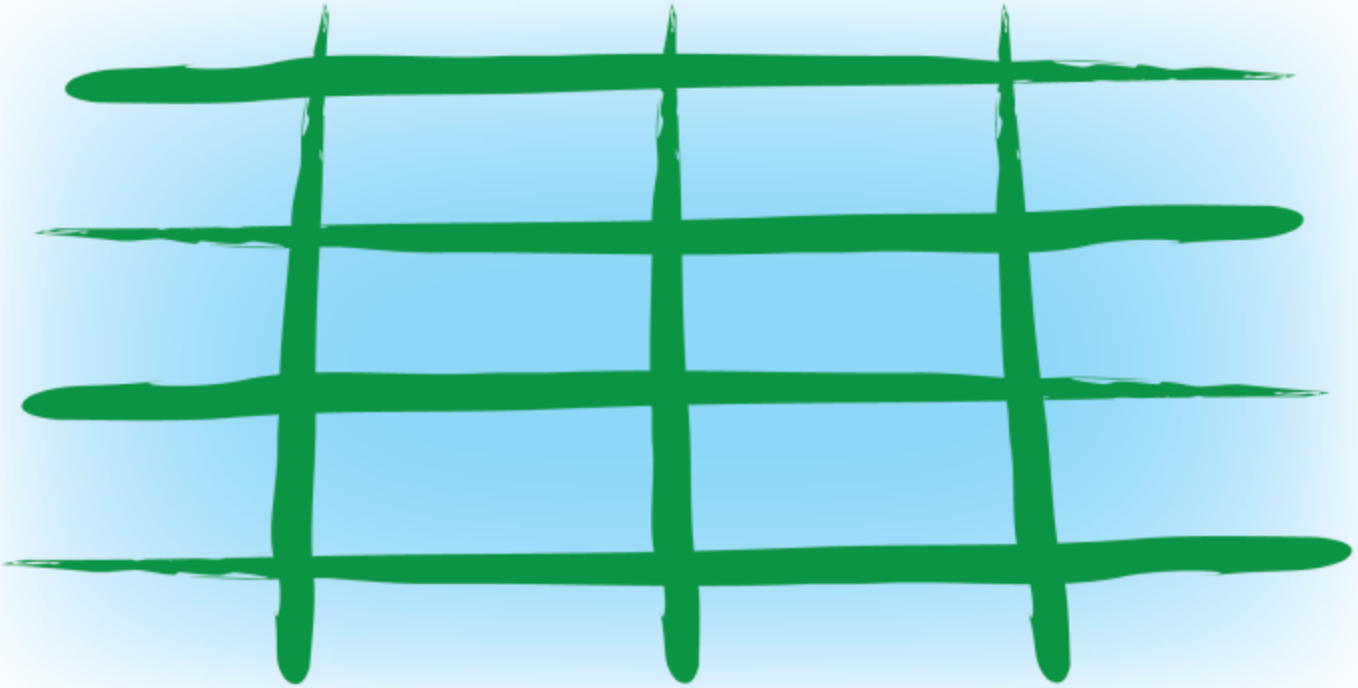
LEGATO

RICE ECOSYSTEM SERVICES



Ecological Engineering – the LEGATO project

by the
LEGATO consortium
c/o Josef Settele

HELMHOLTZ
ZENTRUM FÜR
UMWELTFORSCHUNG
UFZ

LEGATO

Land-use intensity and **E**cological En**G**ineering –

Assessment **T**ools for risks and **O**pportunities

in irrigated rice based production systems

Antragszeitraum / application period:

