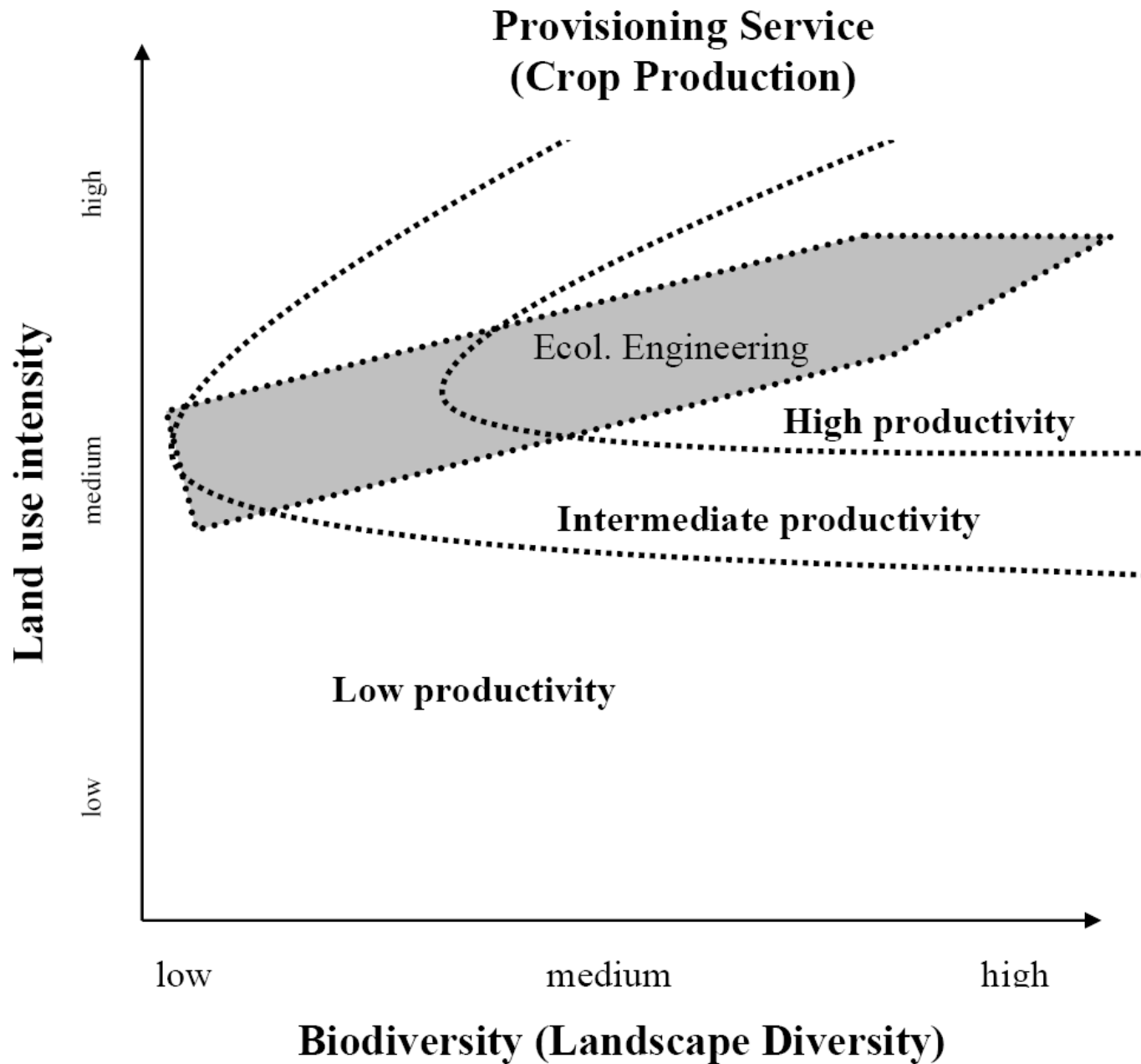
- Ecosystem services dealt with in LEGATO:
 - ✓ Provisioning: biomass & nutrients (rice & other crops),
 - ✓ Regulating: biocontrol & pollinators,
 - ✓ Cultural: cultural identity, aesthetics & recreation

Ecological Engineering

- design, monitoring and construction of ecosystems;
- development of strategies to maximise ecosystem services through
- exploiting natural regulation mechanisms (instead of suppressing them).

LEGATO

- LEGATO analyses the potential of Ecological Engineering to achieve
 - ***sustainable land management***
 - ***increase in crop productivity*** and
 - ***diversification of income sources***
- LEGATO tests the implementation and transferability of Ecological Engineering across regions





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**Ecosystem services:
Production**



HYBRID RICE

IRRI-121
(PSR Rc 72A)

IRRI-122
(PSR Rc 80)

IRRI-118
(PSR Rc 64)

IRRI-116
(PSR Rc 84)

VARIETIES FOR SALINE AREAS

IRRI-115
(PSR Rc 82)

IRRI-109
(PSR Rc 20)

IRRI-108
(PSR Rc 25)

IRRI-106
(PSR Rc 41)

IRRI-105
(PSR Rc 36)

IRRI-122
(PSR Rc 80)

IRRI-118
(PSR Rc 64)

IRRI-116
(PSR Rc 84)

IRRI-115
(PSR Rc 82)

IRRI-109
(PSR Rc 20)

IRRI-123
(PSR Rc 82)



Photo: A. Marxen

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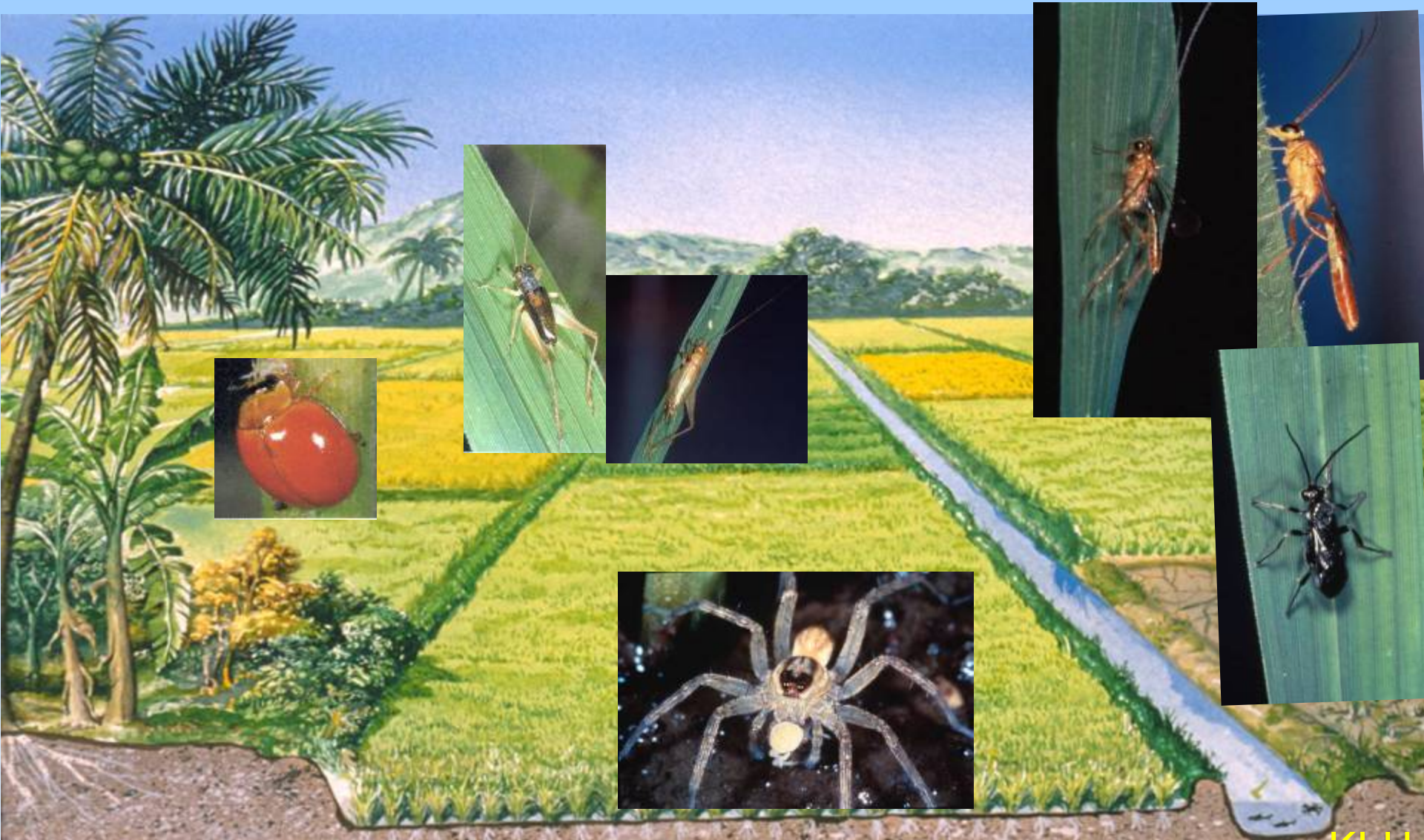
Ecosystem services:
Biocontrol & Pollination







