Estimating and Evaluating Carbon Capture with REDD Abacus SP and GIS tool

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Introduction

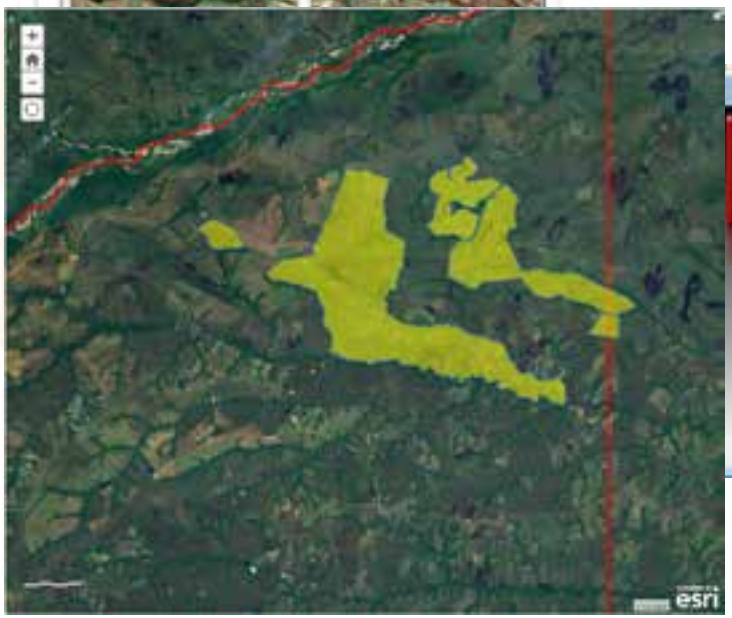
Using Geographic Information Systems (GIS) and REDD Abacus SP tools and land use data, carbon capture data and economic data from the region, the research evaluated the feasibility of land use change to increase carbon stocks

Historia de los lotes

Tabulado 2001/2007	BQ	PM	OTROS	SN
Bq	13	0	0	0
Pm	0	186	0	0
Sn	0	216	0	57
Otros	0	0	0	0

Tabulado 2007/2013	BQ	PM	OTROS	SN
Bq	13	0	0	0
Pm	0	402	0	0
Otros	0	0	0	0
Sn	0	7	0	52

