

Opportunities for agroecological management in fruit & vegetable systems



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Outline

- 1/ What makes a “sustainable” F&V system?
- 2/ Approaches to sustainable F&V systems
- 3/ Agroecological management: theory & practice
- 4/ 3 success stories
- 5/ Complementary ecological & nutritional functions
- 6/ Scaling up agroecological management





Ecological, social, economic, & nutritional functions

(AGRO)ECOLOGICAL FUNCTIONS

Serves multiple functions simultaneously (“multifunctional”)

Nutrient inputs and outputs balanced over time

Increased capacity for nutrient retention over time

Carbon sink, not source

Crop nutritional quality

Stable yields

WHAT MAKES A “SUSTAINABLE” FRUIT & VEGETABLE SYSTEM?

Approaches to agricultural sustainability

PRECISION AGRICULTURE



AGROECOLOGICAL MANAGEMENT



Approaches to agricultural sustainability



PRECISION AGRICULTURE

- Source-sink approach to crop nutrients
- Maximizes nutrient use efficiency from fertilizer applications
- Minimizes growth-limiting factors
- Uncouples biogeochemical cycles (C, N, P)
- Focus: increasing the precision of nutrient delivery



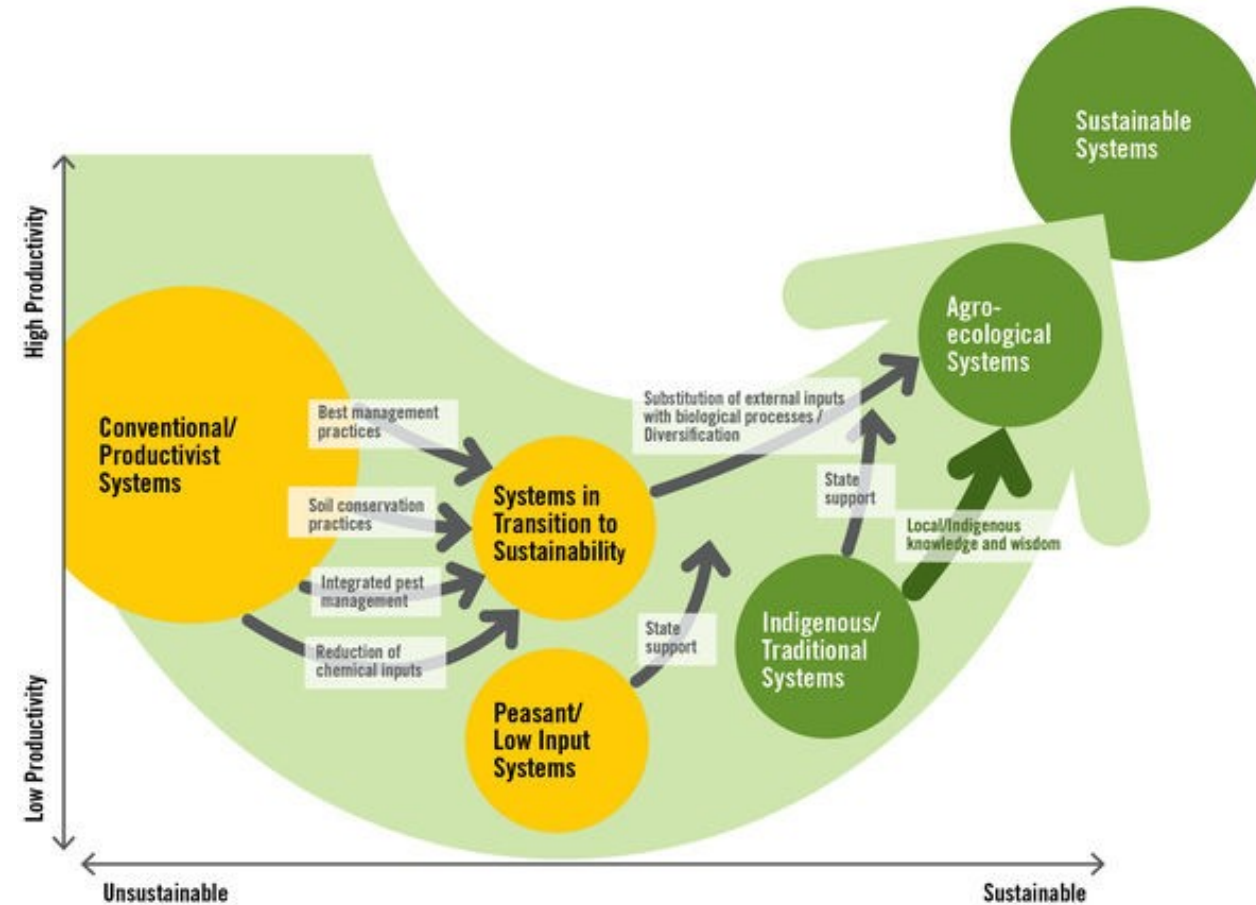
AGROECOLOGICAL MANAGEMENT

- Emphasizes internal system nutrient cycling
- Builds soil nutrient pools for plant uptake and microbial immobilization
- Couples C, N, & P cycles
- Focus: retain N and P by maximizing the extent and functional complementarity of living crop biomass in space and time

Agroecology underlies sustainable F&V systems

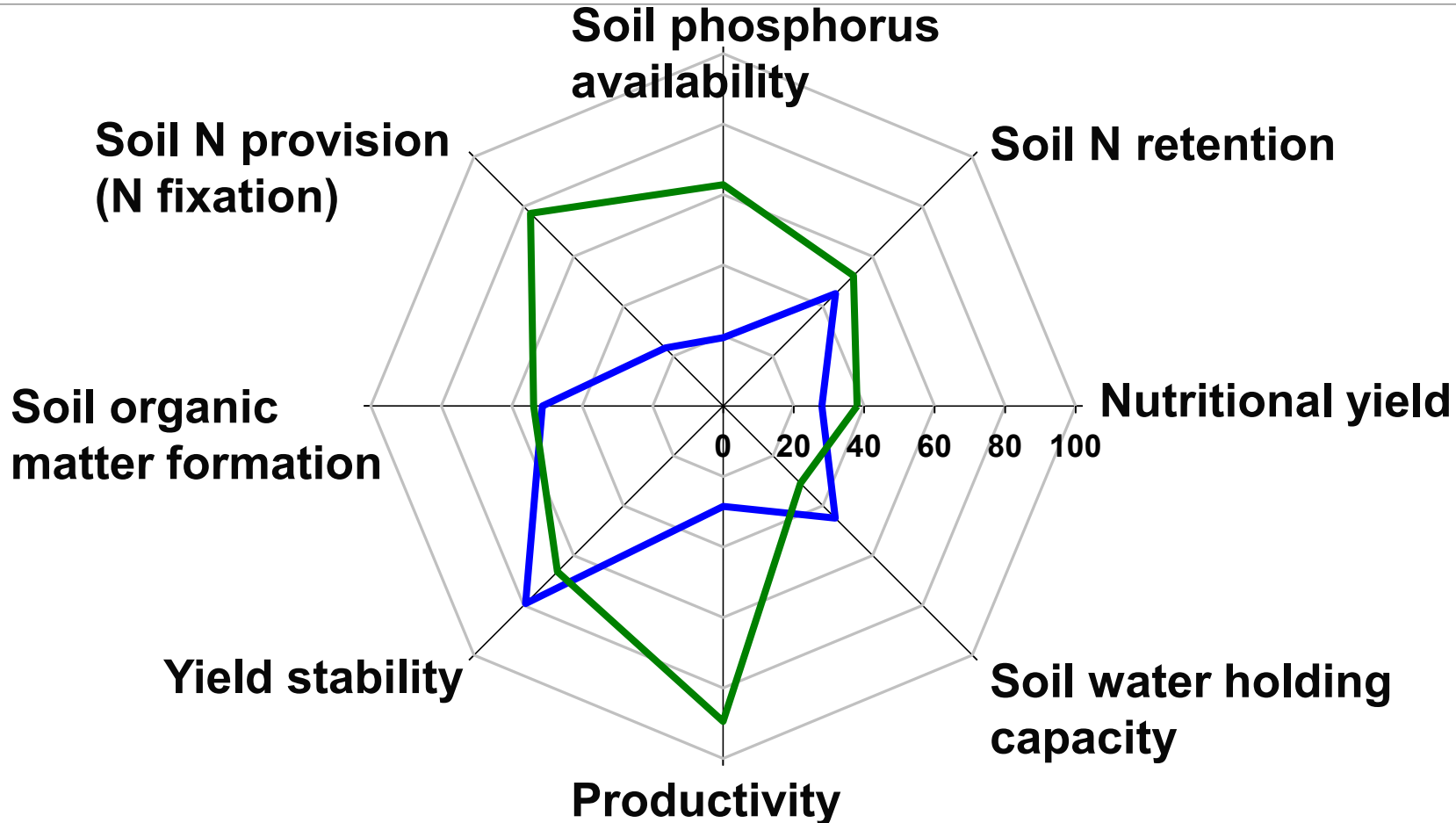
Agroecology (n.) – short for agricultural ecology, the study and practice of agriculture governed by ecological principles