Natural Biological Control Service





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**Ecosystem Services:
Cultural Identity & Aesthetics**







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Changes

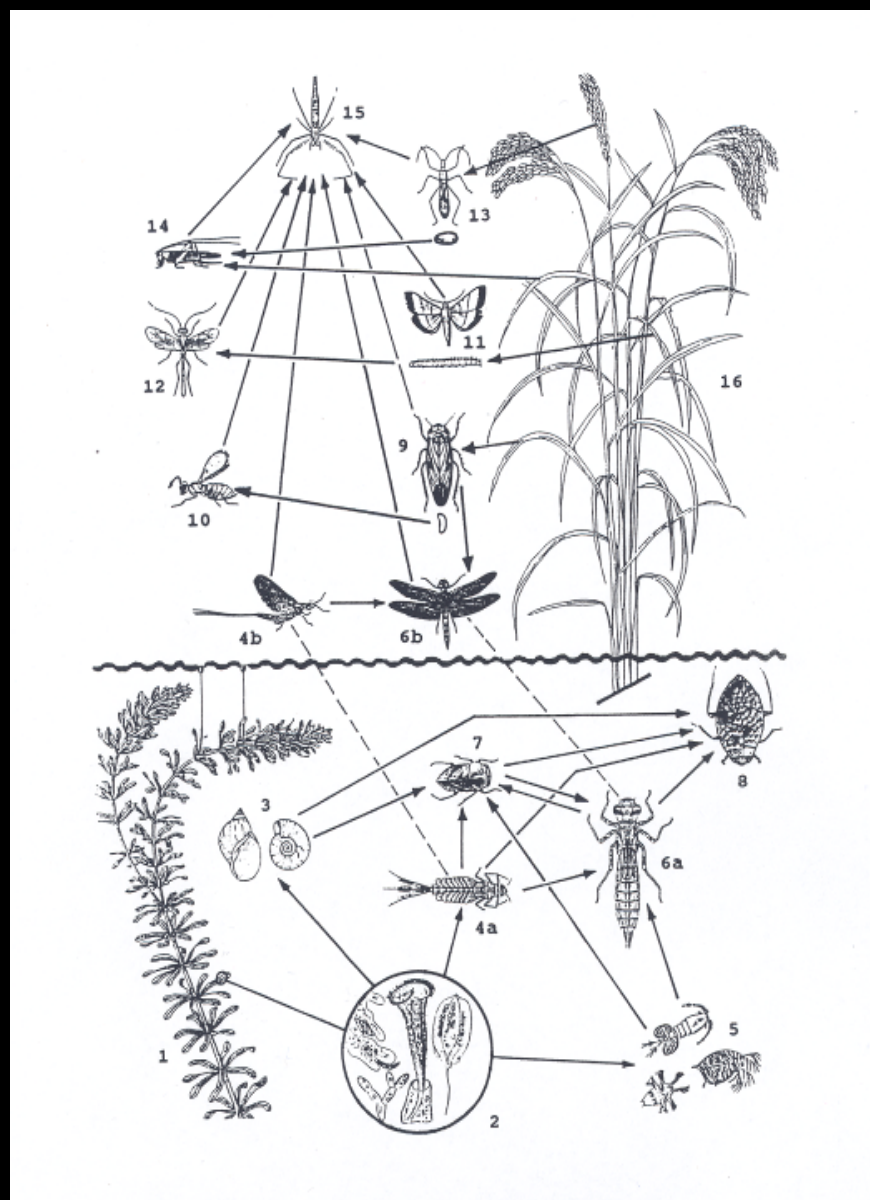


Figure 6: Simplified food web of “traditional” rice field (from Koch et al. 1990, modified); arrows indicate the trophic relationships (according to energy flow in the food chain)

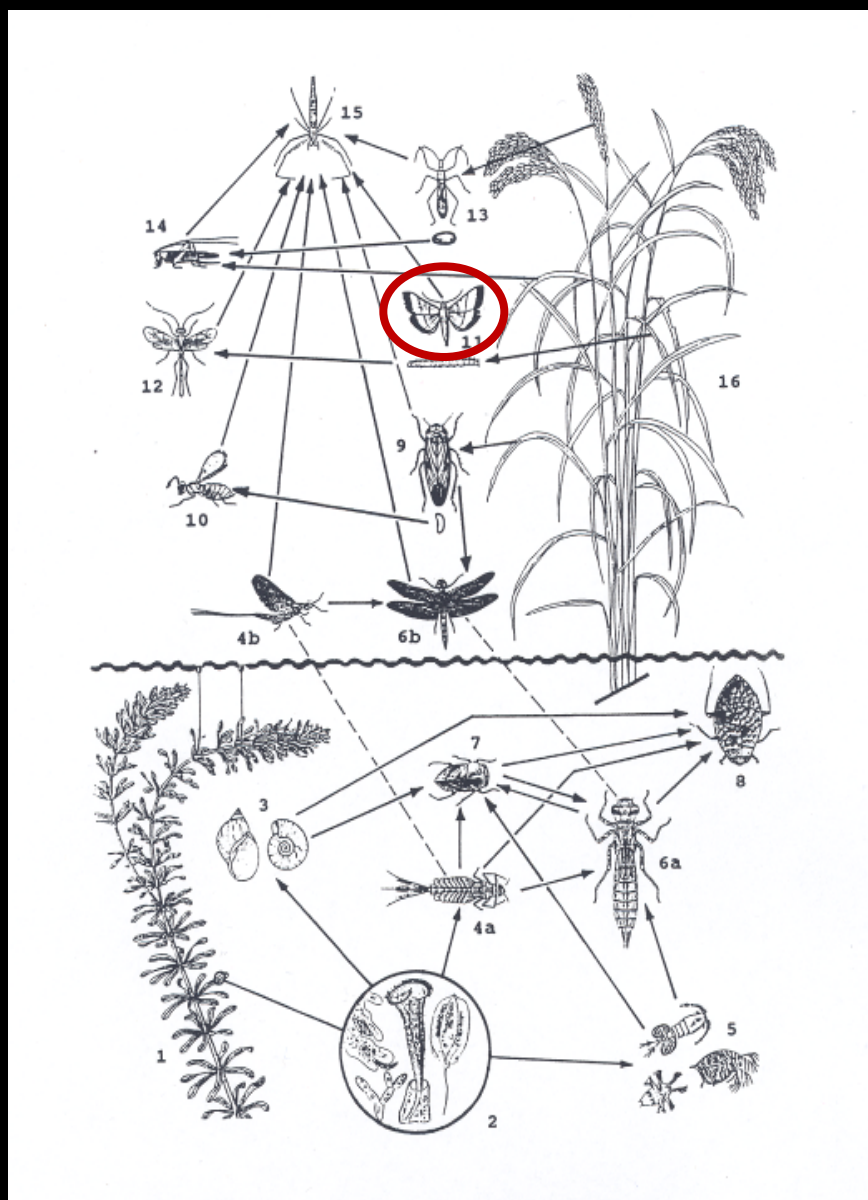
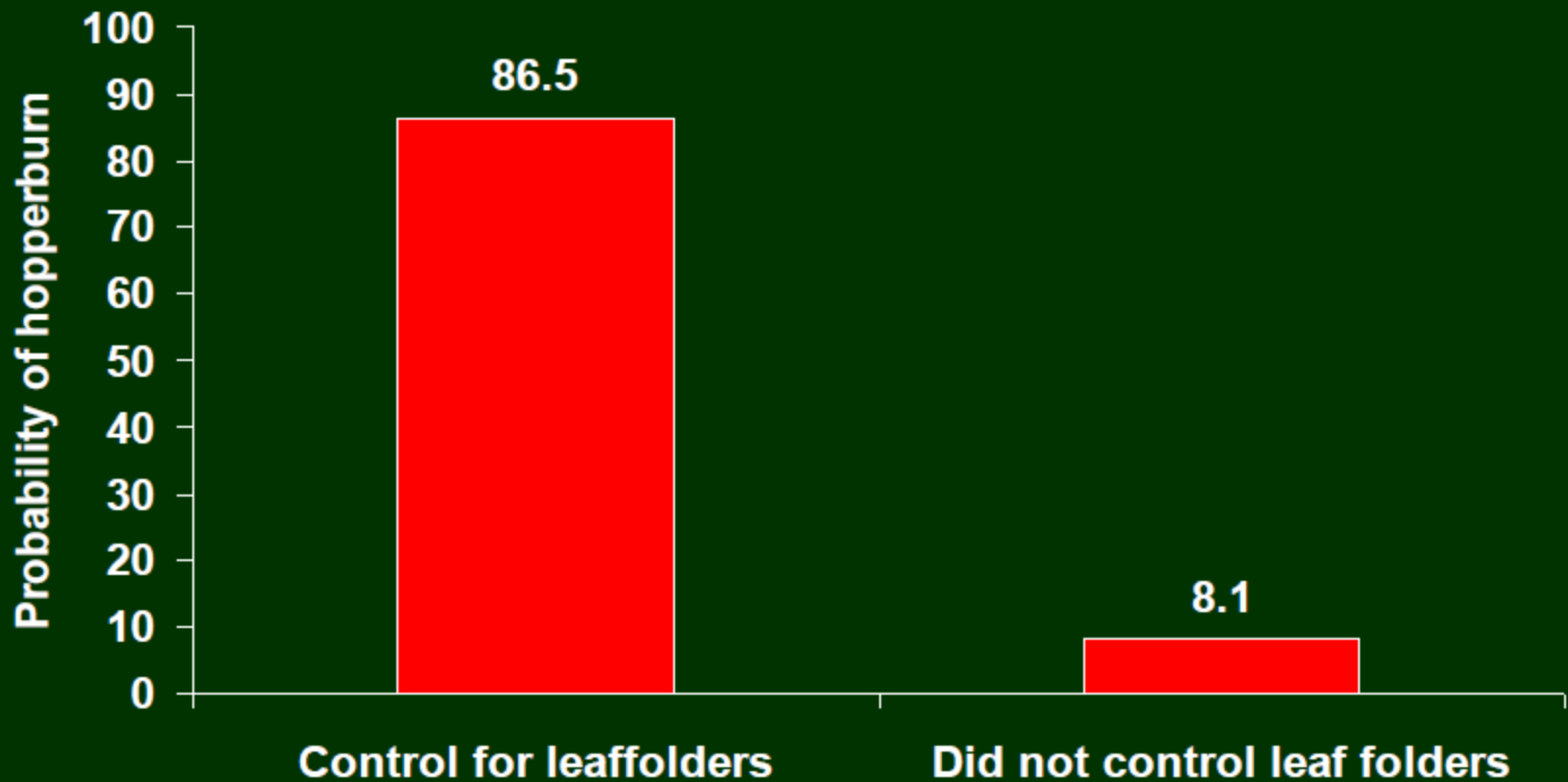