1. March 2011 – 29. Feb. 2016

GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

NACHHALTIGES
LANDMANAGEMENT

HELMHOLTZ
ZENTRUM FÜR
UMWELTFORSCHUNG
UFZ

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

HELMHOLTZ
ZENTRUM FÜR
UMWELTFORSCHUNG
UFZ

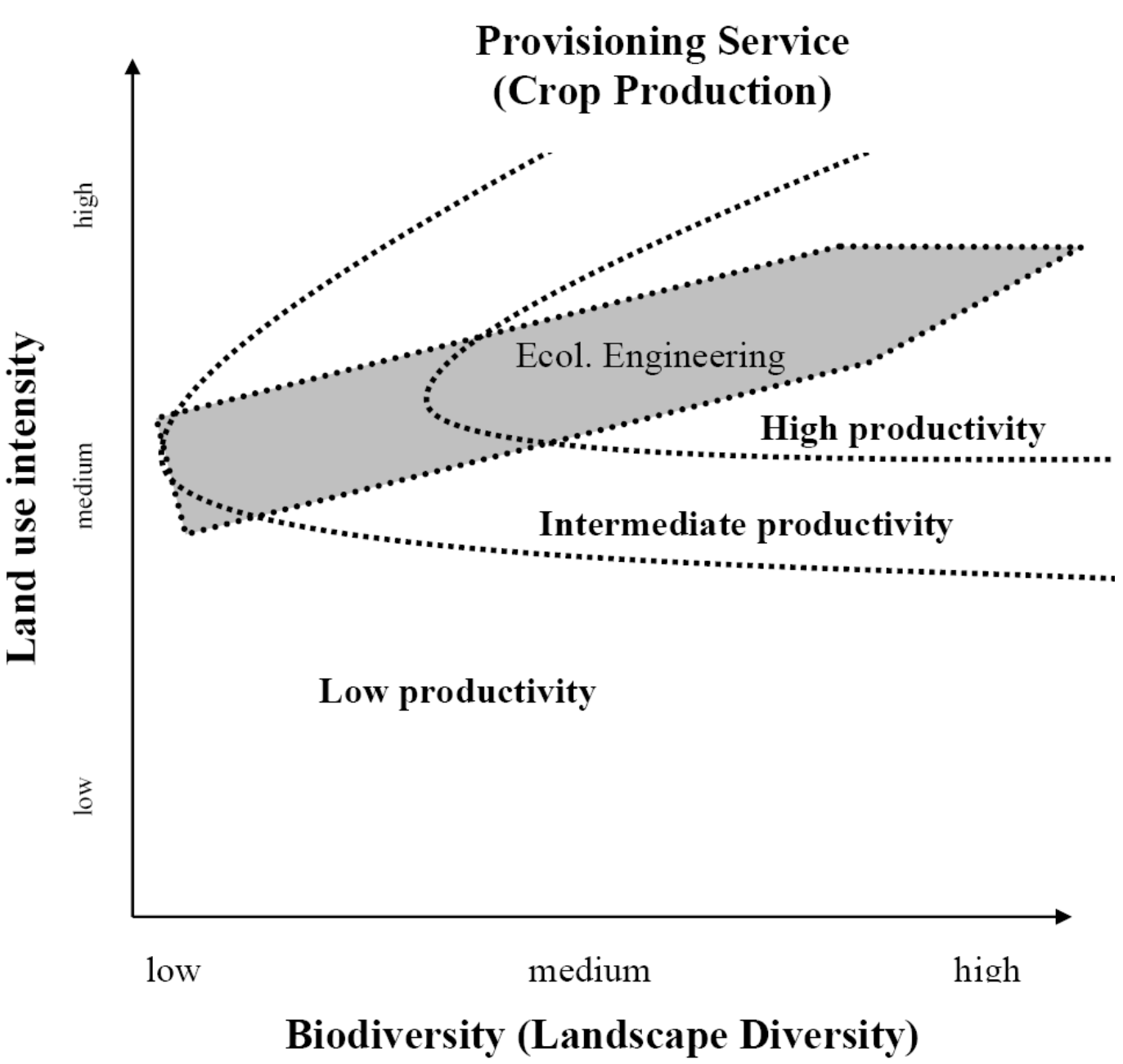
Ecological Engineering

- 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


Provisioning Service
(Crop Production)
Land use intensity
high
medium
low
Ecol. Engineering
High productivity
Intermediate productivity
Low productivity
low
medium
high
Biodiversity (Landscape Diversity)

