



Instituto Nacional de Investigación Agropecuaria
U R U G U A Y

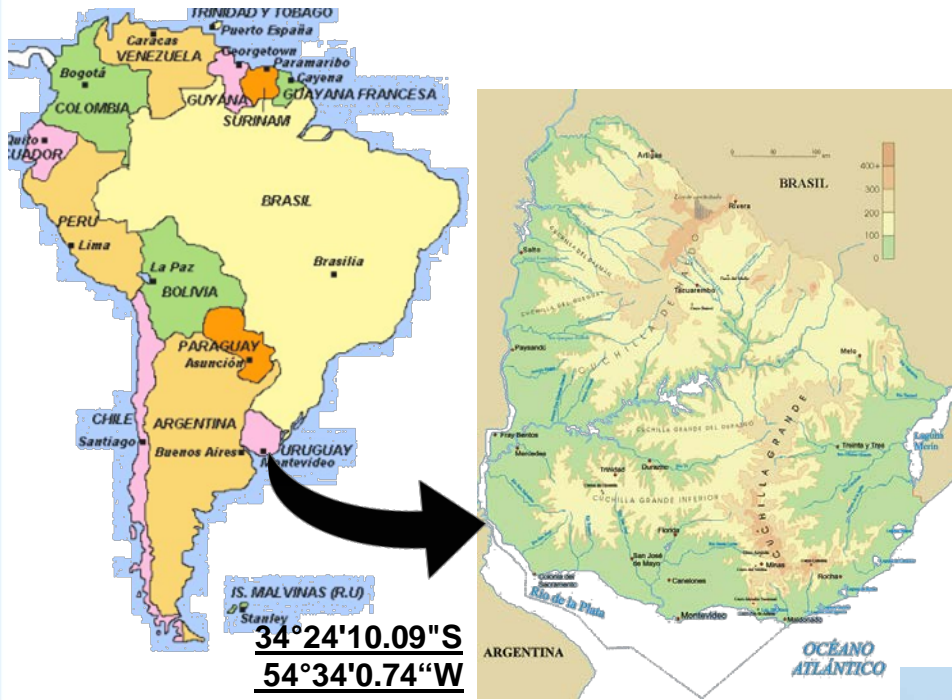
Improving livestock production assuring natural grassland ecosystem conservation: three key management practices at farm level

Oscar Blumetto*, Santiago Scarlato, Andrés Castagna, Guadalupe Tiscornia, Andrea Ruggia, Gerónimo Cardozo

National Institute of Agriculture Research (INIA), Uruguay



Uruguay: production and environmental protection



- >90 % of land are private property

- Most of these properties are occupied by agriculture

- Ecosystem services and biodiversity conservation depends on production systems

- Livestock production is based on grazing systems and occupy about 70 % of country area

- Most of them are based on natural grassland



Our main question:

¿Is it possible to have a win-win relationship between increasing productivity and protect environment?

Our hypothesis:

The re-design of the production system could increase average natural grass biomass along the year, increasing productivity and maintaining environment quality

Study case:

For environmental variables, we select one study case for presenting methodology and first results