Figure 6: Simplified food web of “traditional” rice field (from Koch et al. 1990, modified); arrows indicate the trophic relationships (according to energy flow in the food chain)

Leaf folder control in early crop stages increases vulnerability to hopperburn by 10 folds



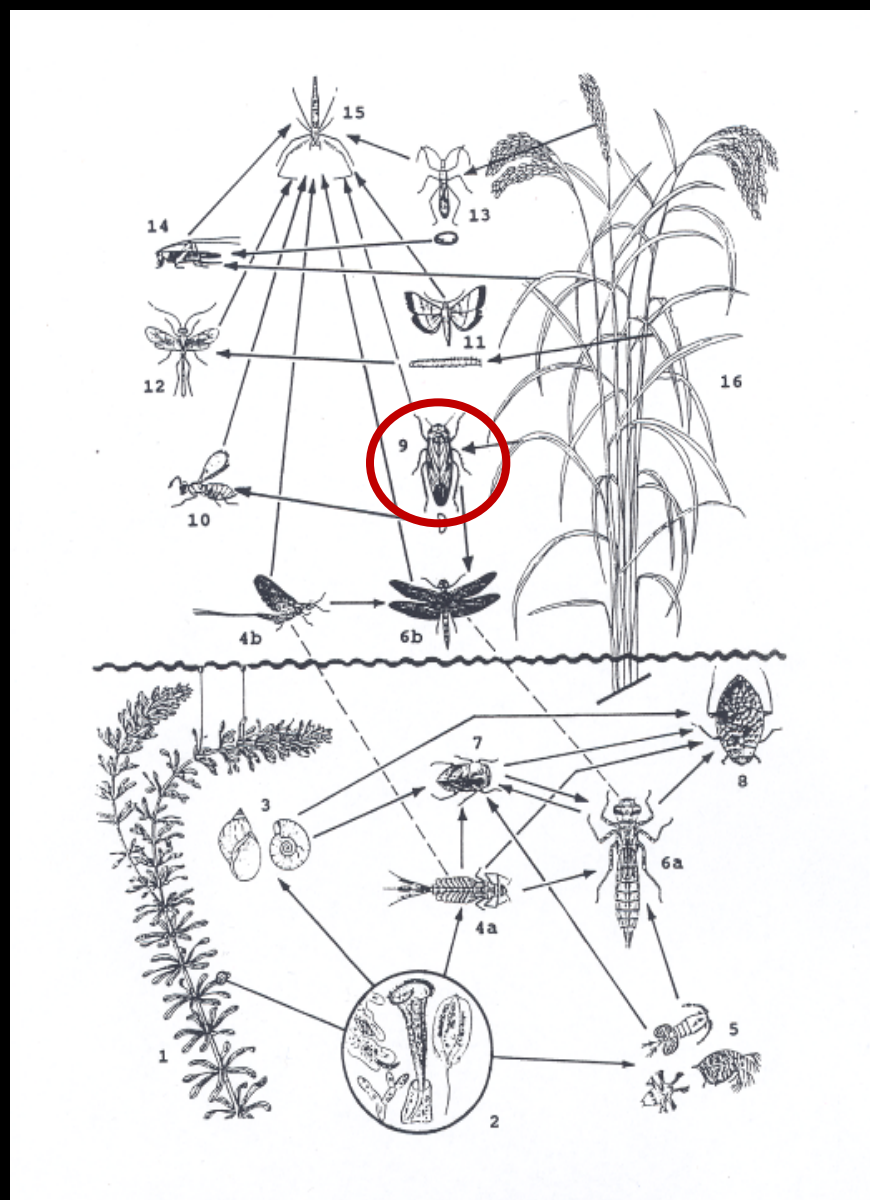


Figure 6: Simplified food web of “traditional” rice field (from Koch et al. 1990, modified); arrows indicate the trophic relationships (according to energy flow in the food chain)