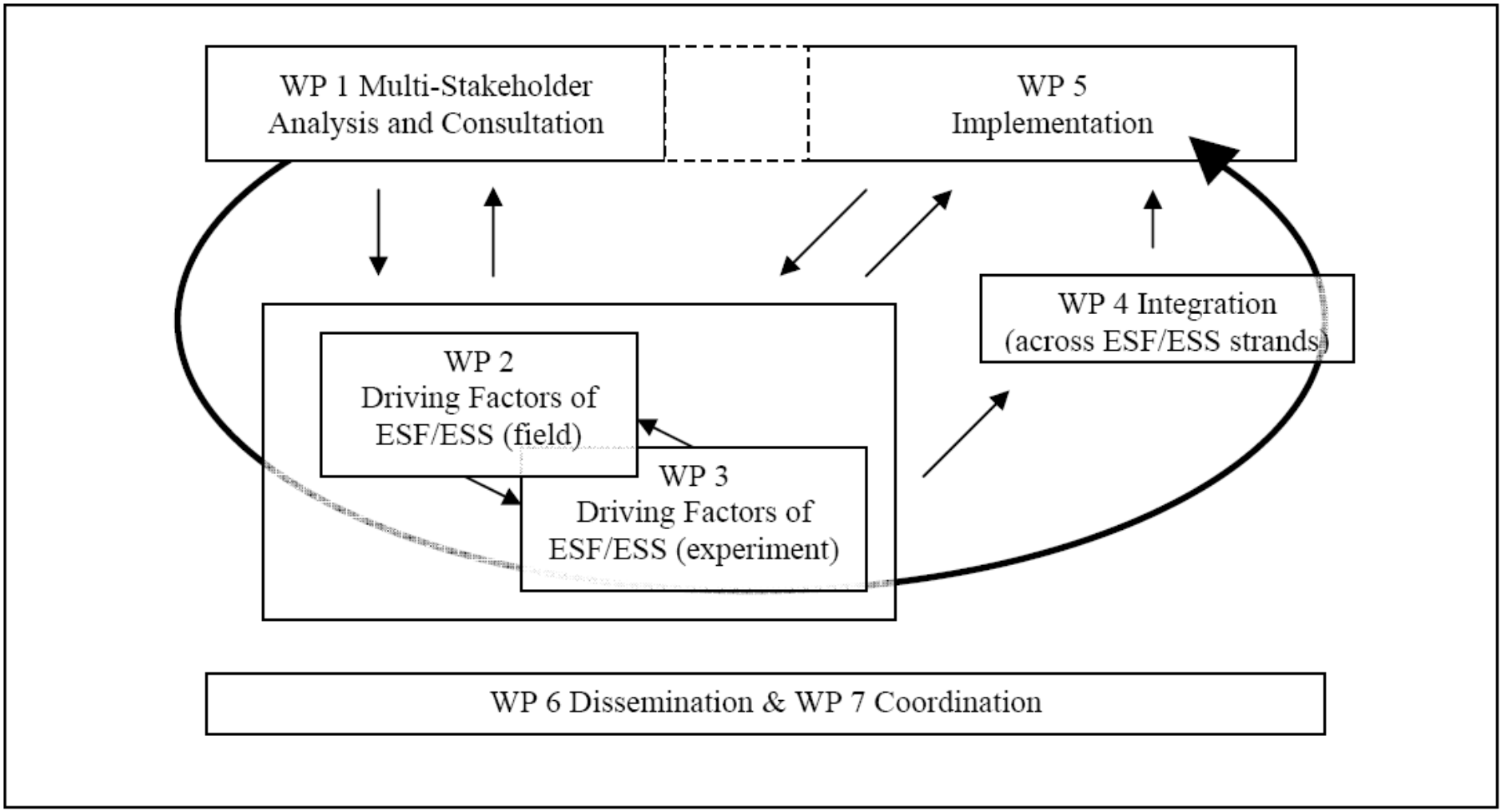