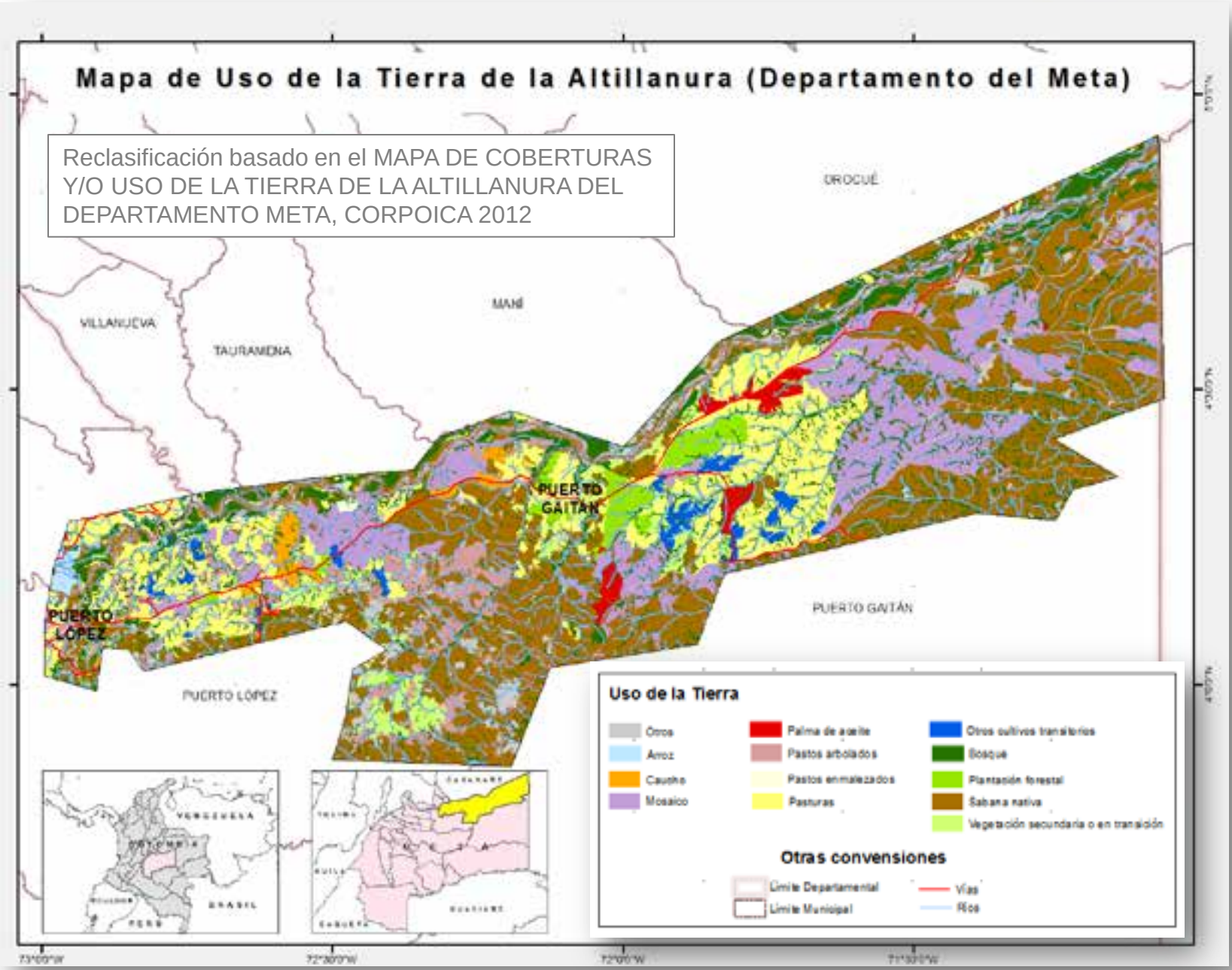
Tabulado 2001/2013	BQ	PM	OTROS	SN
Bq	13	0	0	0
Pm	0	186	0	0
Sn	0	223	0	52
Otros	0	0	0	0



Methodology

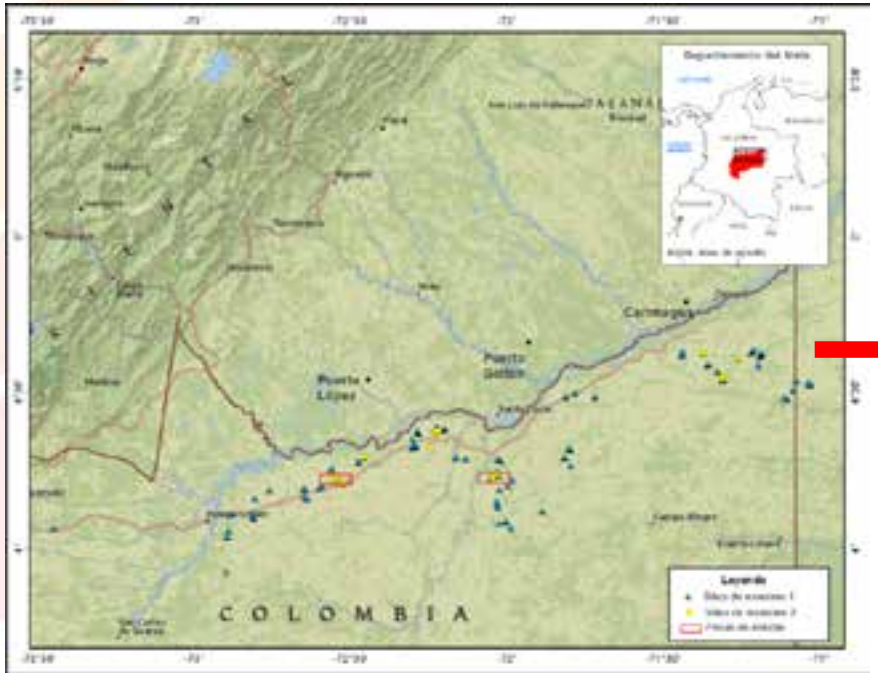
- Gathering and organizing the information
- Analyzing land use and changes in carbon stocks (emissions and carbon sequestration)
- Analyzing possible land use change scenarios and their impacts on carbon stocks.
- Evaluating impacts on emissions and sequestration for both above and belowground biomass
- Evaluating the impacts of land use change on livelihoods of the population.
- Testing the possibility of pasture intensification as a measure to accumulate carbon and improve productivity.