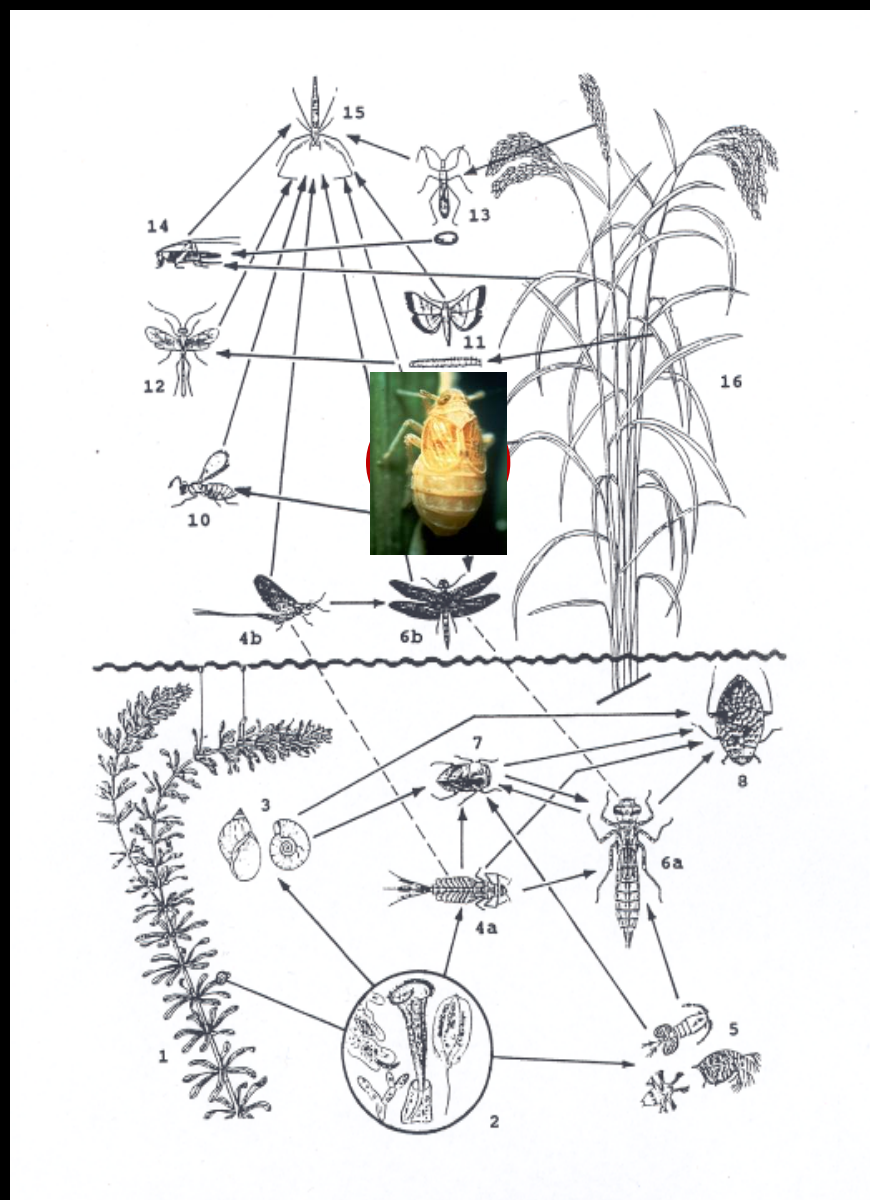
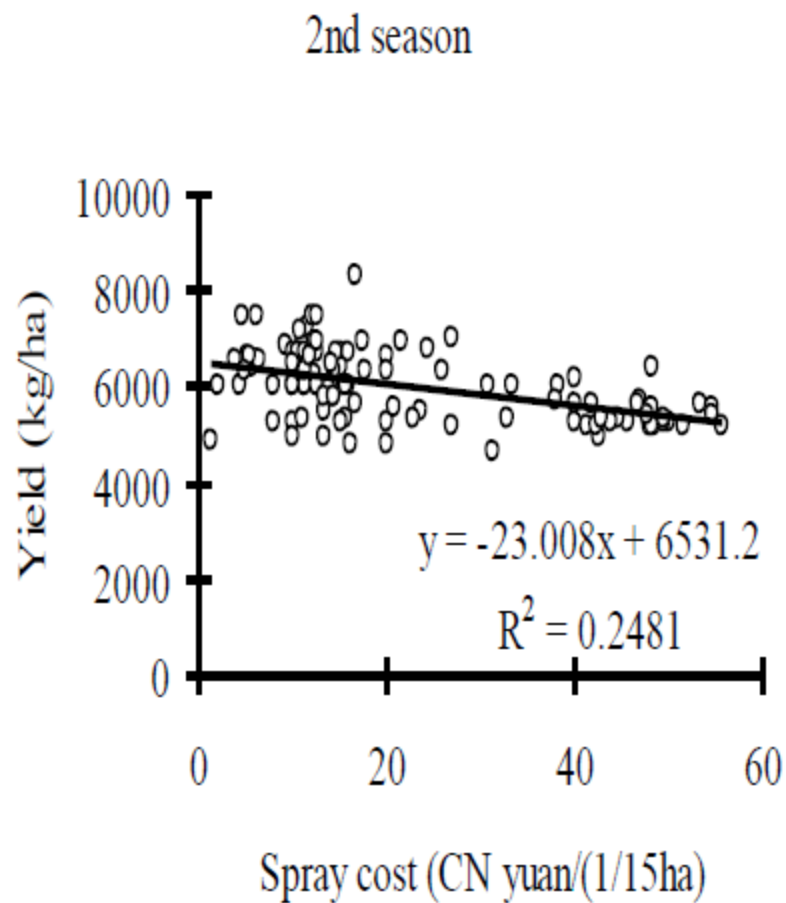
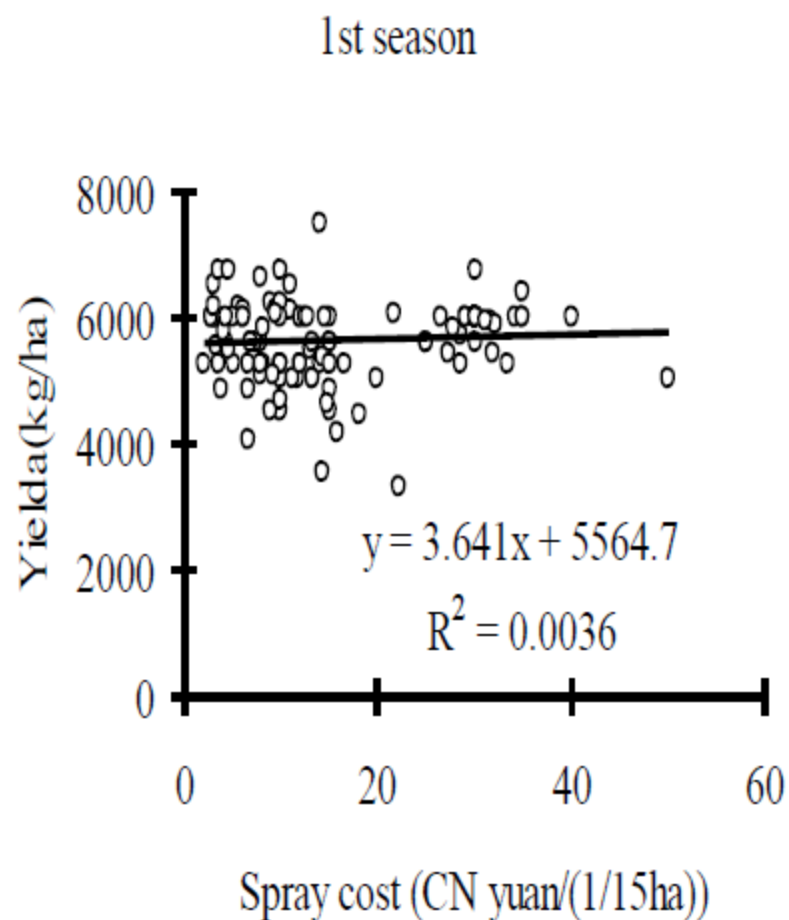


Figure 6: Simplified food web of “traditional” rice field (from Koch et al. 1990, modified); arrows indicate the trophic relationships (according to energy flow in the food chain)