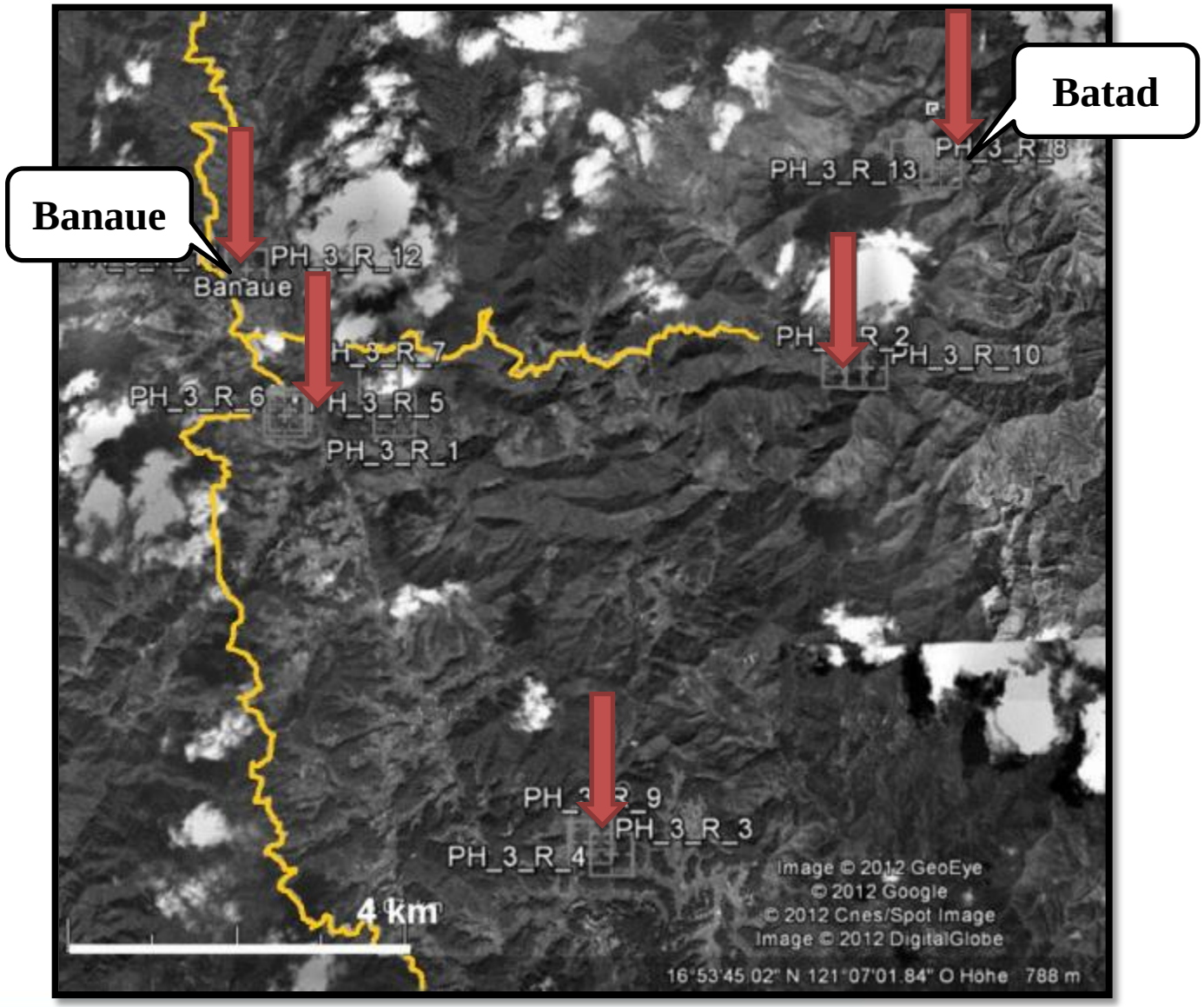