Agreement with farmer

Stocking rate
Cattle/sheep relationship
Forage asignation by categories

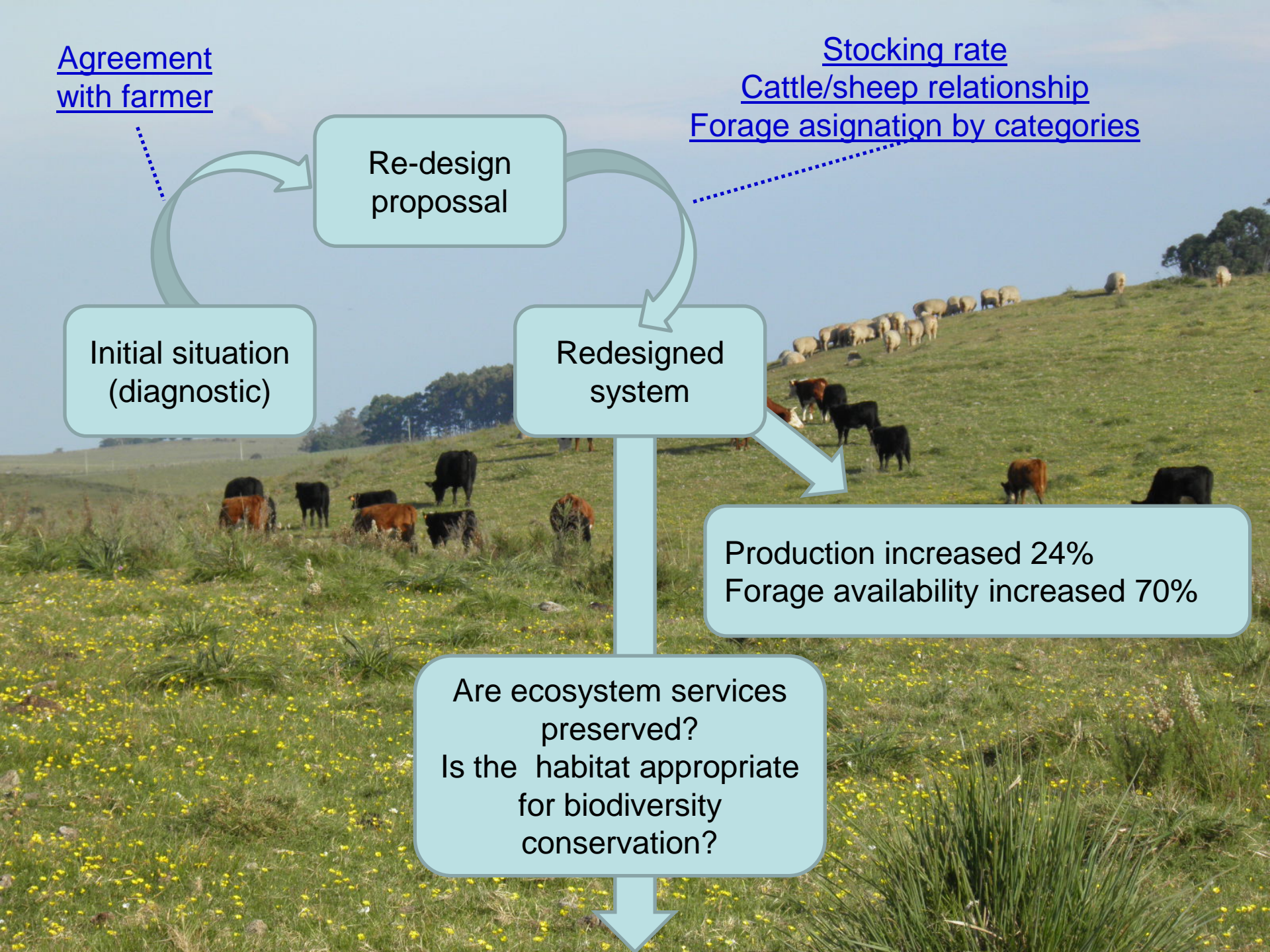
Re-design
propossal

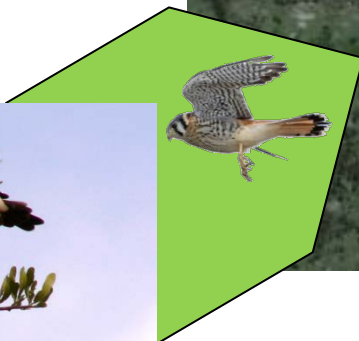
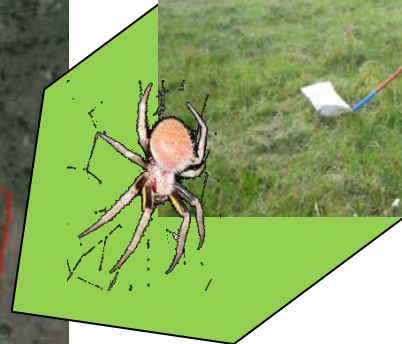
Initial situation
(diagnostic)