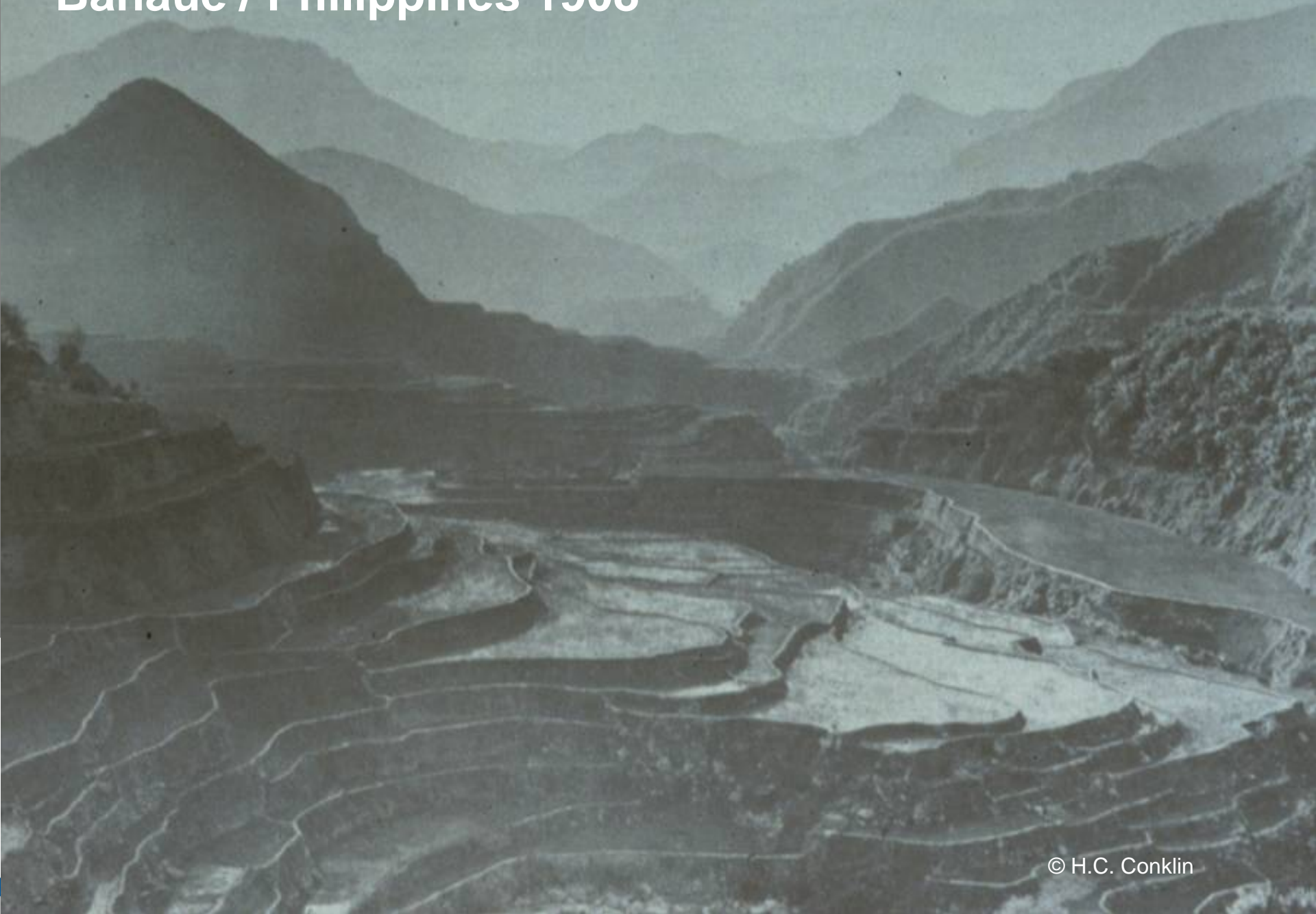
**Insecticide sprays have no effect on hopper –
Only few specialist species for egg mortality**



Relationships between farmers' yields and pesticide spending in Jiaxing, China.



Banaue / Philippines 1908



Banaue / Philippines 2010



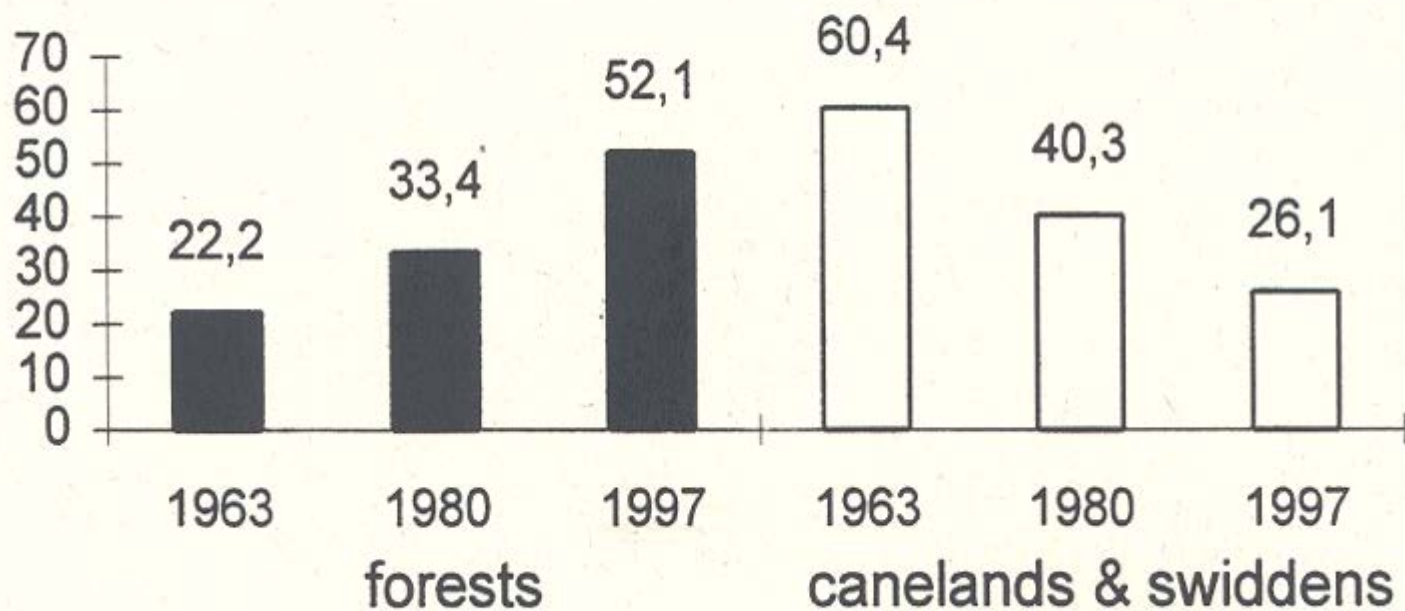
Banaue / Philippines 1908



Banaue / Philippines 2010



landuse area [ha]