Based on changes in land use: Altillanura plana in the Colombian Orinoco

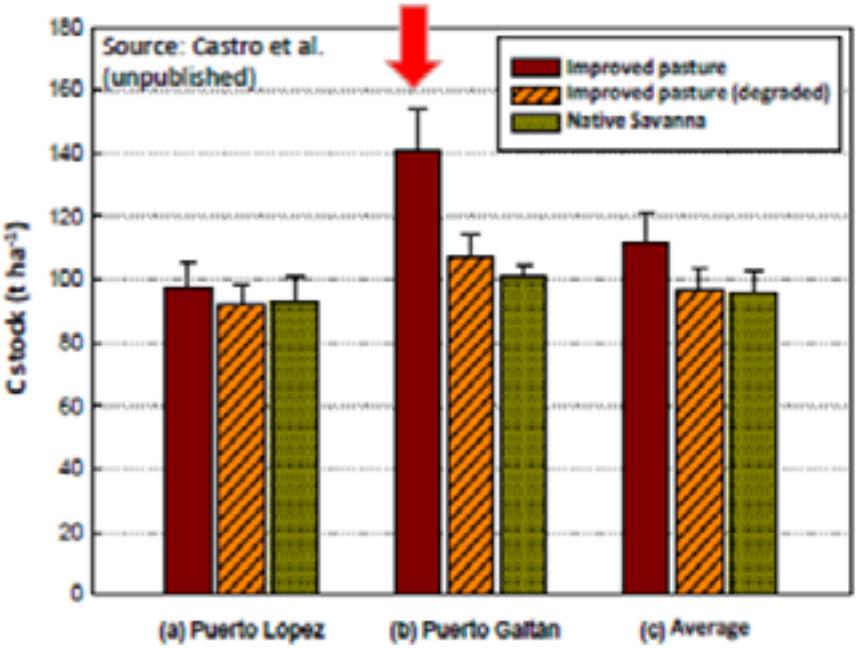


Fuentes:
CORPOICA

Carbon stock data

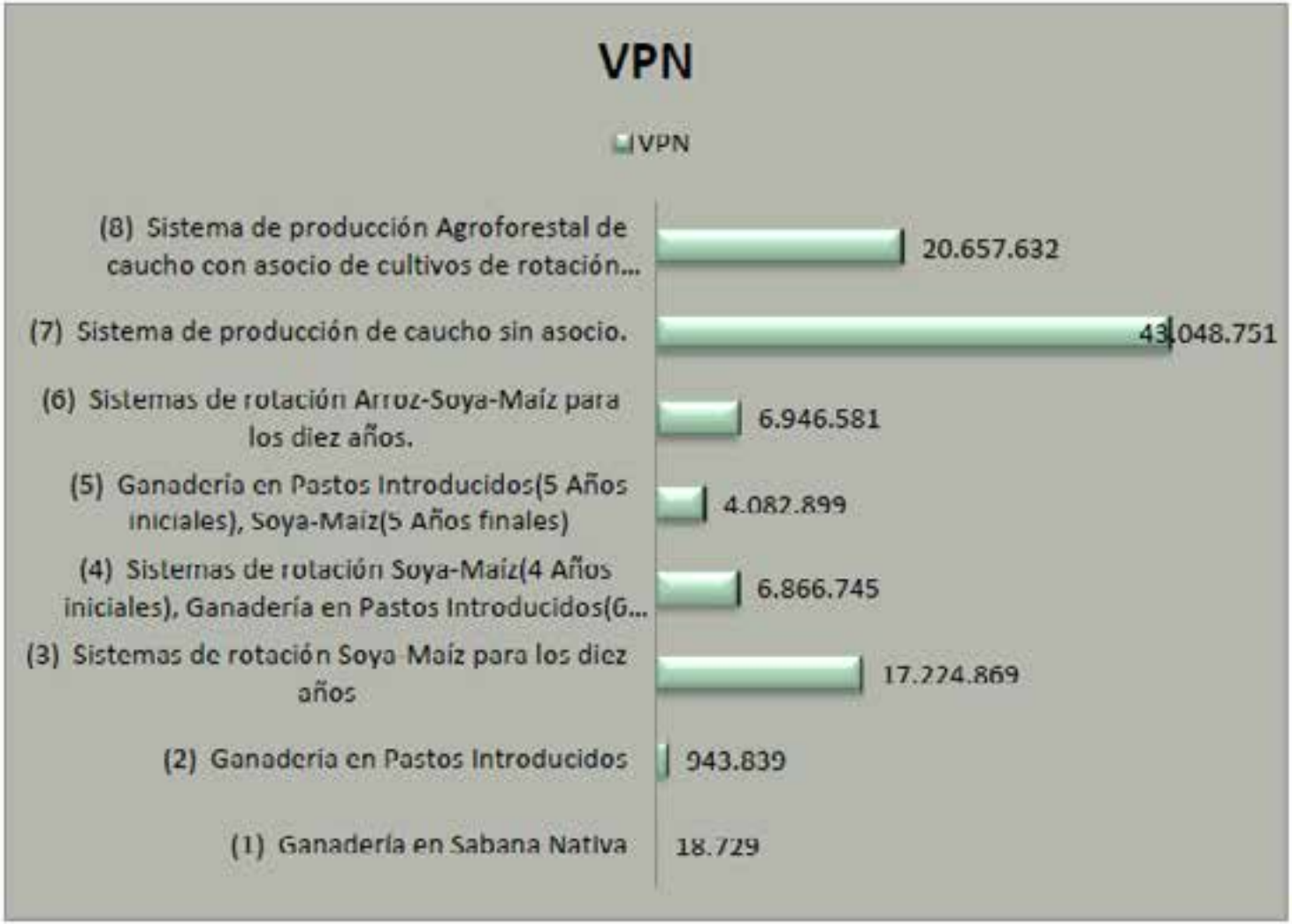


Carbon stock information was measured above- and below-ground in land use in predominant land use systems



Profitability of land uses in the Llanos, Colombia

Figura 46. Valor Presente Neto para los sistemas de producción representativos de la Altillanura plana del Meta



