Sustainable futures for the Costa Rica dairy sector: optimising environmental and economic outcomes (SusCoRiDa)

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Aim of project

- ***To develop sustainable futures for food production in the tropics, using the Costa Rican dairy sector as a case study.***
- ***More specifically, in this multi-disciplinary, multi-actor, proof of concept project we will:***
  - ***integrate measurements and mined data***
  - ***to model a range of scenarios of potential transitions for the dairy sector in Costa Rica***
  - ***in order to propose promising pathways of sustainable intensification for the dairy and wider land use sectors***
  - ***that balance socio-economic and environmental outcomes.***

Objective 1: Determine what is already known

- Collection of existing data:
  - trends in livestock numbers
  - sectoral GHG emissions
  - energy, water, nutrient inputs & outputs
  - tree-pasture-livestock interactions
  - livestock genetic changes
- Determine their robustness and suitability for models to be developed during the project
- In the following slides, objectives fairly closely map on to the WPs (work packages)

Objective 2: measurement protocols

- Establish best protocols for measuring:
  - GHG and NH_3 emissions to the atmosphere
  - nitrate and phosphate losses via leaching
- Commence with Finca CATIE
- Build on GHG accounting protocol developed for Central America conditions by
  - FONTAGRO
  - EC LEDS
- Apply these protocols to a pilot sample of three commercial farms along a gradient of intensification
- Train Costa Rican technicians and scientists in:
  - environmental measurements listed above
  - C- footprinting, Life Cycle Assessment and farm scale modelling

Objective 3: initial modelling

- Calculate environmental and economic balances for the CATIE farm and three dairy farming systems (and their products)
- Model sensitivity to specific management practices and technologies that would be representative of trends in intensification
- Explore other sustainable intensification strategies
- For example, CR Livestock NAMA advocates:
  - improved fertilization plans
  - implementation of rotational grazing
  - live fences and adoption of silvo-pastoral systems
  - pasture improvement
- Where the project can collect or obtain robust data, these will be modelled

Objective 4: develop the bigger picture

- Use measured and modelled data to -
- Scale up and assess potential trade-offs and synergies for specific dairy development pathways between:
  - Environmental goals (reduction of GHG, NH_3 emissions and nutrient losses) and,
  - Productive/economic goals in terms of -
    - dairy productivity,
    - rural employment,
    - improved resource efficiency,
    - improved farm household livelihoods
- One way to characterize these (maybe) contrasting objectives is land sharing v. land sparing
- Use findings to advise key actors; e.g.
  - Ministry of Agriculture
  - Ministry of Environment & Energy
  - National Milk Chamber (CNPL)
- Via stakeholder groups and final project workshop