- Diversified systems
- Biotic interactions replace synthetic inputs to maintain agroecosystem function
- Ecologically increases NUE
- Goals and outcomes are social, ecological, nutritional, and economic



Source: Latin America and the Caribbean, Summary for Decision Makers, p. 9

Multifunctionality





COVER CROP



INTERCROP



AGROFOREST

AGROECOLOGICAL MANAGEMENT SUCCESS STORIES



Cover cropping

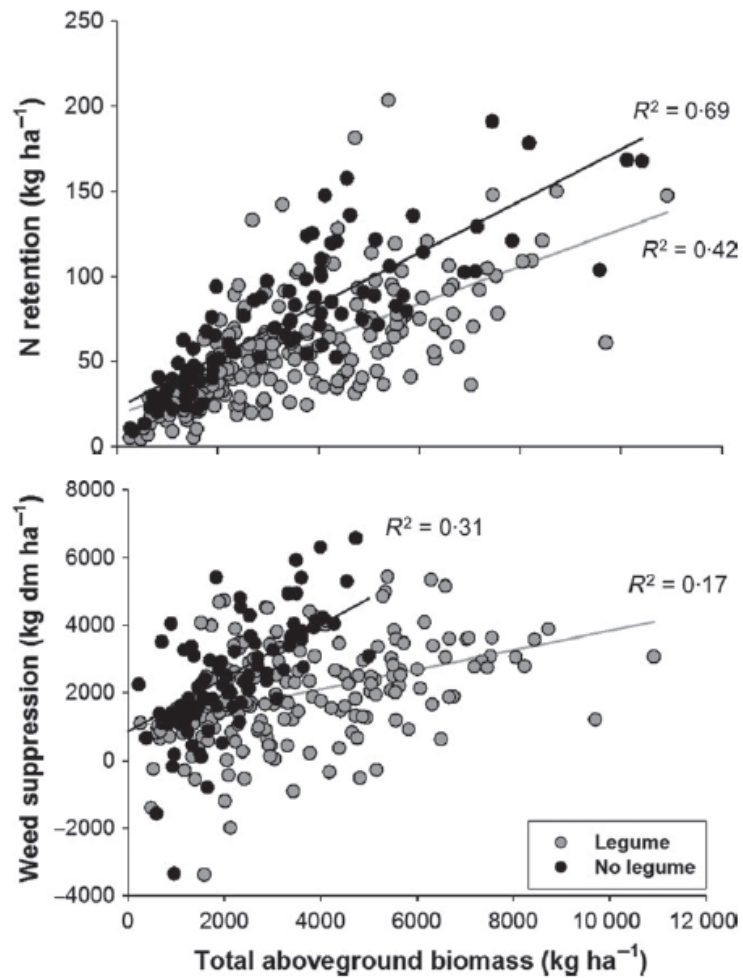
FUNCTIONS

- C & N SOURCE; SEQUESTERS SOIL C
- COMPLEMENTARY NUTRIENT PROVISION & UPTAKE
- MAXIMIZE SOIL COVER; MINIMIZE EROSION
- ROOT & FUNGAL INPUTS TO SOIL ORGANIC MATTER