Figure 7.1: LEGATO overview structure and work flow


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
Lao Cai (VN_3)
Vinh Phuc (VN_2)
Hai Duong (VN_1)
Tien Giang (VN_4)
Ifugao (PH_3)
Nueva Ecija (PH_2)
Laguna (PH_1)
Lao
Laos)
Việt Nam
(Vietnam)
Cambodia
Paracel Islands
South China Sea
Spratly Islands
Pilipinas
(Philippines)
Luzon
Quezon
Mindoro Island
Panay
Samar Island
Palawan
Negros
Sulu Sea
Mindanao
香港
(Hong Kong)
澳門
(Macau)
海南
Hà Nội
Hải Phòng
Phnom Penh
Hồ Chí Minh
500 km
200 Meile/n

LEGATO Ifugao (PH_3) research sites




Structurally rich
Structurally poor
PH_3_R_8

Banaue / Philippines 1908

Banaue / Philippines 2010

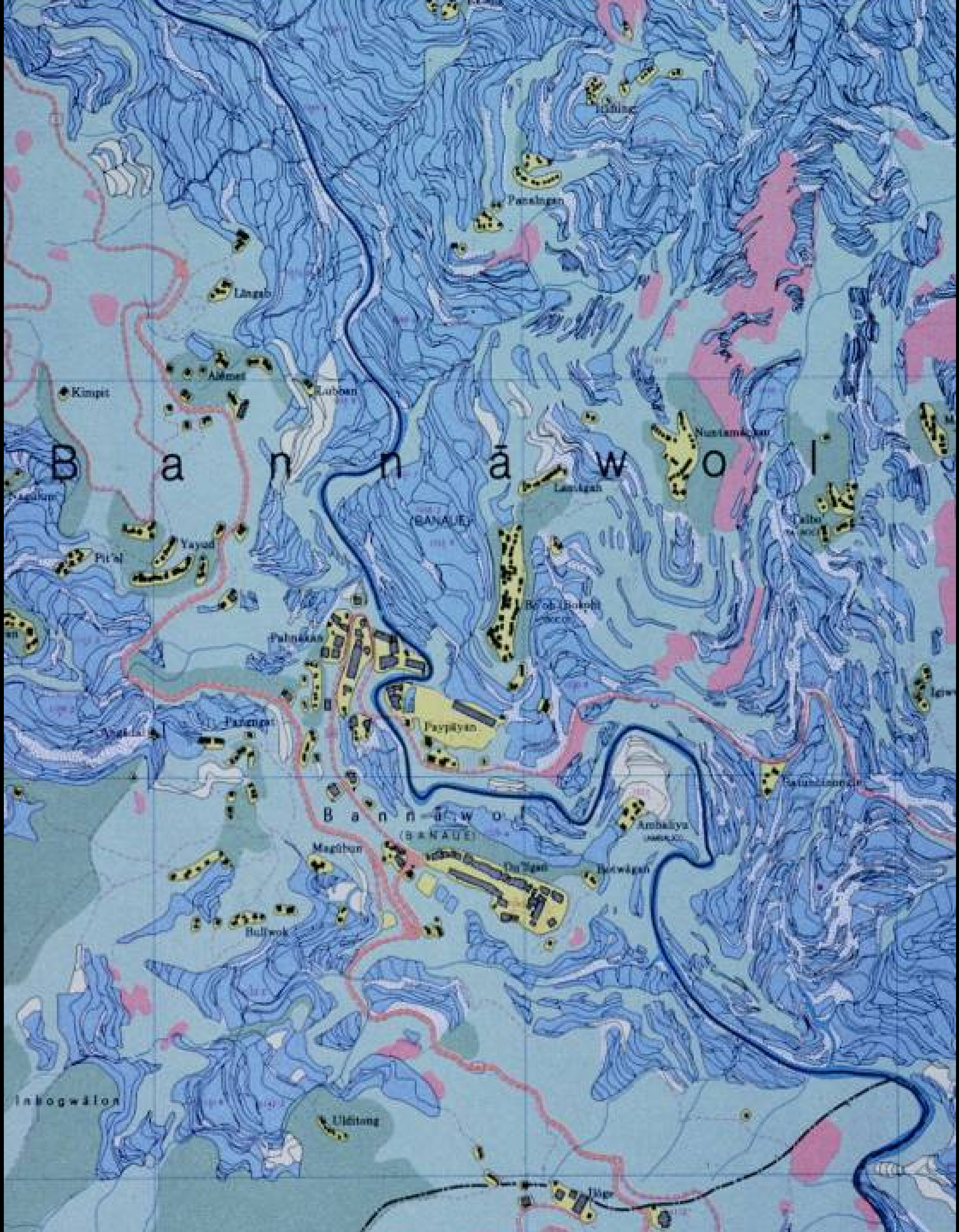
LEGATO

Co-Design, Feedback,
Implementation
Citizen Science

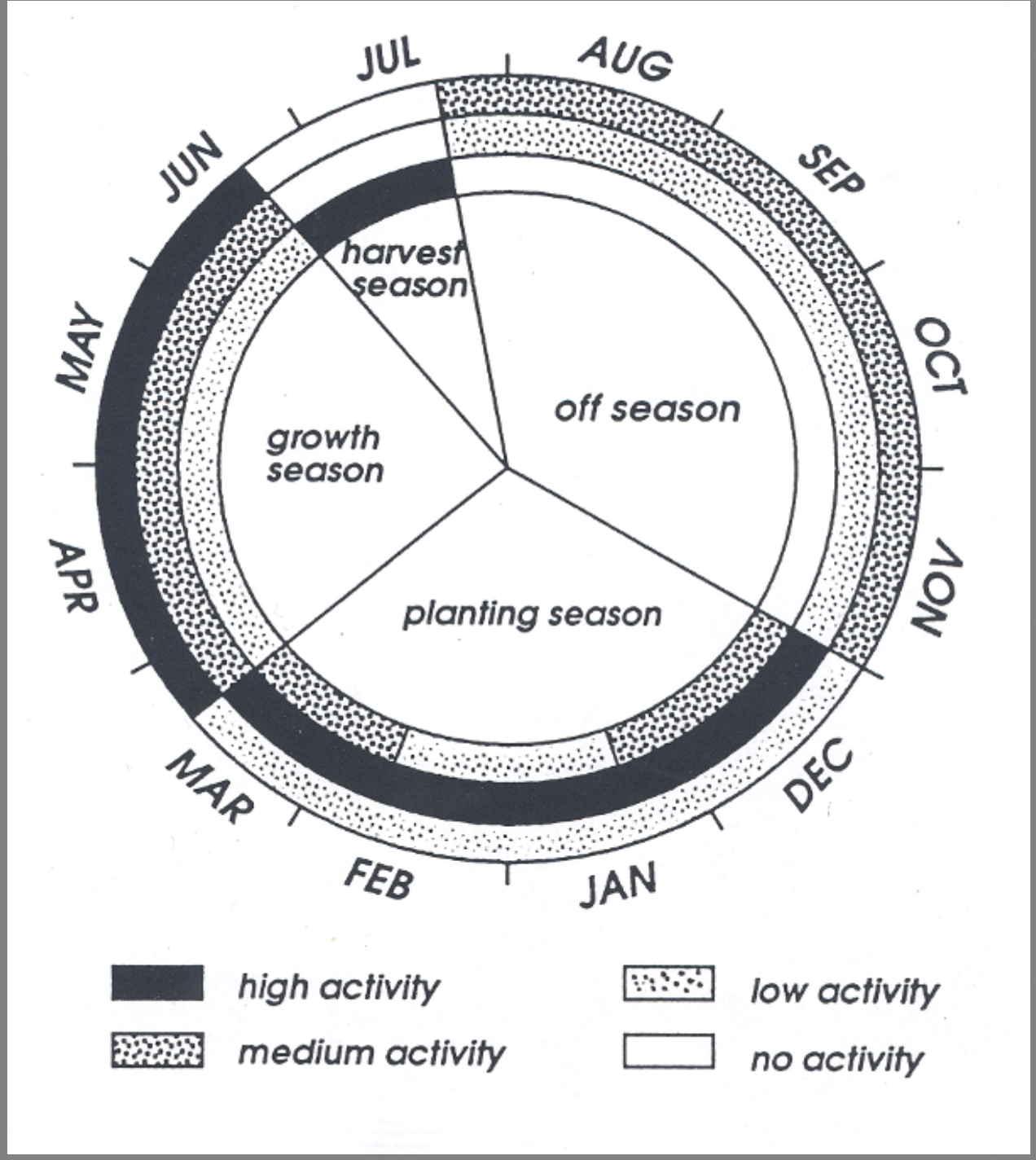

PLEASE
ORDER
DINNER
BEFORE
7:00 PM

LEGATO
RICE ECOSYSTEM SERVICES

LEGATO
RICE ECOSYSTEM SERVICES



Lingab
Kimpit
Lubban
B a n n ā w o l
(BANAUE)
Yayud
Nustamākan
Paypāyan
B a n n ā w o l
(BANAUE)
