Ecological intensification of livestock production in native grasslands: a case of co-innovation in Uruguay

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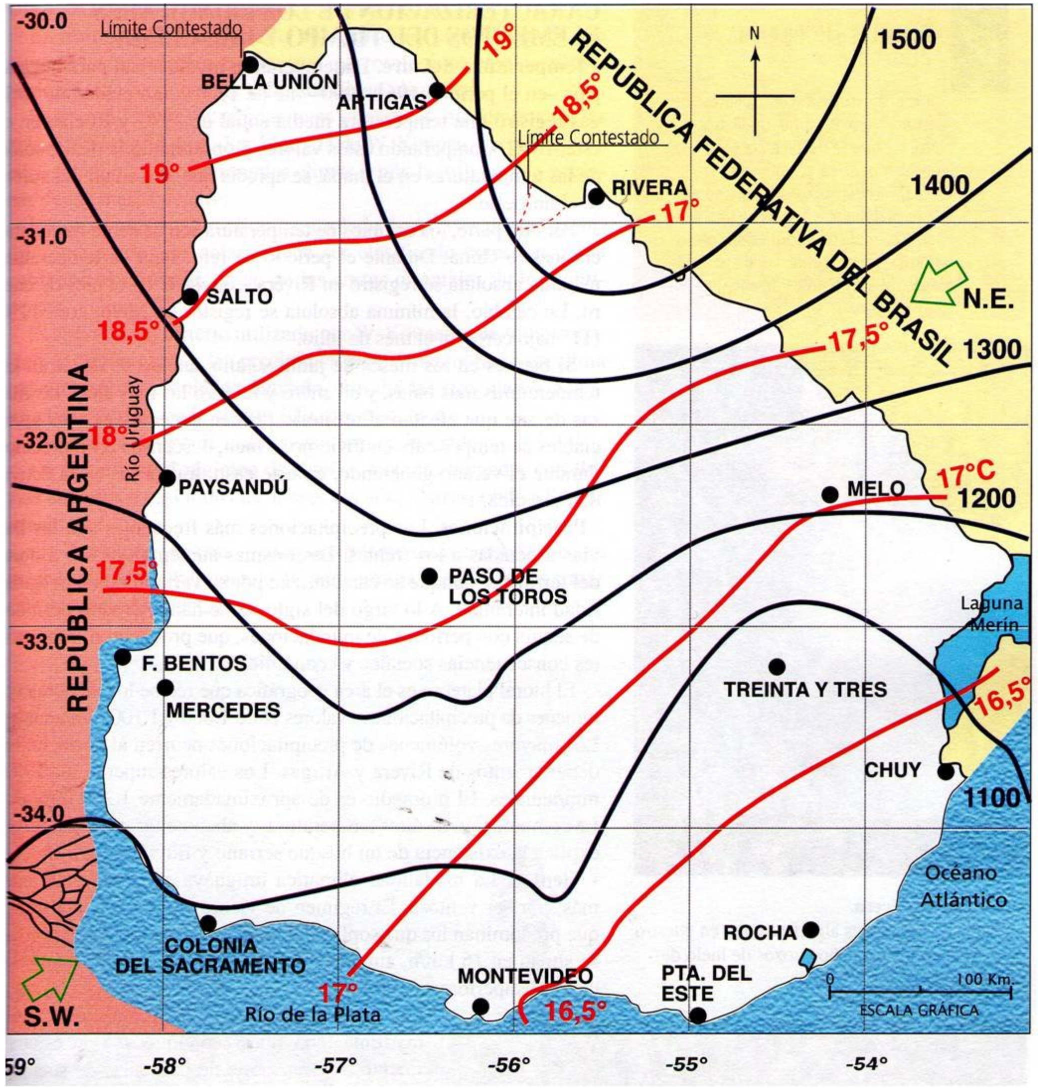
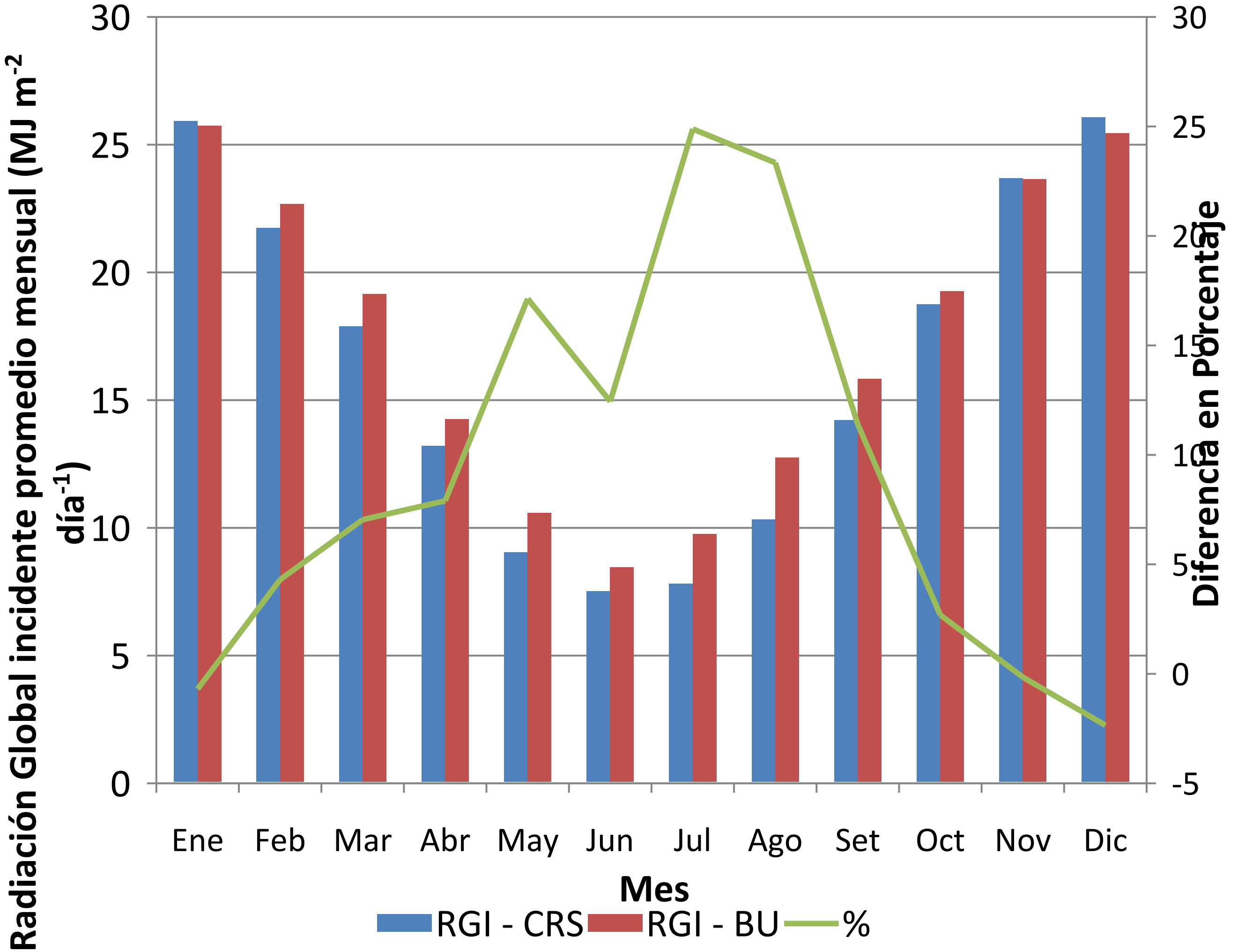
Organización de las Naciones Unidas para la Alimentación y la Agricultura
gef GLOBAL ENVIRONMENT FACILITY INVESTING IN OUR PLANET
INIA URUGUAY
FACULTAD DE AGRONOMÍA