Redesigned
system

Production increased 24%
Forage availability increased 70%

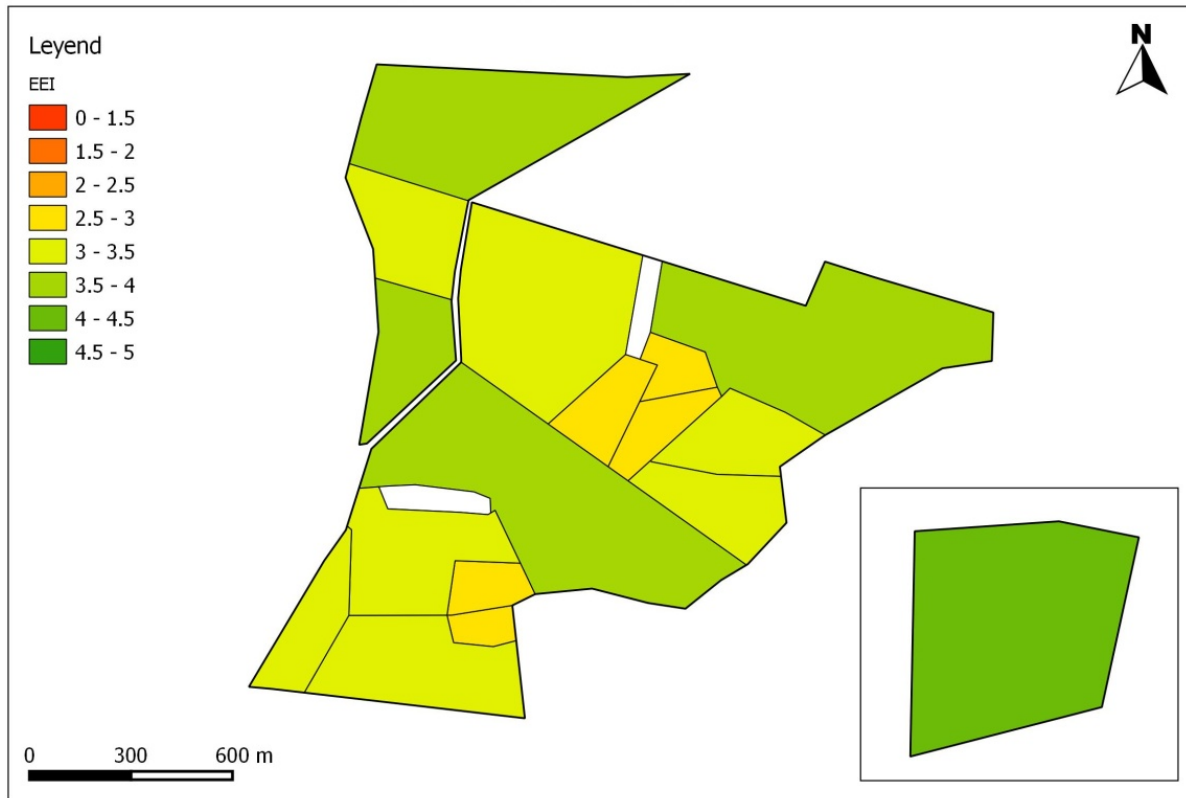
Are ecosystem services
preserved?
Is the habitat appropriate
for biodiversity
conservation?