Ambaliyu
Bullwok
Ulditong
Inbogwālon


JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
harvest season
off season
growth season
planting season
high activity
low activity
medium activity
no activity


Banaue HOTEL
WELCOME
LEGATO CONFERENCE
LEGATO
Ecological Engineering for Sustainable Management in Rice Landscapes
IRRI
Banaue Hotel and Youth Hostel • July 1-7, 2012

Nutrient Research in LEGATO

Marxen/Klotzbuecher et al. (in prep.)

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

Contrasting geology and soils

Vietnam

- quatenary sediments in the river deltas, but differences in the mineral assemblage
- intrusive, metamorphic rocks in the highlands

→ highly weathered soils

Philippines

- basic, effusive rocks (vulcanos)
- recent carbonate sediments

→ younger, more weatherable minerals

Conclusions and outlook

- Differences in Si availability between the Philippines and Vietnam are much greater than within the countries

  → Geo-/pedological conditions are the major determinant for Si availability in soils

- Concentration of plant available Si in soils determines Si status of rice plants

  → role of phytoliths?

  → adequate management?

Interdisciplinary questions

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

Decomposition Research in LEGATO

Schmidt A. et al. (in prep.)

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

Small scale decomposition survey

Invertebrate decomposers are crucial for the long-term **sustainability** development of rice ecosystems.

Surrounding structures influence decomposition rates of invertebrates, measurable by a **gradient** within the field.

Pollinator Research in LEGATO

Westphal et al. (in prep.)

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

Species richness and plant-pollinator interactions

- 13 bee genera (Apidae, Halictidae, Megachilidae)
- 26 morphospecies
- 77 flowering plant species (many non-native)
- 491 plant-pollinator interactions