Summer ET0 = 185 mm month^{-1}

Winter ET0 = 35 mm month^{-1}







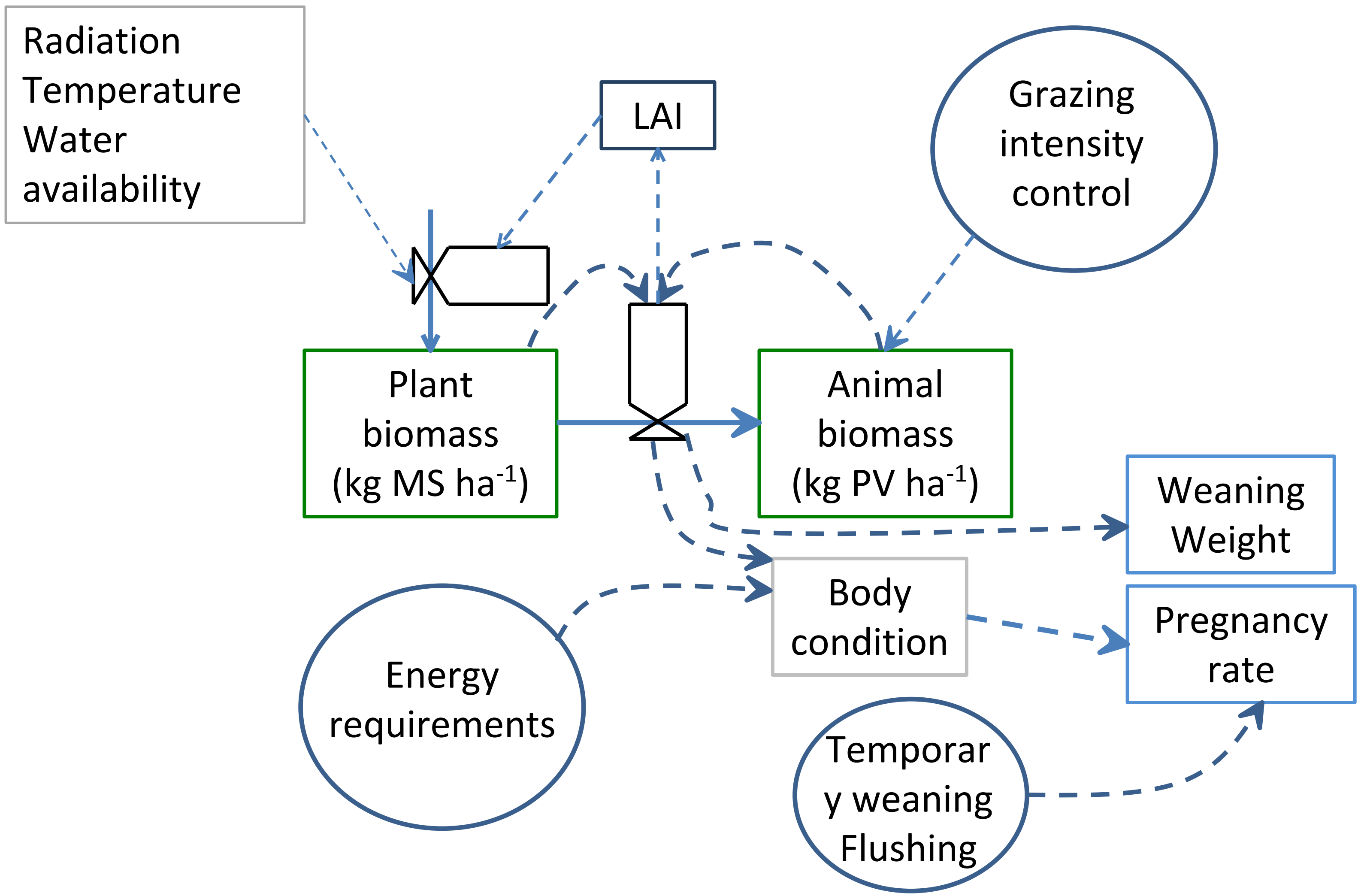
Project aim

Contribute to **GHG emission intensity reduction** and **natural grasslands conservation and restoration** while increasing **productivity and farmers’ income** without increasing risks and input use in grazing livestock systems based on natural grasslands.