Multi- functional vegetable systems



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FUNCTIONAL TRAITS IN AGROECOLOGY

Journal of Applied Ecology  BRITISH
ECOLOGICAL
SOCIETY

Functional traits in cover crop mixtures: Biological nitrogen fixation and multifunctionality

Jennifer Blesh 

Intercropping

FUNCTIONS

COMPLEMENTARY NUTRIENT PROVISION & UPTAKE
DIVERSIFIES PLANT COMMUNITY (SPECIES, FUNCTIONS, GENOTYPES)
BUILDS FUNCTIONAL MICROBIAL & INSECT COMMUNITIES
INTER-SPECIES FACILITATION



broad bean-wheat for leaf spot of the broad bean and wheat rust control



Maize-potato for Asiatic corn Borer and potato late blight disease control



Soybean-maize for leaf spot of the maize control and soil health



Maize-pepper for blight of pepper and maize northern leaf blight control

Staple & vegetable
intercropping
adopted on 2.77
million ha
(2006-2015)

YUNNAN PROVINCE, SW CHINA

PROF. YOU-YONG ZHU

YUNNAN AGRICULTURAL UNIVERSITY



Perennialization

FUNCTIONS

COMPLEMENTARY NUTRIENT PROVISION & UPTAKE

MAXIMIZES SOIL COVER; MINIMIZE DISTURBANCE

ROOT & FUNGAL INPUTS TO SOIL ORGANIC MATTER

DIVERSIFIES PLANT COMMUNITY (SPECIES, FUNCTIONS, GENOTYPES)