Ecosystem Integrity Index

Ecosystem Integrity Index (EEI) - OTTO RIERA



Ten point scale 0 to 5

Evaluation dimensions:

- Vegetation type
- Species composition
- Structure
- Soil
- Streams and riparian zone

EEI = 3.5

Some production results for the study case

- Productivity increased 30% after re-design (94 to 122 kg meat equivalent)
- Net income increased 71%
- Stocking rate decrease from 0.94 to 0.84
- Sheep/cattle relationship reduced from 2.4 to 1.4
- Average forage allowance increase from 3.4 to 6.0

Water Quality Index

$$WQI = \frac{\sum_{i=1}^n (C_i \cdot P_i)}{\sum_{i=1}^n P_i}$$

Integrate: phosphorus, nitrates, turbidity, dissolved oxygen, total dissolved solids, pH

Scale: 0 to 100

Parameters registered for analysed water (media \pm SD)

Type	DO ppm	pH	Turbidity FNU	TDS ppm	NO ₃ mg/L	P ppb	WQI
First Year	6,1 \pm 2.5	7,6 \pm 0.4	75,5 \pm 16.8	24,3 \pm 20.2	127.0 \pm 49.8	0.42 \pm 0.3	72
Last year	8.75 \pm 2.7	6,5 \pm 0.4	5,3 \pm 14.8	59,4 \pm 21.2	0.42 \pm 0.1	37 \pm 18.8	86

Plants diversity

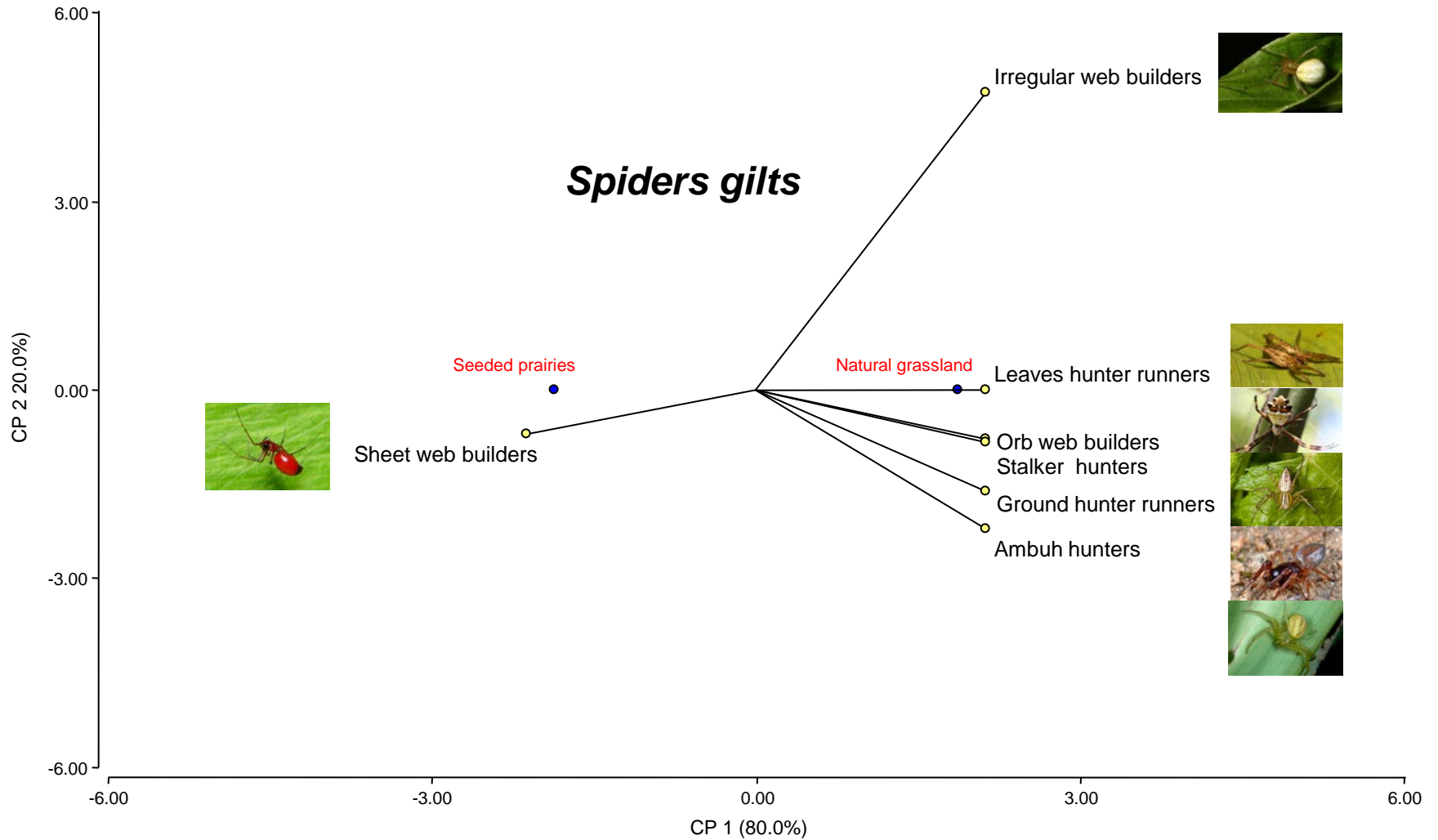
60 species of herbaceous plants and 22 species of trees associated to grasslands were found.