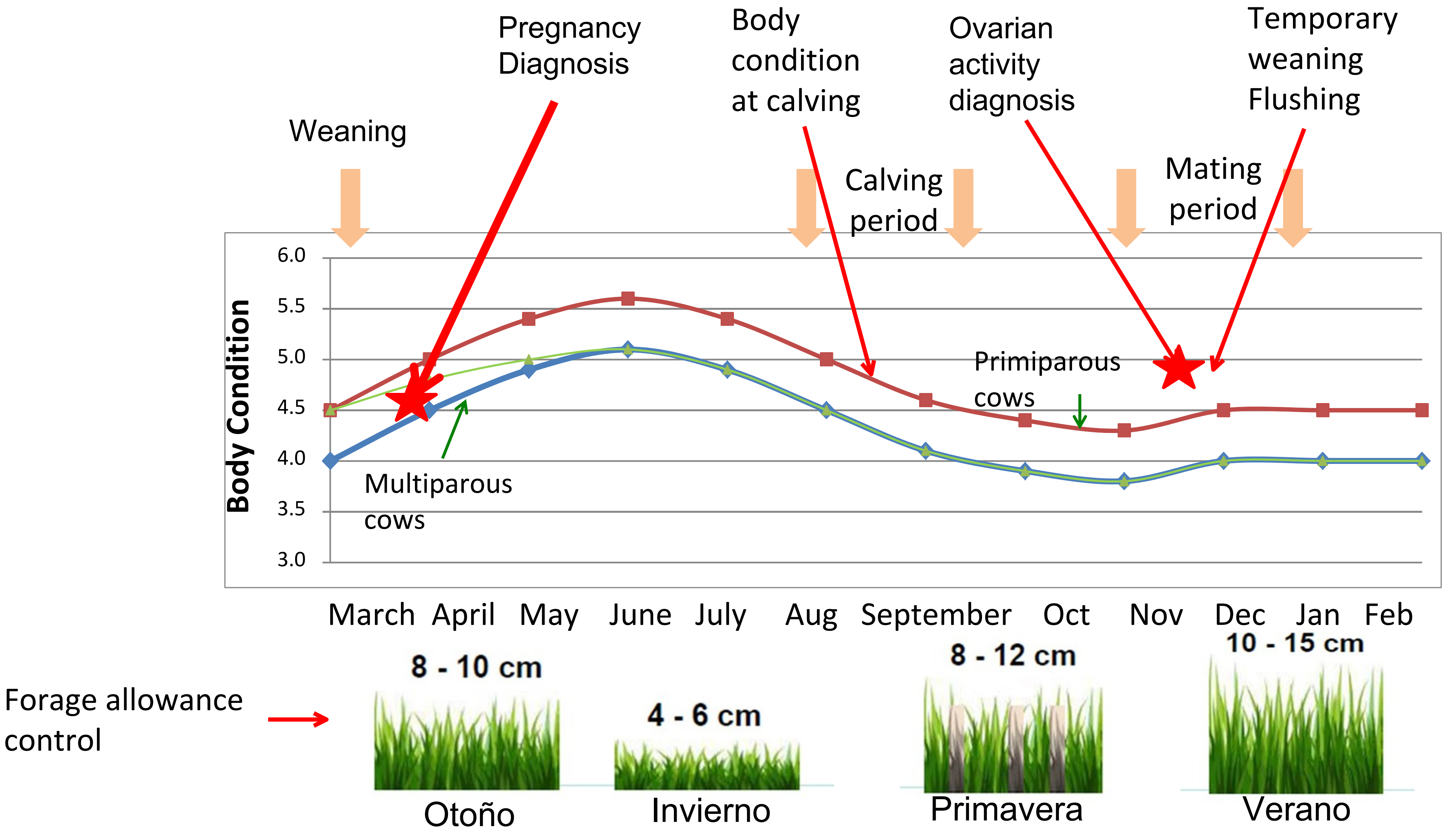



Basic concepts and Techniques to support ecological intensification of cow-calf systems



Transition to more productive and ecologically intensive livestock systems requires increasing knowledge and control by farmers of the agroecosystem basic processes to benefit from their natural diversity

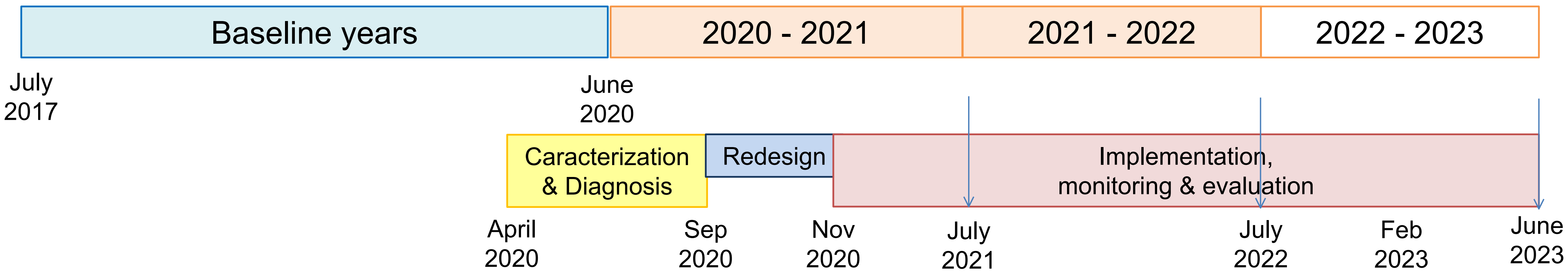
Basic concepts and Techniques to support ecological intensification of cow-calf systems