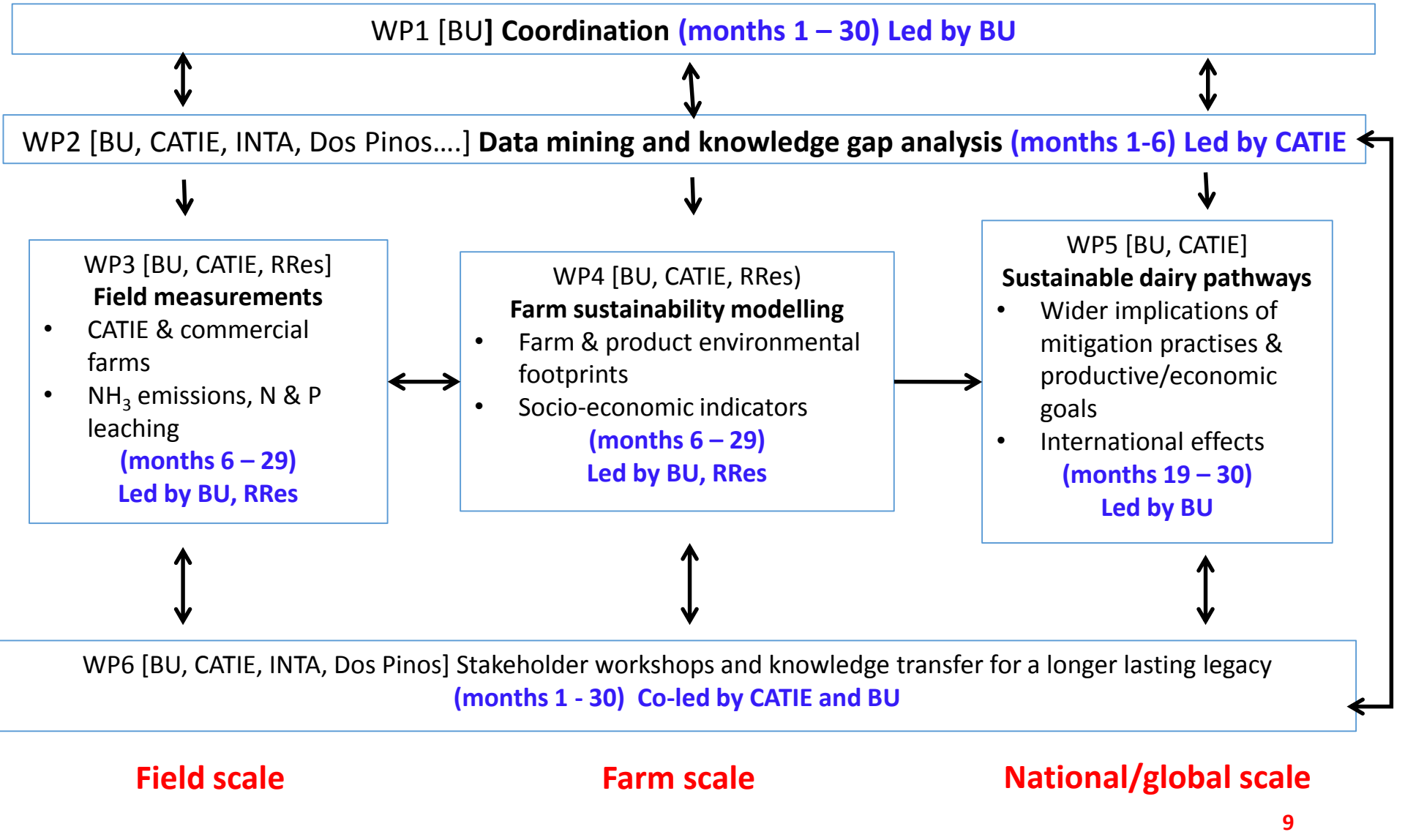
Objective 5: identify business models

- Work with the Costa Rican dairy sector (CNPL, Dos Pinos, others)
- Identify potential business models (reflecting sustainable management practices)
- Use a value chain approach
- Also considering governance and investment security

Objective 6: building a legacy

- Develop this capacity building project into a broader and longer lasting legacy
- Train researchers, technicians and extension officers in environmental measurements and farm scale modelling
- Work with key industry and policy stakeholders (via a stakeholder group)
- Plan how this exemplar project could be rolled out to other sectors and other Central American countries

Schematic representation of the interactions between the different Work Packages



Project timetable (revised from original proposal)

	Tasks	2017								2018												2019									
		M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O
WP1	Coordination																														
	Project Meetings		IP CR			IP UK	IP CR			SK		SK		SK		IP CR		IP UK		SK		SK		SK		SK		SK		IP CR	
	Stakeholder Workshops		CR													CR														CR	
	PDRA training					Tr2	Tr1																								
	Other outreach activities						Regular visitors (policy, industry, researchers) to CATIE Dairy Farm + env. emissions training for CA researchers																										
	Data archiving																									Archiving of anonymised environmental emissions and farm nutrient input and economic data + model outputs data							
WP2	Data mining and gap analysis	Data collation – literature reviews, national statistics, industry records																													
WP3	On-farm measurements						CATIE farm												Commercial dairy farms												
WP4	Farm-scale modelling						Parameterising LCA/CF models								CATIE farm data				Commercial dairy farm data												
WP5	Broader-scale modelling																		Consequential LCA, business models10												
WP6	Legacy development	Developing broader and longer-lasting legacy																													

IP = in person. SK = Skype/teleconference. CR=CATIE Costa Rica, UK=Bangor University

Tr1	PDRA and research technician training in ammonia and GHG emission measurements and inventories, and nutrient leaching at the CATIE dairy farm.
Tr2	PDRA training in carbon and nutrient footprinting and LCA at Bangor Univ.

Deliverables

- By the end of the project, we should have:-
- Understanding of what is and isn't known about the environmental impact of dairying and options for improvement
- New data on ammonia emissions and nitrate and phosphate leaching
- Data collated about other GHG emissions (from other studies)
- Data on farm economics (collected ourselves and from other studies)
- Models of the environmental and economic balances for the farms studied (using the above sources)
- Based on data collected and modelled, environmental recommendations scaled up for wider use in Costa Rica
- Business models for dairy and (maybe) dual purpose farms in Costa Rica
- A longer lasting legacy encompassing trained technicians and researchers, environmental and business models for use by wider stakeholders including industry groups, Government ministries, (hopefully) further projects
- Publications in the international journal and regional Spanish sectors