Polycultures

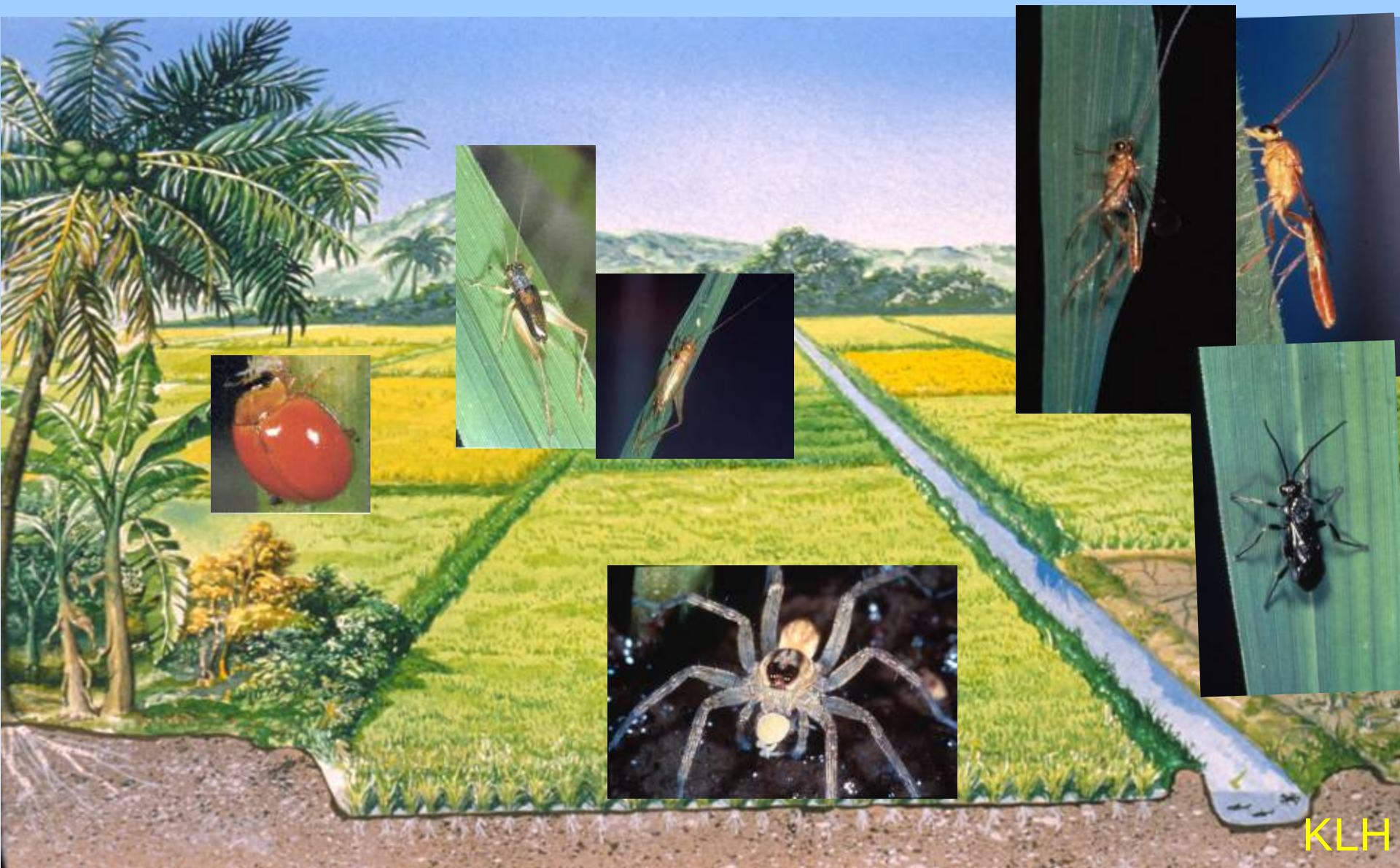
→ Provide important nesting and foraging habitats for bees in rice-dominated landscapes

→ 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 parasitoids

Natural Biological Control Service



KLH

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

Christophe Dominik

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

The Ecosystem Service Cascade: The influence of purpose and application characteristics like scale and beneficiaries

Spangenberg et al. (subm.)

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ


1000
HAGDAN-HAGDANG PALAYAN NG BANAWE
SANLIBONG PISO


1000
MANUNGGUL
HAGDAN-HAGDANG PALAYAN NG BANAWE
LANGGAL
SANLIBONG PISO

LEGATO

RICE ECOSYSTEM SERVICES