Ten species represent 71.8% in terms of soil covering in the reference

Cynodon dactylon,
Axonopus affinis,
Richardia humistrata,
Paspalum notatum,
Piptochaetium montevidense,
Cyperus sp.,
Trachipogon montufari,
Andropogon ternatus,
Botriocloa laguroides.

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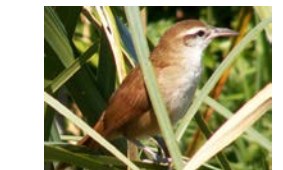
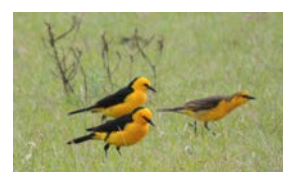
12 families and 24 species of spider belonging to 7 different guilds



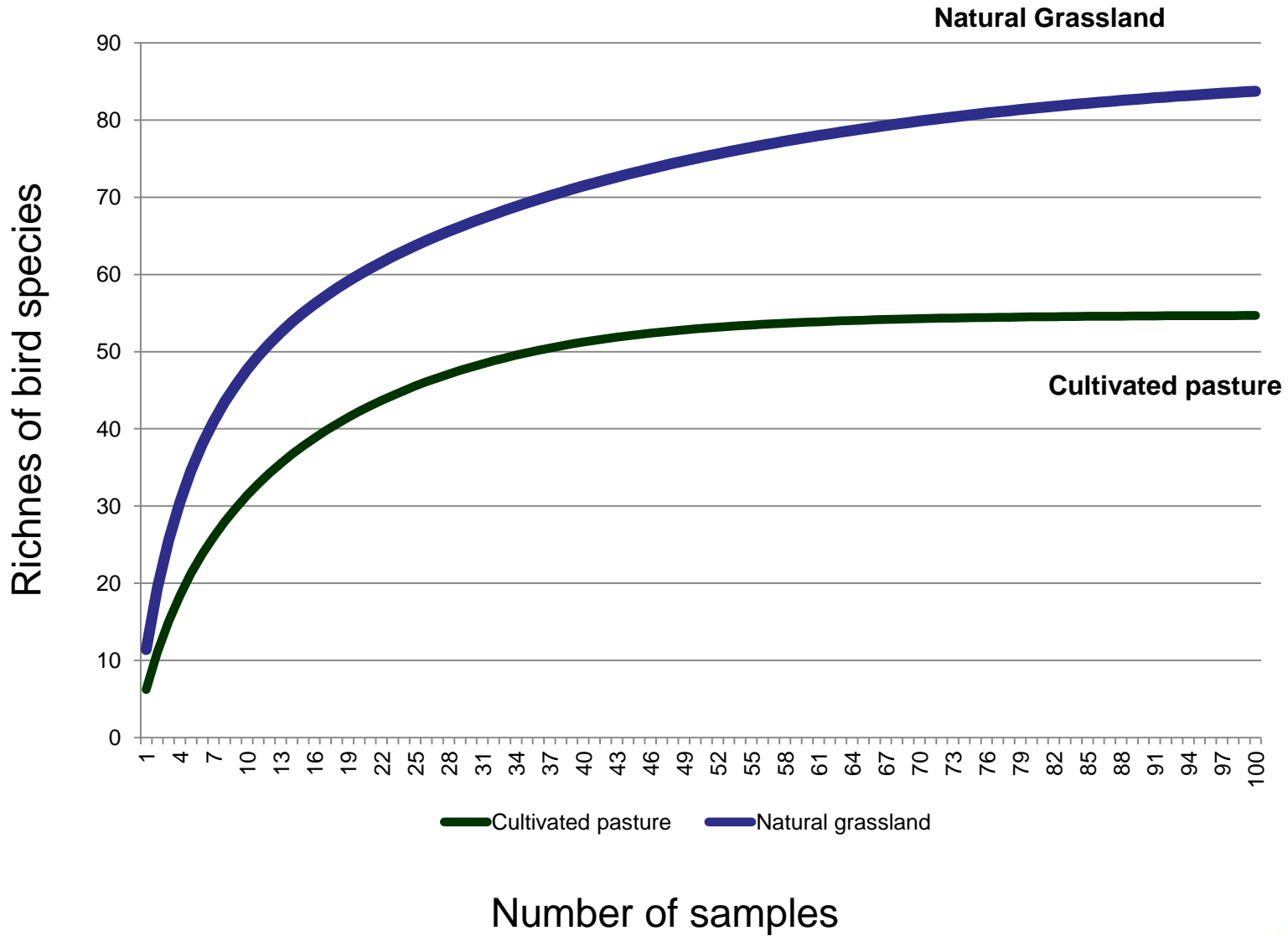
Total 80 species for this farm

18 priority conservation species

Species	English name
<i>Aramus guarauna</i>	Limpkin
<i>Bartramia longicauda</i>	Upland Sandpiper
<i>Cariama cristata</i>	Red-legged Seriema
<i>Circus cinereus</i>	Cinereus Harrier
<i>Coragyps atratus</i>	Black Vulture
<i>Donacospiza albifrons</i>	Long-tailed Reed Finch Black-chested Buzzard- Eagle
<i>Geranoaetus melanoleucus</i>	Chopi Blackbird
<i>Gnorimopsar chopi</i>	Straight-billed Reedhaunter
<i>Limnoctites rectirostris</i>	Curve-billed Reedhaunter
<i>Lochmias nematura</i>	Sharp-tailed <i>Streamcreeper</i>
<i>Nothura maculosa</i>	Spotted Notura South American painted- snipe
<i>Nycticryphes semicollaris</i>	Red-crested Cardinal
<i>Picumnus nebulosus</i>	Mottled Piculus
<i>Rhea americana</i>	Greater Rhea
<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper
<i>Xanthopsar flavus</i>	Saffron-cowled Blackbird
<i>Xolmis dominicanus</i>	Black-and-withe Monjita