LEGATO

Co-Design, Feedback,
Implementation
Citizen Science



PLEASE
ORDER
DINNER
BEFORE
7:00 PM

PLEASE RETURN
OUR KEY UPON
CHECK-OUT



PLEASE
ORDER
DINNER
BEFORE
7:00 PM

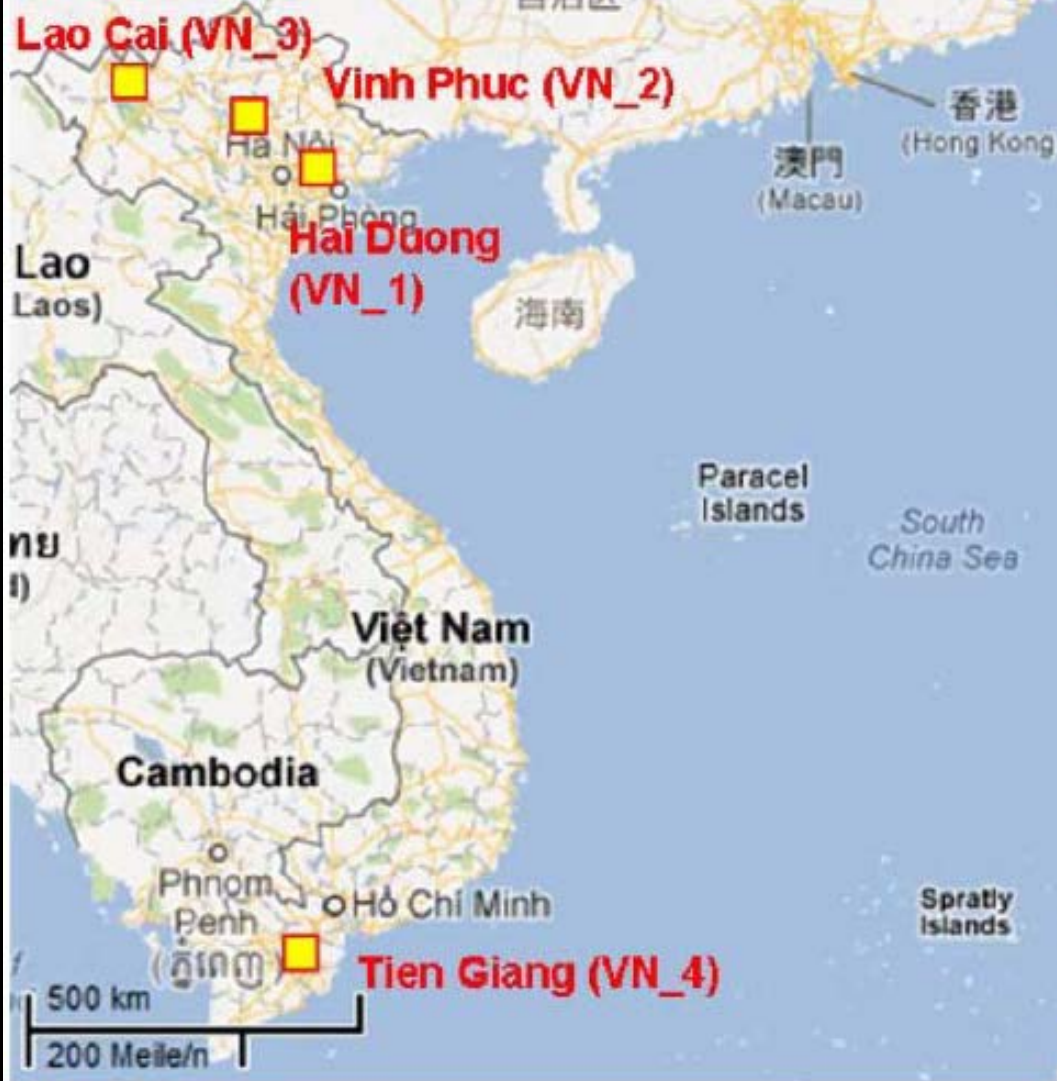
PLEASE RETURN
OUR KEY UPON
CHECK-OUT





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Research Regions

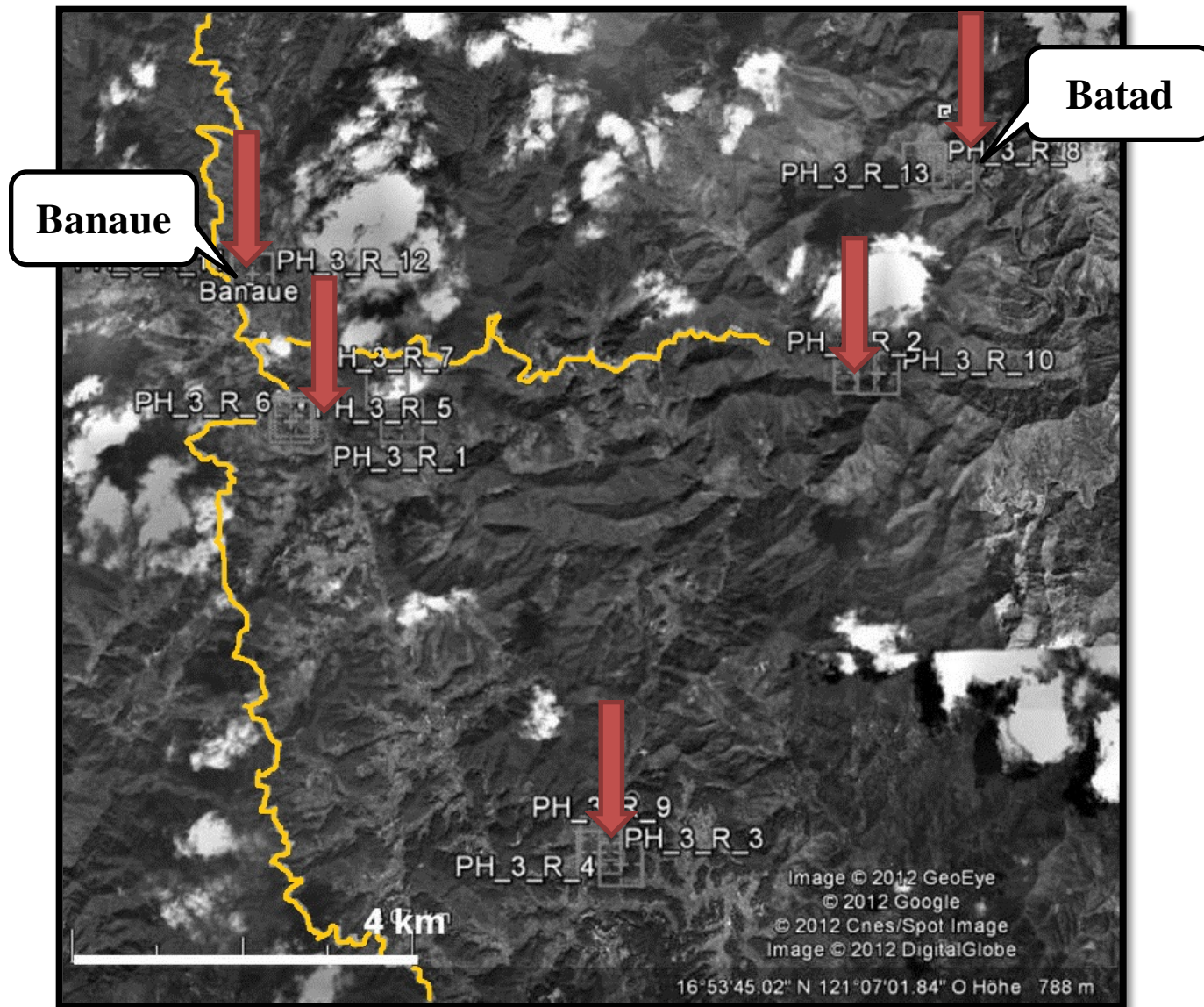


Yellow squares represent 15x15 km² study regions, each with 5 landscapes (with 2 core sites per landscape), including the name of the region and the code used within LEGATO