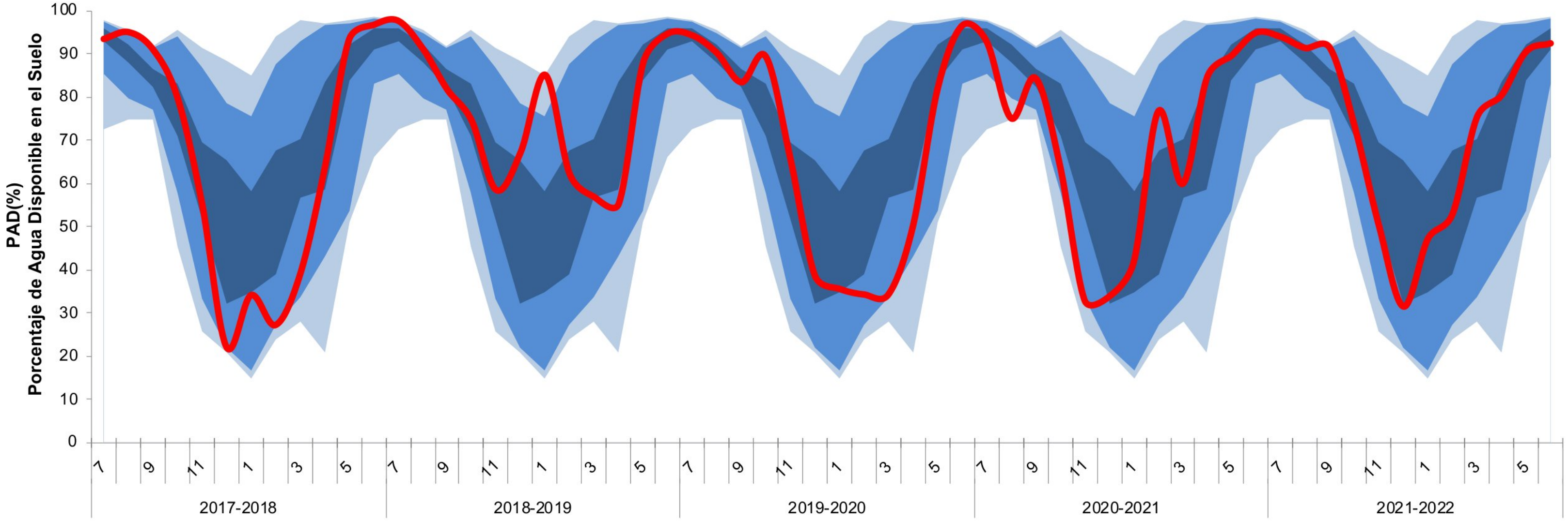
Win – Win hypothesis

- Increasing plant biomass (LAI) in natural grasslands increases:
  - forage growth rate,
  - animal energy consumption and meet production per animal unit and per ha,
  - animal selectivity and diet quality
  - biodiversity,
  - carbon sequestration
  - soil protection
- Increasing match between grassland production seasonality and animal energy requirements increases:
  - energy efficiency
  - animal energy consumption and meat production per animal and per ha,
  - Reproductive efficiency
- GHG emission per unit of product and per ha can be reduced by:
  - Increased reproductive efficiency and meat production per animal unit
  - Reduced stocking rate
  - Increased diet quality
  - Reducing use of chemical fertilizers and external sources of feed (grain)

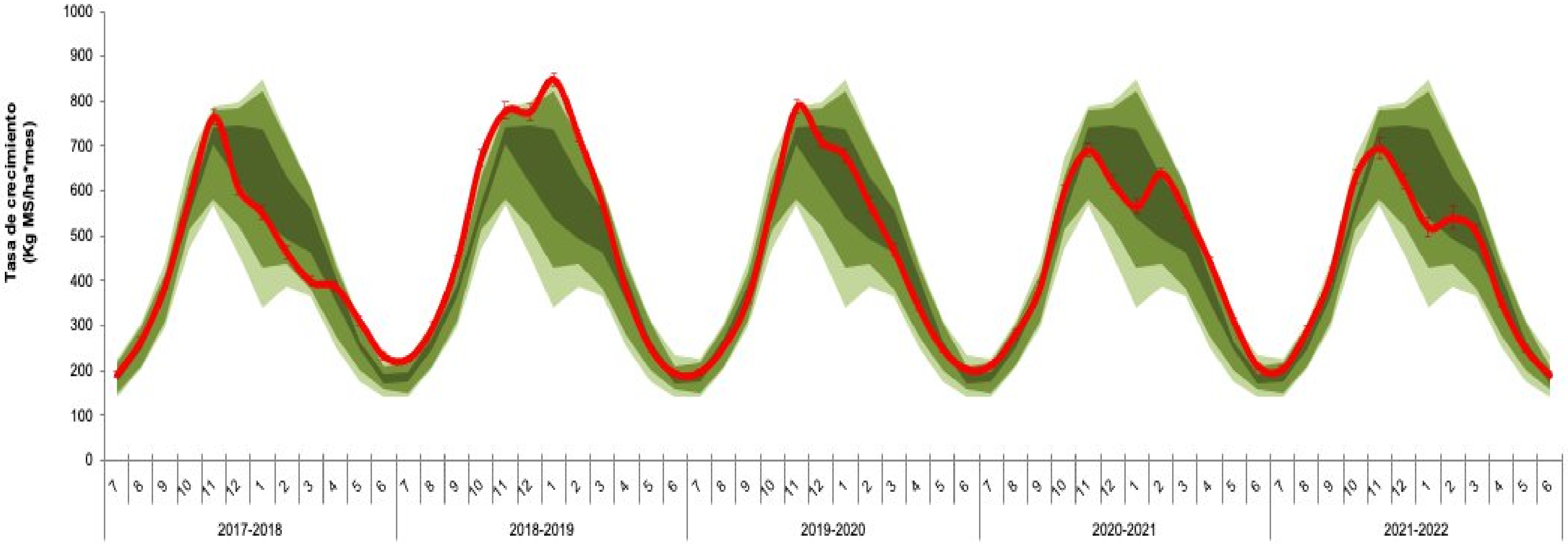
Project time line



Available water and forage production



Soil available water (% of total)



Estimated average forage growth rate per month
(kg DM ha^{-1} $month^{-1}$)