Bird species accumulation curves



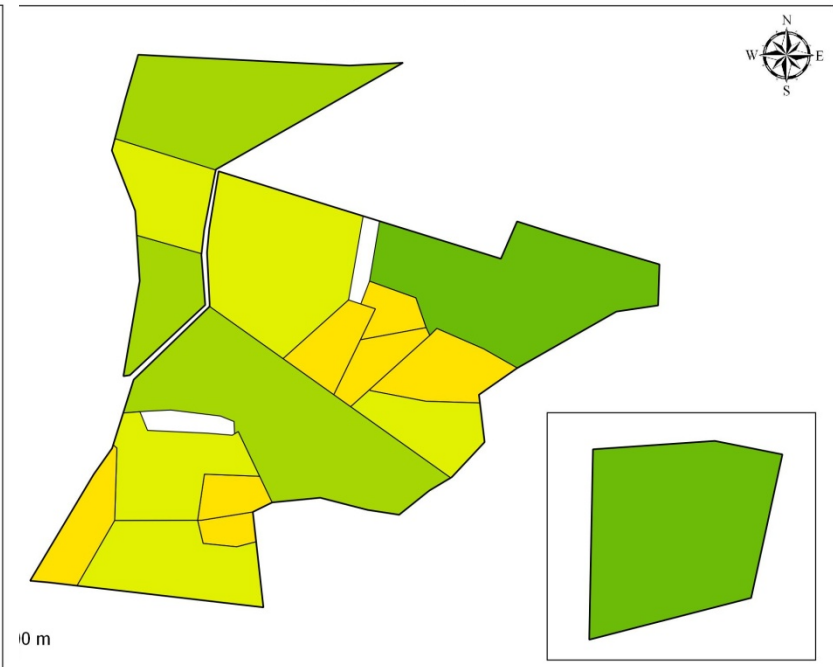
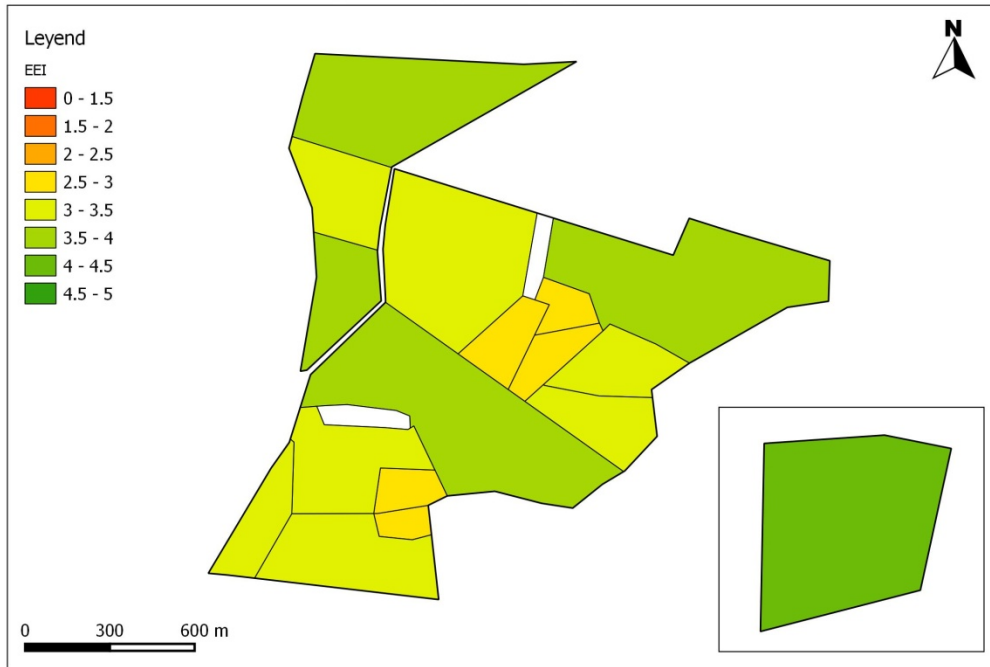
Ecosystem Integrity Index