LEGATO Ifugao (PH_3) research sites



Tappiya Falls Trail

Structurally
rich

PH_3_R_8

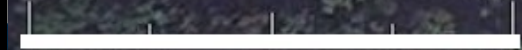
Structurally
poor

PH_3_R_13

149 m

149 m

© 2012 Mapabc.com
© 2012 Cnes/Spot Image
Image © 2012 DigitalGlobe
© 2012 Google









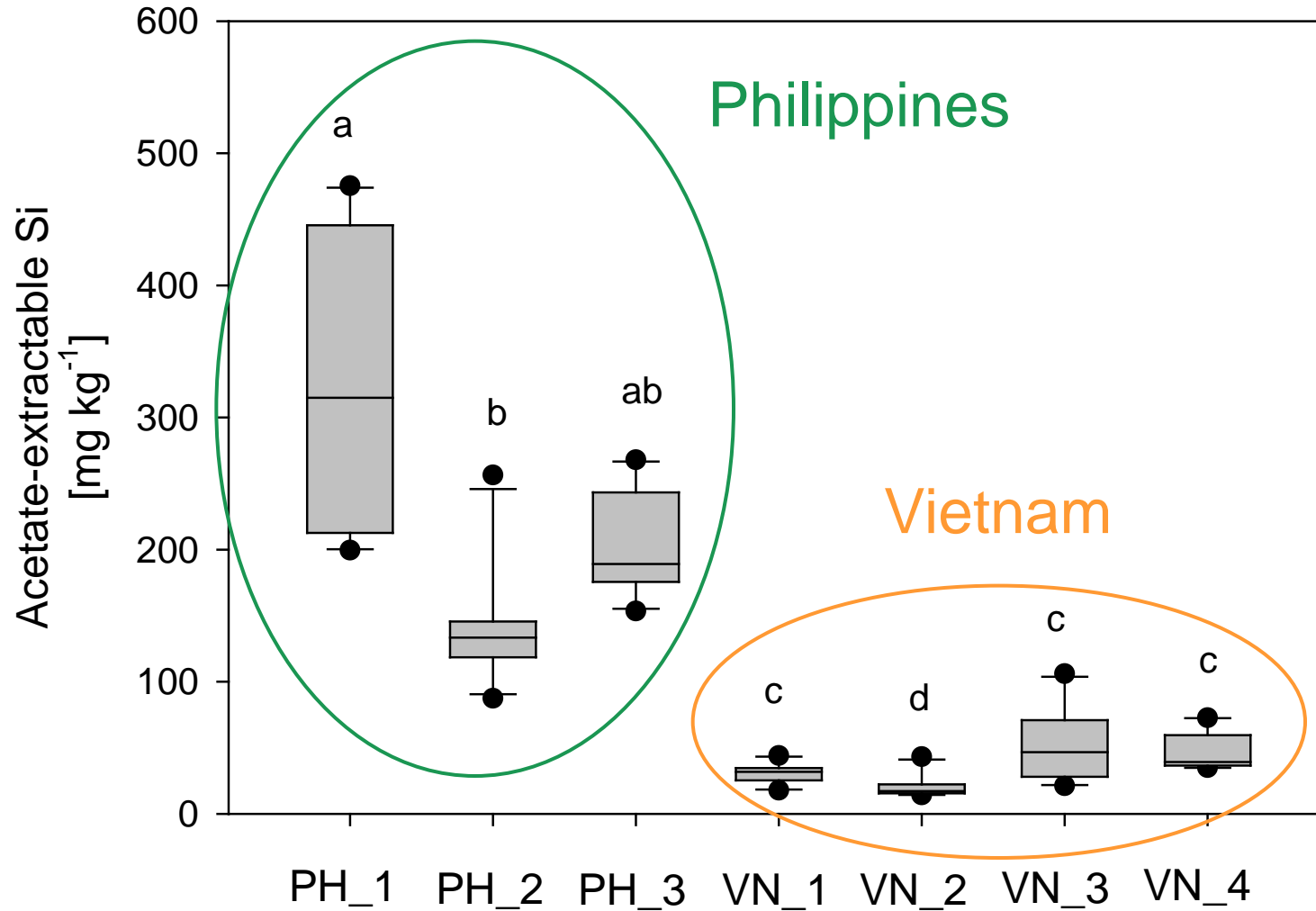


LEGATO

Spotlight on some ongoing
research activities

Plant available Si in soils

(Klotzbücher et al., in prep.)



Plant available Si in soils

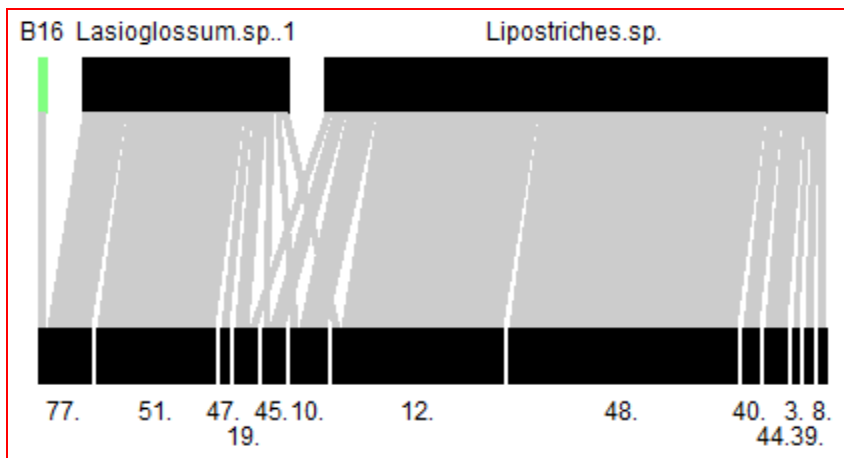
(Klotzbücher et al., in prep.)

Interdisciplinary questions

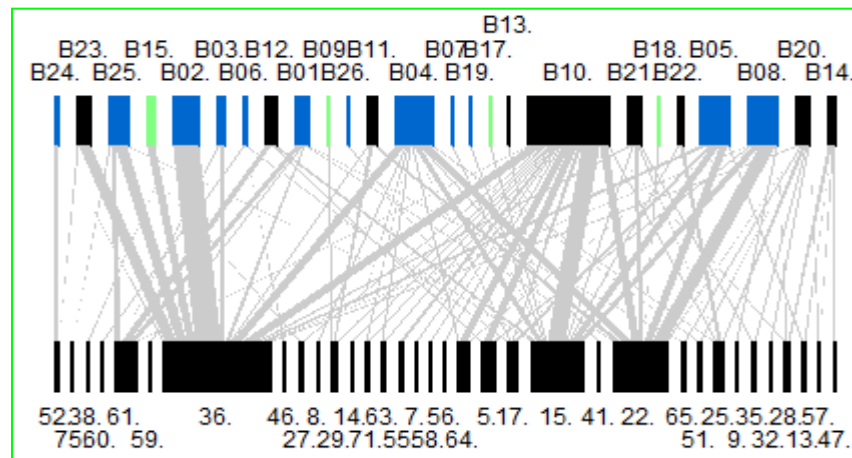
- Influence of rice Si concentration on pests?
- Which socio-economic factors drive crop residue management?
- Economic feasibility of Si fertilization?

Pollinator Research in LEGATO (Westphal et al. In prep.)

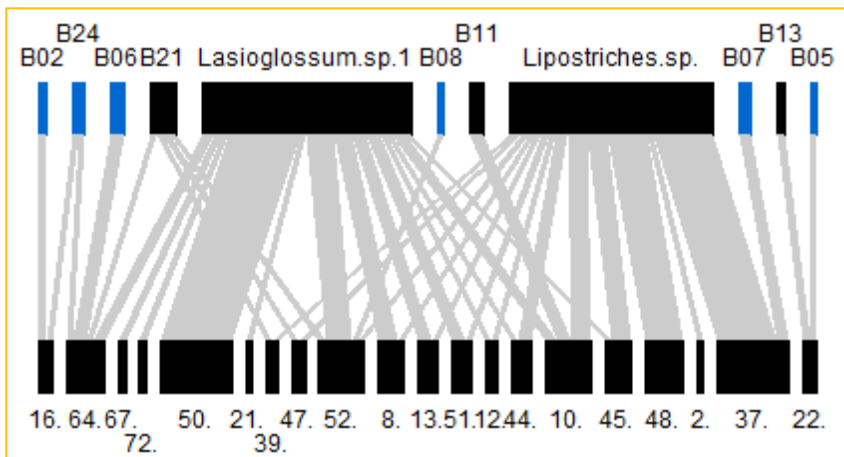
Complexity of interaction webs



Rice.iso



Polyculture



Rice.aPc



- Halictidae
- Apidae
- Megachilidae

Conclusions on the role of Polycultures

- Provide important nesting and foraging habitats for bees in rice-dominated landscapes
- Positive effects on diversity and stability of plant pollinator interactions in neighboring fields
- Structurally complex polycultures could represent effective ecological engineering measures