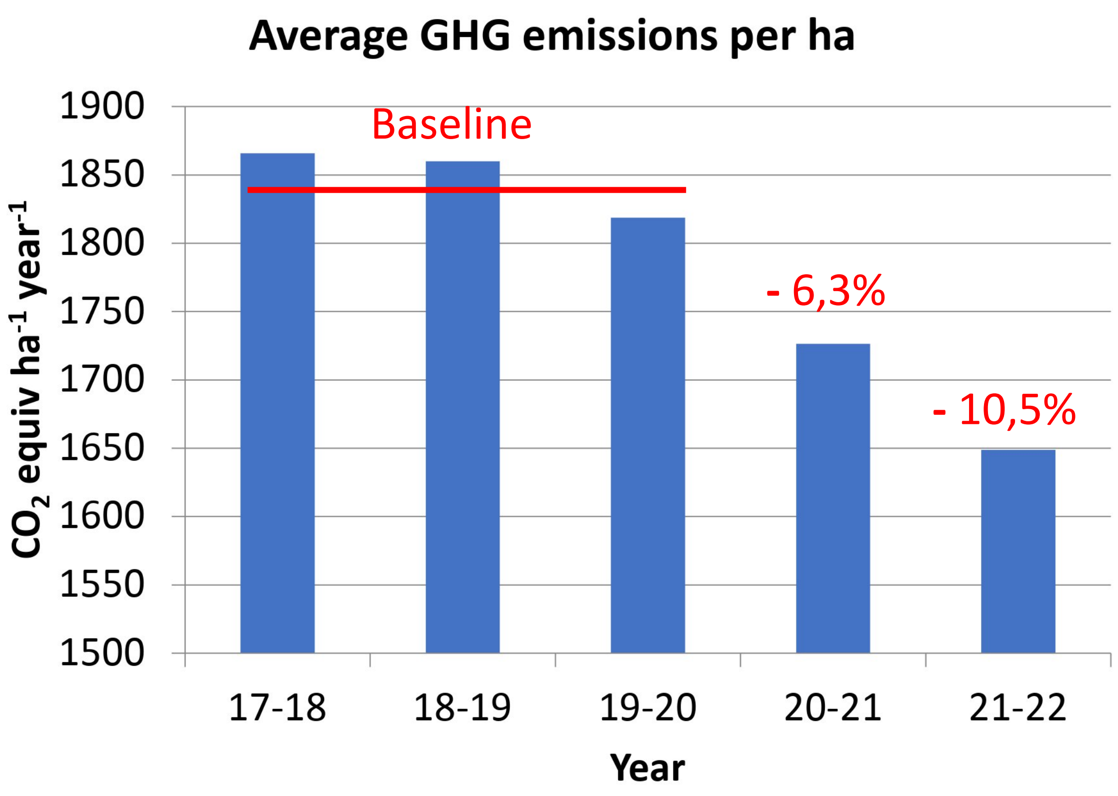
Impact in Productivity

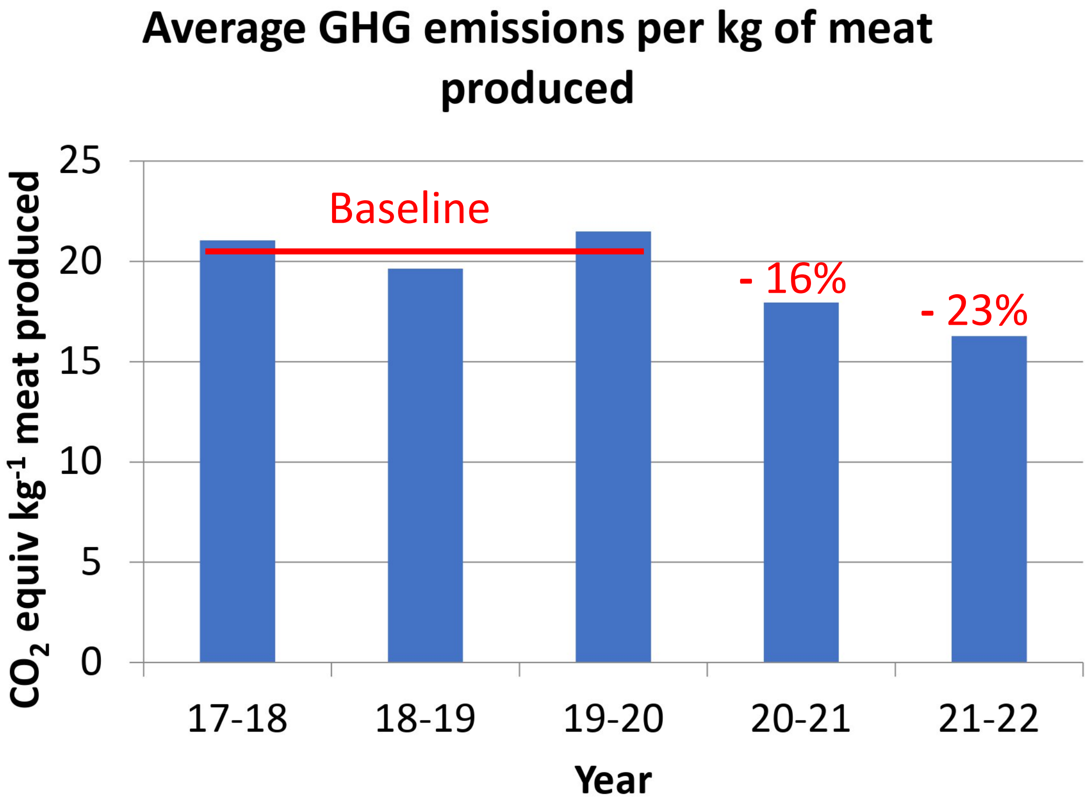
	Baseline average	20/21	21/22	Significance	21/22 vs Baseline (%)
Stocking rate (AU ha^{-1})	0.85	0.77	0.73	P≤0.001	-14%
ovine/bovine	1.54	1.2	1.08	P≤0.04	-30%
Beef meat (kg ha^{-1})	80	83	87	P≤0.005	9%
Sheep meat (kg ha^{-1})	11	14	12	P≤0.003	9%
Beef meat per animal (kg AU^{-1})	116	127	139	P≤0.001	20%
Sheep meat per animal (kg AU^{-1})	93	137	149	P≤0.002	60%
Weaning weight (kg $calf^{-1}$)	150	153	167	P≤0.01	11%
Weaning weight (kg $lamb^{-1}$)	18	22	24	P≤0.002	33%
Weaning percentage bovine (%)	70	67	73	NS	4%
Weaning percentage ovine (%)	63	68	76	P≤0.06	21%
Pregnancy rate bovine (%)	74	77	87	P≤0.04	17%

Impact in Economic results

	Baseline average	20/21	21/22	Significance	21/22 vs Baseline (%)
Gross Income Beef (USD ha^{-1})	125	127	177	P≤0.0001	42%
Gross Income Sheep (USD ha^{-1})	27	20	24	NS	-11%
Total Costs (USD ha^{-1})	102	98	102	NS	0%
Net family income (USD ha^{-1})	52	54	104	P≤0.001	100%
Corrected NFI (USD ha^{-1})	50	62	62	P≤0.001	24%