Agroecological agroforestry systems

SOUTHERN BRAZIL
APPLIED ECOLOGY LAB
FEDERAL UNIV OF SANTA CATARINA



Project implemented in Parana by ASSESOAR

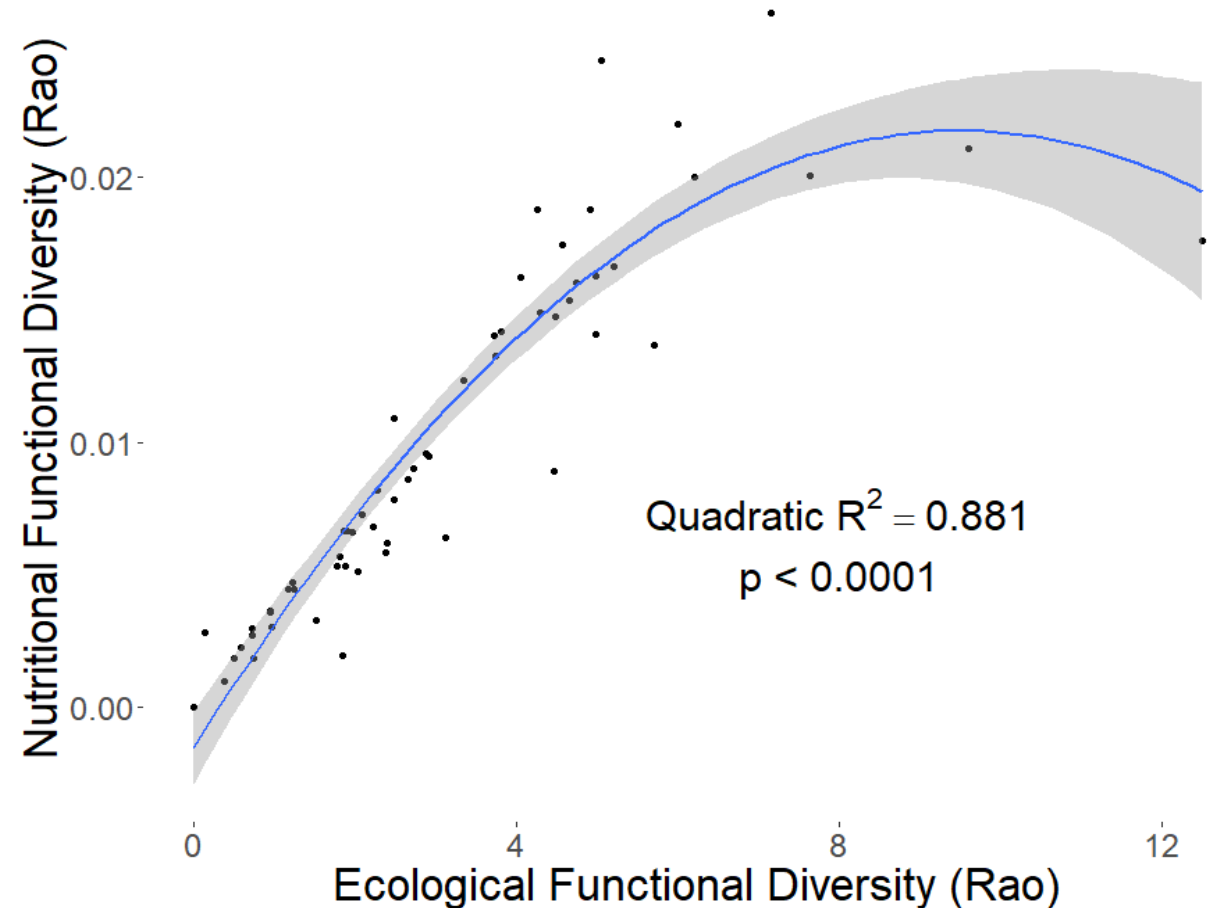


Ecological & nutritional functional diversity

Sarstun, Guatemala case study

Quantified ecological and nutritional functional crop diversity for smallholders (n=60)

Strong positive relationship indicates that as species with diverse ecological functions decline, so will nutritional diversity of production



Scaling up agroecological management

Requires policy support & investment

Brazilian example: National School Lunch Program (PNAE)

- Innovative national food procurement program
- 30% local sourcing required at municipal level - fresh fruits, vegetables, whole foods for school lunches (Brazilian Law No. 11.947)
- Explicitly ties family farming, ecological management, local food consumption
- 30% price premiums for organic & agroecological production since 2009
- 6+ month contracts with growers to ensure a stable market
- Participating farmers reduce input use, increase diversity

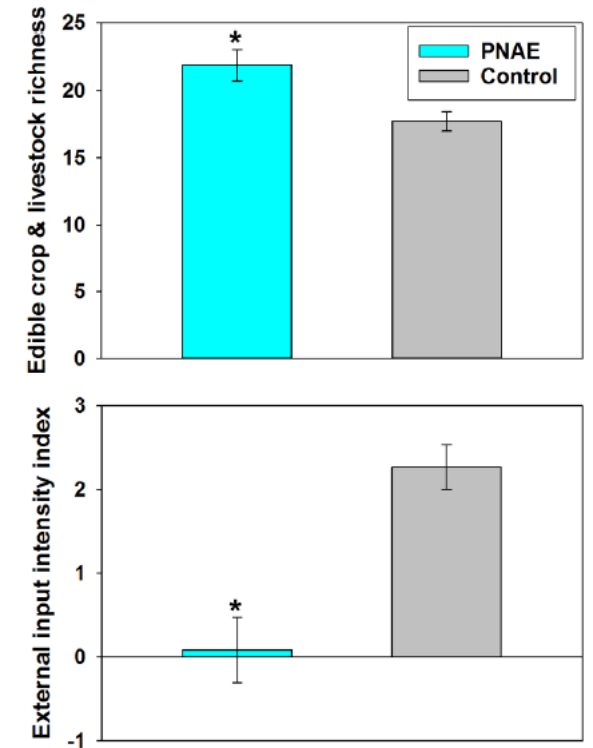


Figure 2. Mean richness (total number) of edible crops and livestock on PNAE versus control farms in Santa Catarina (top panel; N=75 farmers), and an index of use of external inputs purchased from off the farm (bottom panel).

Thank you!

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Governo do Estado de Santa Catarina
Secretaria de Estado de Agricultura e da Pesca
Empresa de Pesquisa Agropecuária e Extensão Rural
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Questions?

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