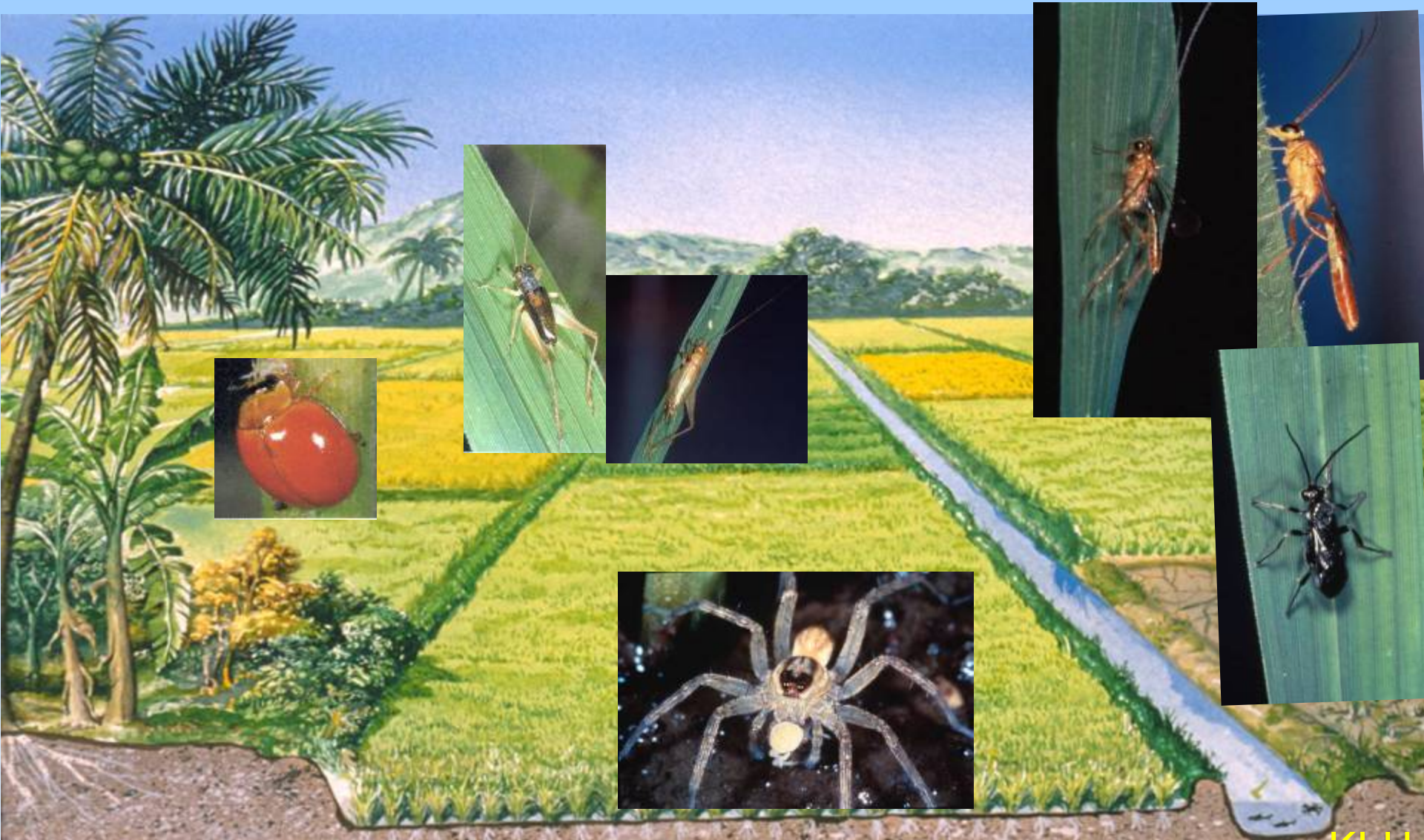
Next step: role of bees as
indicators of landscape
level status of parasitoids



The effects of surrounding landscapes on the biocontrol-production function in rice dominated agroecosystems

Christophe Dominik

Natural Biological Control Service



PR & publication

Science

21 July 2006 | \$10



 AAAS

Market without Pollinators



© SDR / M. Ladwig

Market with Pollinators



CORRESPONDENCE

Switch to ecological engineering would aid independence

SIR — In your News Feature 'Is China ready for GM rice?' (*Nature* 455, 850–852; 2008), you consider the merits of using genetically modified (GM) crops for pest control. But don't overlook the potential of ecological engineering, which can provide an important and undervalued approach to tackling agricultural problems.

Biological control in irrigated rice is a prime example of how

sustainable management schemes for ecosystem services for other key crops, in China and worldwide.

Josef Settele UFZ, Helmholtz Centre for Environmental Research, Theodor-Lieser-Strasse 4, 06120 Halle, Germany
e-mail: Josef.Settele@ufz.de

Jacobus Biesmeijer Institute of Integrative and Comparative Biology and Earth and Biosphere Institute, University of Leeds, Leeds LS2 9JT, UK

Riccardo Bommarco Department of Ecology, Swedish University of Agricultural Sciences, 75007 Uppsala, Sweden

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genoty
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conclu
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unprov
result s

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Settele et al. (2008) *Nature*

open-access journal

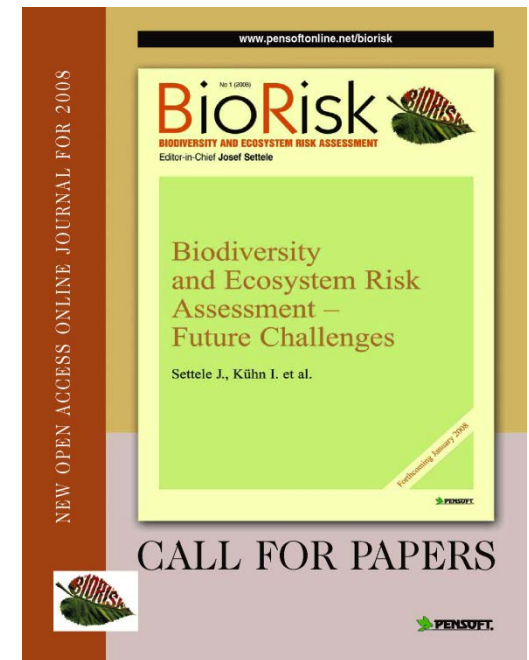
BIORISK

Biodiversity & Ecosystem Risk Assessment
a peer-reviewed open-access journal



- ✓ Risks and consequences for biodiversity and ecosystems caused by: socio-economic developments, land use and habitat fragmentation, landscape planning and infrastructures, climate change, environmental pollution, loss of pollinators, biological invasions.
- ✓ Methods and tools for biodiversity risk assessment
- ✓ Uncertainty in risk assessments
- ✓ Environmental Impact Assessment (EIA)
- ✓ Ecological expertise, expert systems and evidence based assessments
- ✓ Goods and services at risk

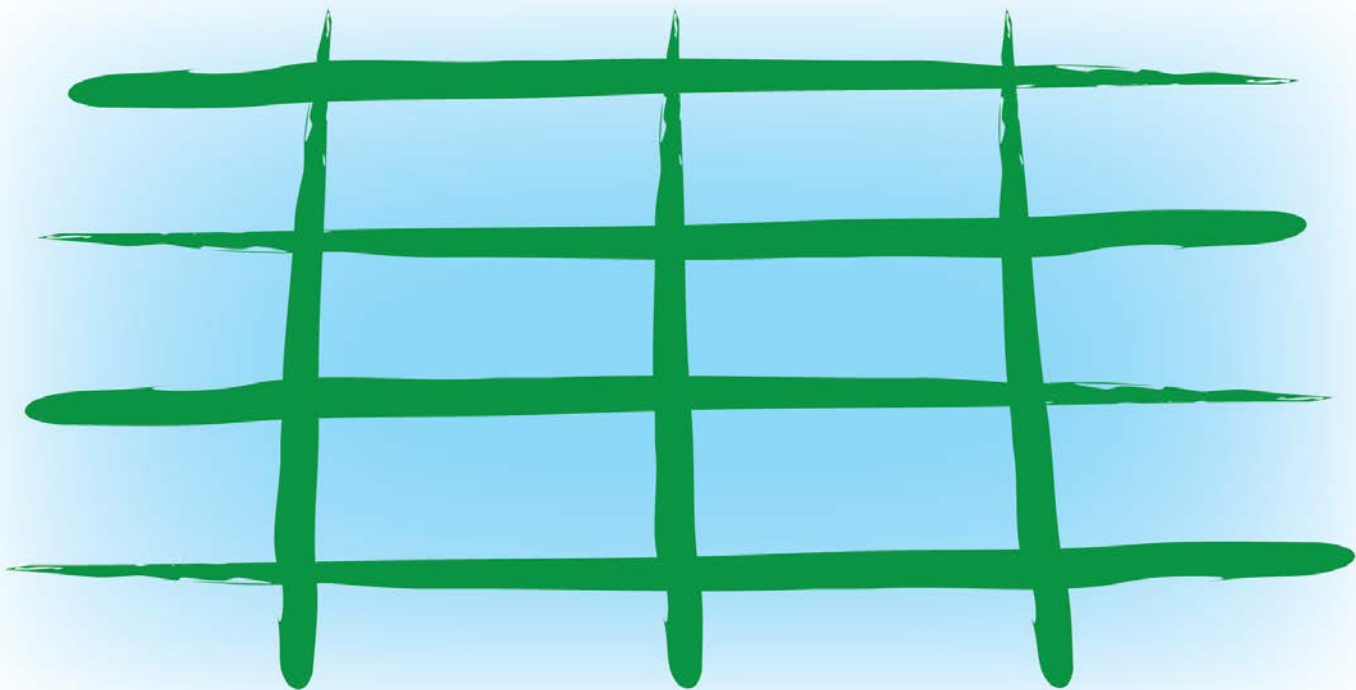
www.pensoftonline.net/biorisk



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ZENTRUM FÜR
UMWELTFORSCHUNG
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www.legato-project.net





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Ecological Engineering

International Conference on Ecological Engineering