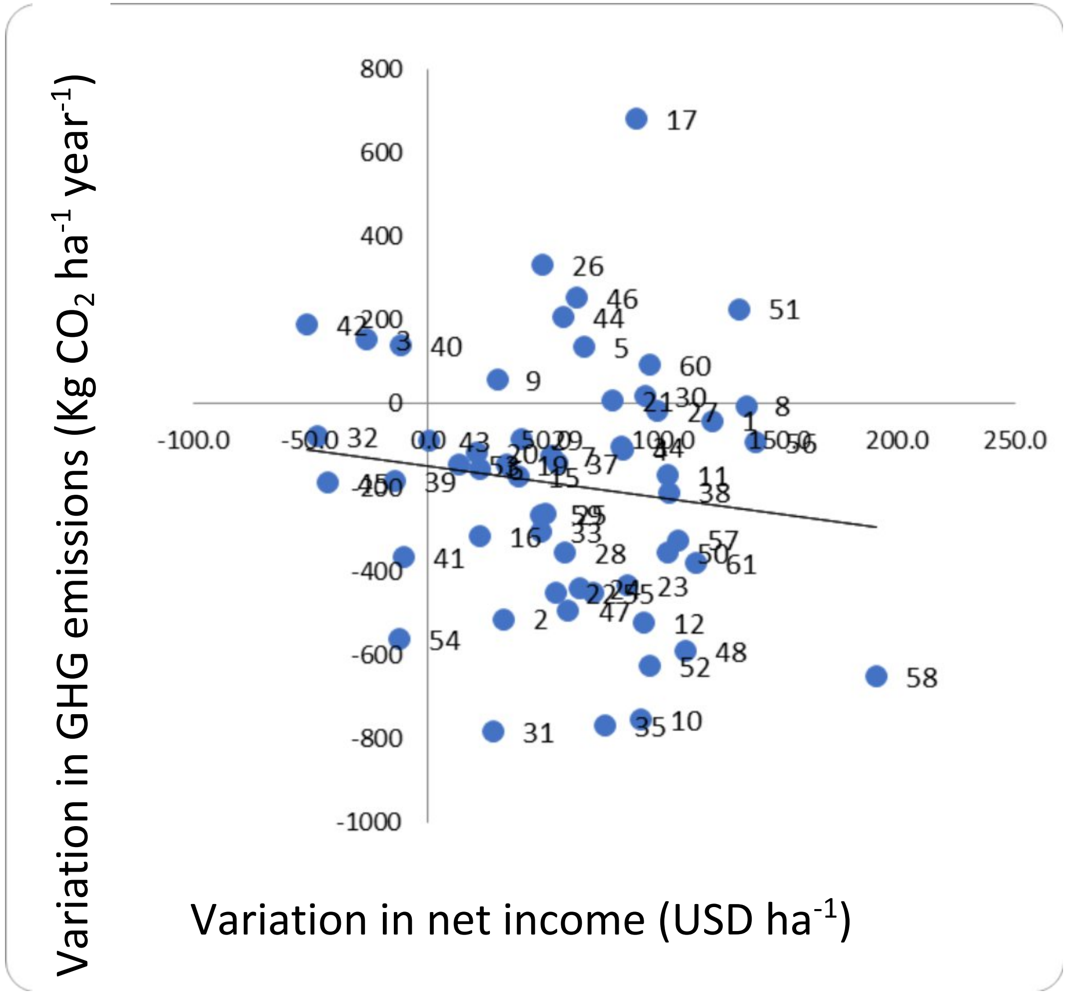
GHG emissions (IPCC Tier 1)

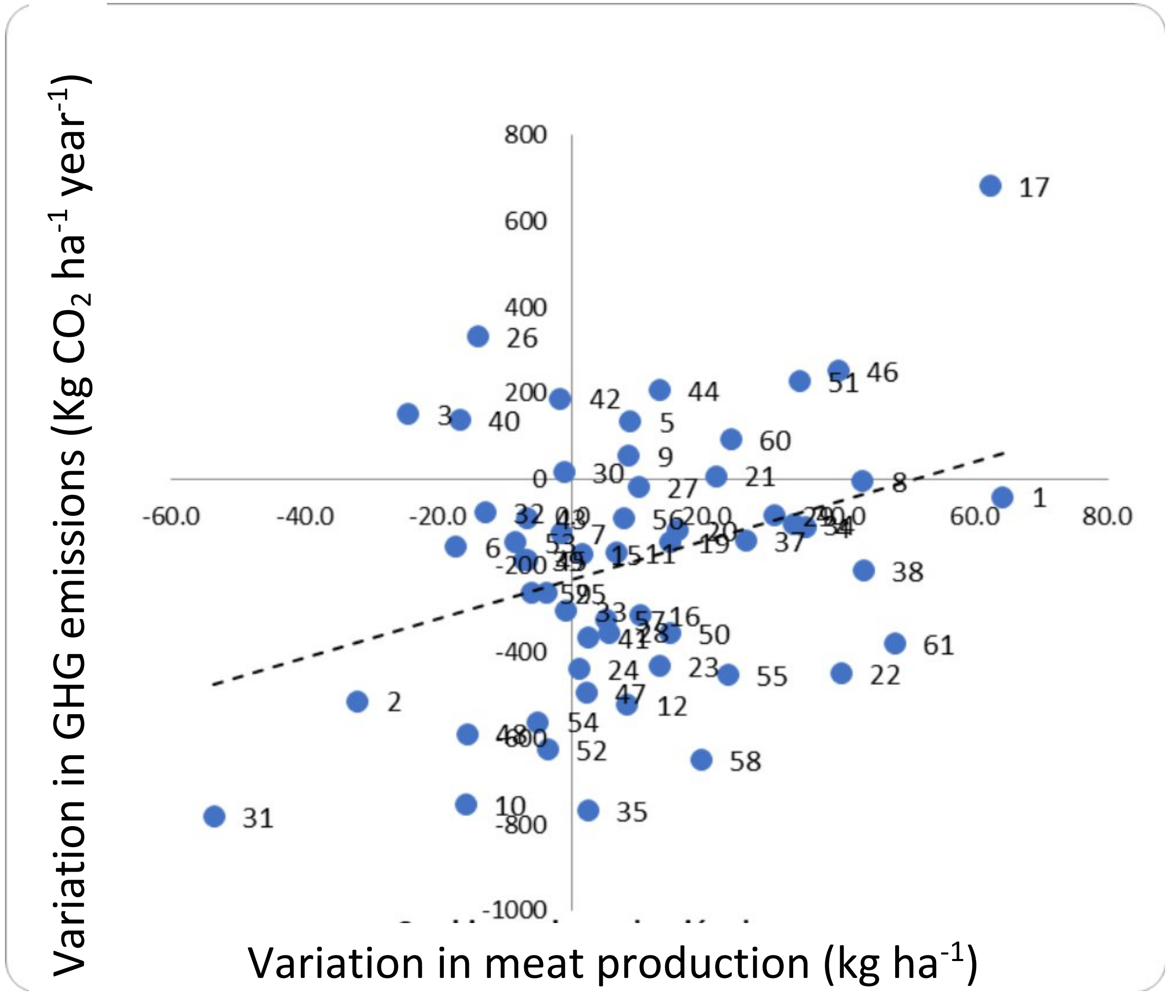




In 2021-2022, 68 and 77% of farms reduce GHG emissions per ha and per kg of meat produced, respectively, compared to baseline