IIE = 3.5

IIE = 3.7

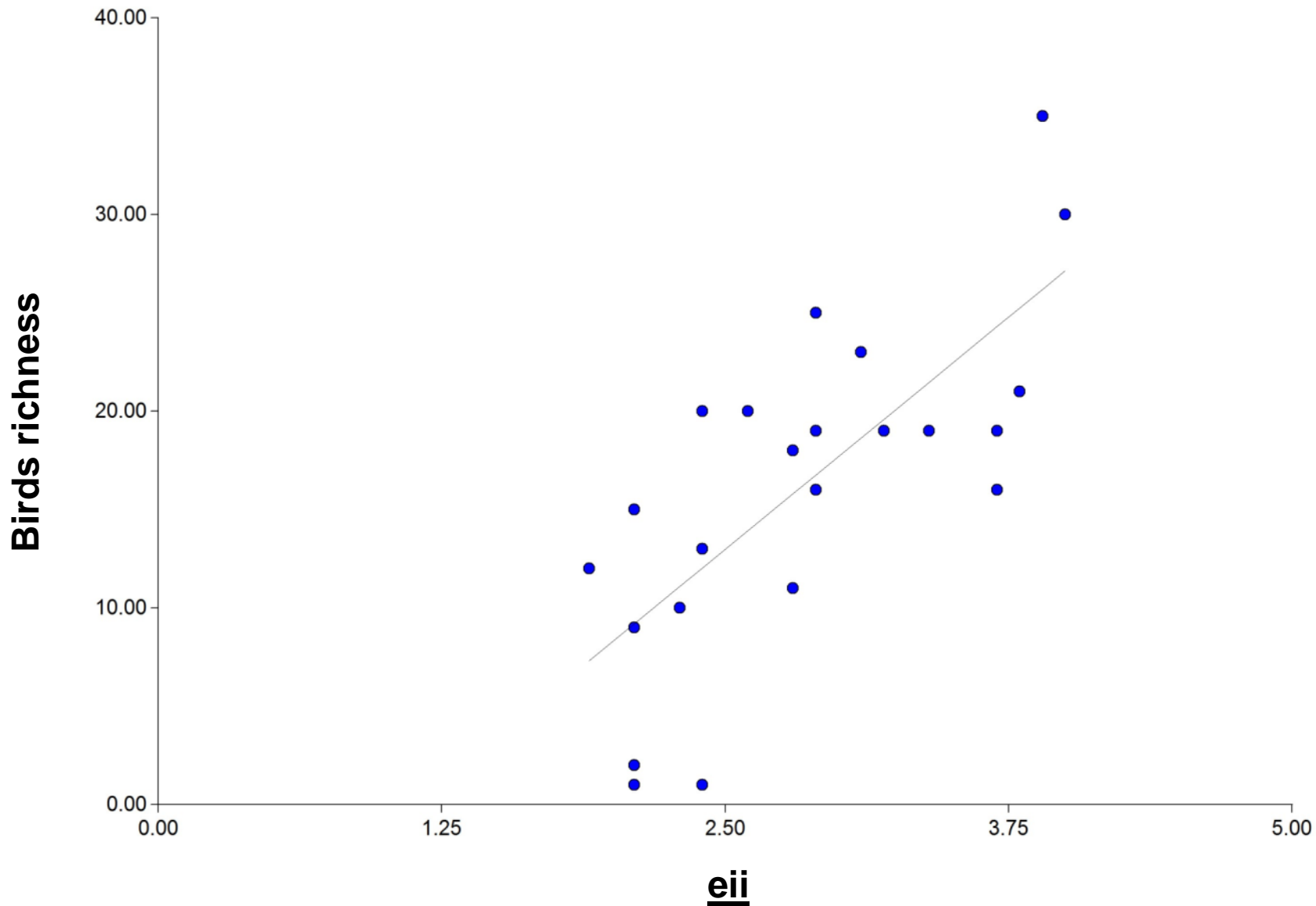
Ecosystem Integrity Index (EEI) - OTTO RIERA

Ecosystem Integrity Index (EII)



2012

2015



Conclusions:

The keys for improving productivity preserving ecosystem services

Adjustment of average stocking rate of the system and reduce sheep/cattle ratio.

Flexible management of animal categories between paddocks and establish forage allowance adjusted by each categories and seasons, working with higher biomass availability

The co-innovation approach is an excellent tool for becoming resilient the production system and incorporating permanently values in the decision criteria of farmer.

We developed a new tool, Ecosystem Integrity Index, useful for evaluation the general state of the environment in commercial farms.

Thank you for your attention!

