



Phosphorus
in Soils
and Plants
Symposium

*Towards a sustainable
phosphorus utilization in
agroecosystems*



abstracts



**Theme 4 - Sustainable
intensification of phosphorus
supply in food production
Oral presentation**



Phosphorus and pH levels as indicators of soil health on dairy systems in Uruguay

Silvana Schaffner¹, Santiago Fariña² and Andrea Ruggia²

¹ Facultad de Agronomía, Universidad de la República, Uruguay

² Instituto Nacional de Investigación Agropecuaria (INIA), Uruguay

Current sustainability challenges of production systems require comprehensive answers with a multidimensional approach. The objective of this study is to select indicators that allow quantifying the productive-economic, social, and environmental evolution of dairy systems transitioning towards agroecology through a co-innovation approach. Six farms were characterized by assessment of descriptors on the three areas of sustainability. A diagnosis based on the information collected was made to identify and rank critical points and, in turn, propose a system redesign, without neglecting its original strengths.

In this framework, key indicators that could affect (positively or negatively) soil health (see table below) were identified: pH values showed possible acidification (between 3 and 18% below undisturbed soil levels), and phosphorus accumulation above the regulated environmental limits in Uruguay (31 ppm Bray). The simultaneous evaluation of these and other indicators from different dimensions of sustainability allows the proposal of redesigns that could reverse situations of environmental risk while sustaining the economic and social viability of the systems.

Table 1. System health indicators

Dimension	Group	Indicator	Farm					
			1	2	3	4	5	6
Environmental Soil	Biologic	ACI	-0,57	-0,21	-0,21	-0,35	-0,43	-0,18
		RI	-0,68	0,02	-2,03	-0,22	-0,55	-0,41
		PI	-0,16	-0,08	0,11	-0,04	-0,04	-0,05
	Physical	PRI (0-15cm)	0,01	-0,23	-0,34	-0,30	-0,34	-0,44
		PRI (15-45cm)	-0,16	-0,22	-0,20	0,01	-0,02	-0,21
	Chemical	OMI	-0,05	-0,05	-0,04	-0,15	-0,27	-0,05
		pHI	-0,18	-0,06	-0,16	-0,08	-0,05	-0,03
		P (ppm)	27,9	29,6	61,4	14,7	42,3	17,9
	Environmental System level	Pesticides	EI (mam)	0,47	0,05	0,05	0	0,85
Biodiversity		EII	2,4	3,2	2,5	2,6	2,4	2,6
Economic- productive*		KI (U\$S/ha/year)	337	34	720	-31	107	173
		Prod. (lt/ha/year)	4564	5717	14742	3128	9780	3824
		Rel. I/O	0,74	0,91	0,80	0,84	0,89	0,76
Social		CTA (hr/year/pBC)	6,3	5,7	6,6	5,5	5,0	3,5
Ref.: ACI: Active Carbon Index; RI: Respiration Index; PI: Protein Index; PRI: Penetration resistance Index; OMI: Organic matter index; pHI: pH Index; P: Phosphorus; EI (mam): Mammalian ecotoxicity Index; EII: Ecosystem Integrity Index; KI: Capital income after rent; Prod.: milk productivity; Rel. I/O: Input/Output Relationship; CTA: Calculate Time Available.								
*average of three years 2018/2019 to 2020/2021								