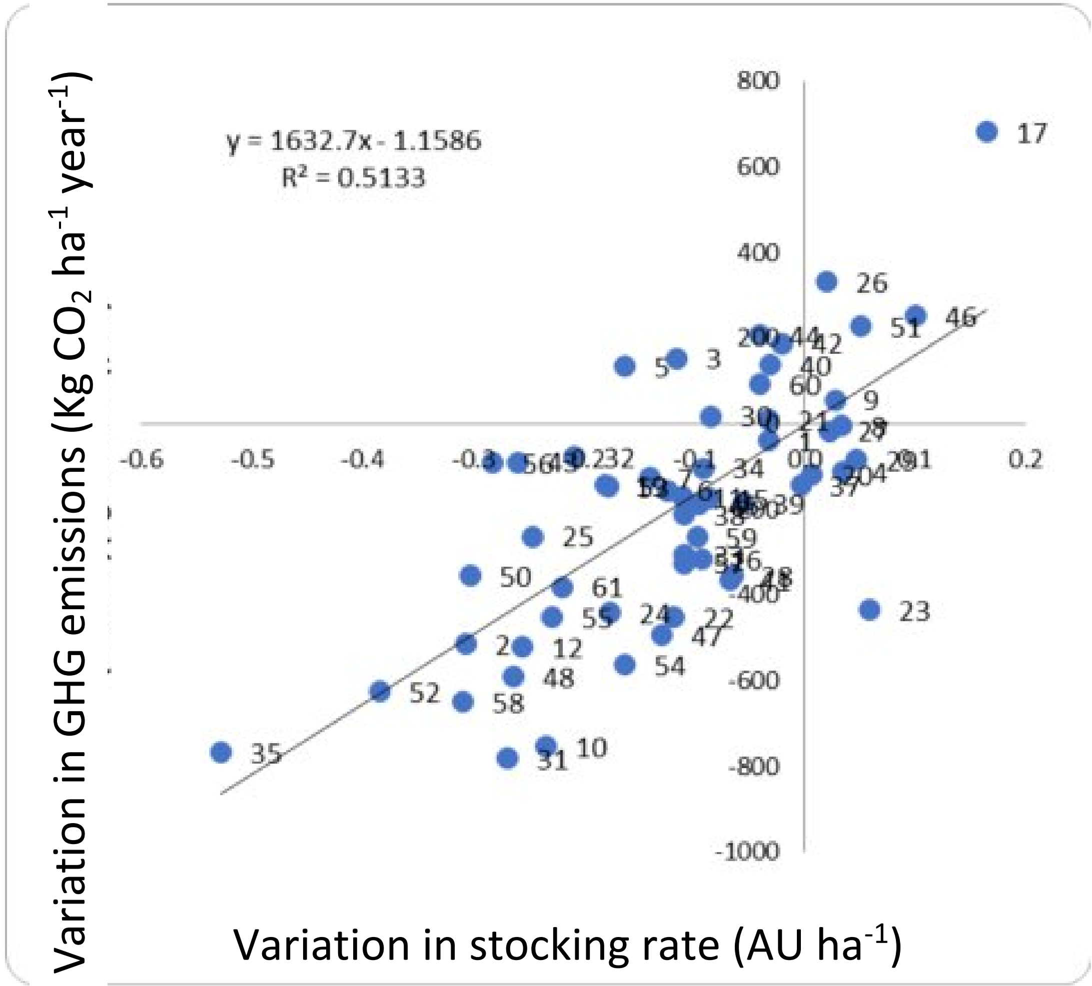
GHG emissions – income and productivity

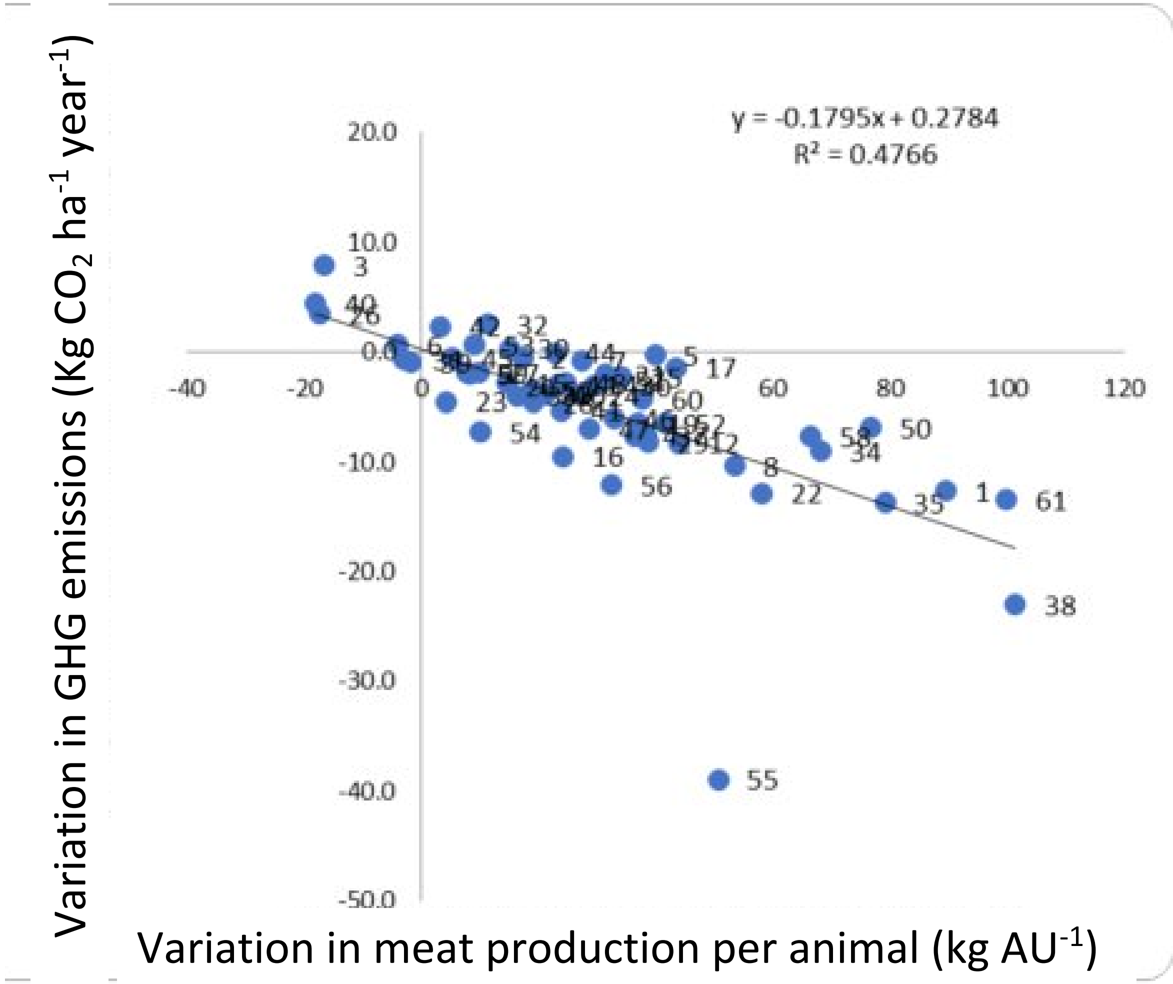




Year 2021-2022 minus Baseline

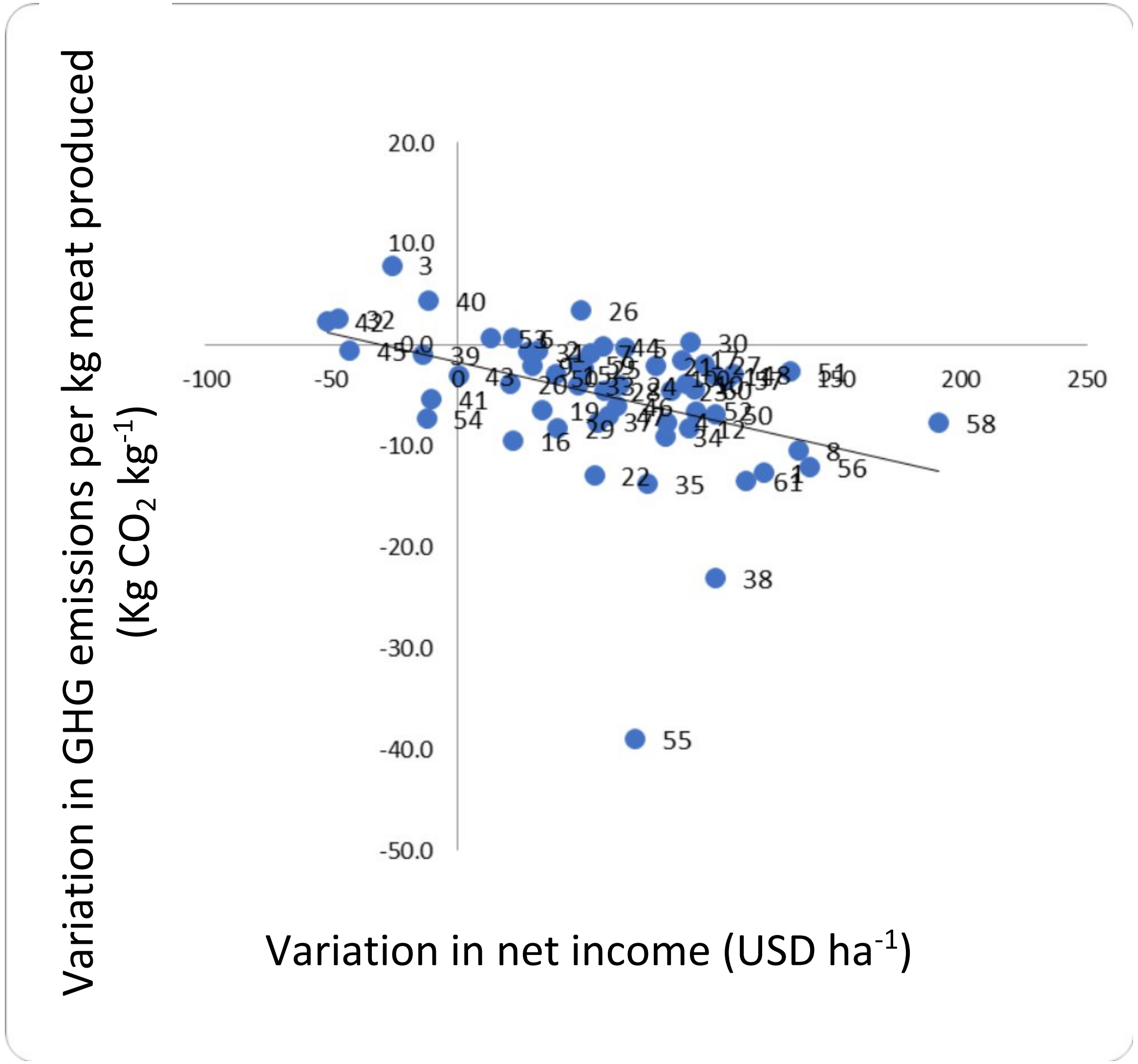
GHG emissions – income and productivity





Year 2021-2022 minus Baseline

GHG emissions – income and productivity



Year 2021-2022 minus Baseline

Monitoring and evaluation of environmental variables

- Monitoreo ambiental intensivo en 20 predios participantes y 20 vecinos:
  - Productividad→ EVI
  - Altura de pasto
  - Emisiones de CH4 y N2O → Modelo del IPCC Tier 2.
  - Composición de la dieta con microhistología de heces.
  - Calidad de las dieta estimada por calidad de heces
  - Digestibilidad y calidad del forraje.
  - Diversidad vegetal y aves
  - Suelo → C, N y PMN, Textura, etc..
  - Calidad de Aguas
  - Caracterización de paisajes y muestreo de diversidad de especies
  - Proporción de arbustos
- Monitoreo ambiental en todos los predios:
  - Mediciones satelitales de Productividad→ EVI
  - Emisiones de CH4 y N2O → Modelo del IPCC Tier 1