Net Present Value (NPV)

NPV

Net Present Value (NPV) [Projecto Altillanura]

Net Present Value of a land use system ($/ha)

Private

	Altillanura ...
Arroz	360.9
Bosque	0
Caucho	536.6
Mosaico	212.1
Otros	0
Otros cultivos transitorios	360.9
Palma de aceite	536.6
Pastos arbolados	49.03
Pastos enmalezados	49.03
Pasturas	49.03
Plantación forestal	536.6
Sabana nativa	0.97
Vegetación secundaria	0

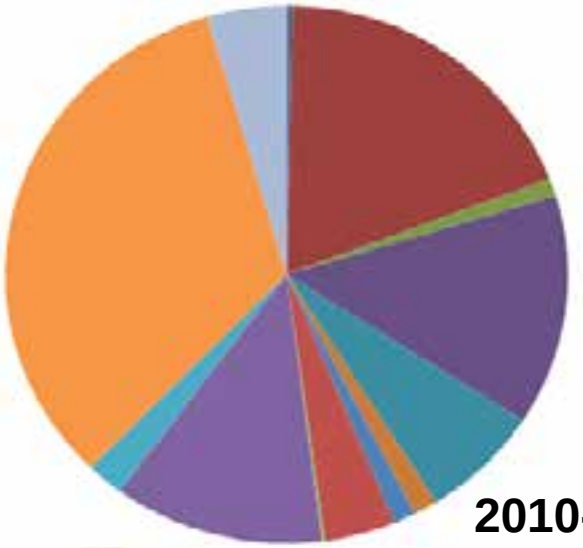
Captura de Carbono

Carbon Stock [Projecto Altillanura]

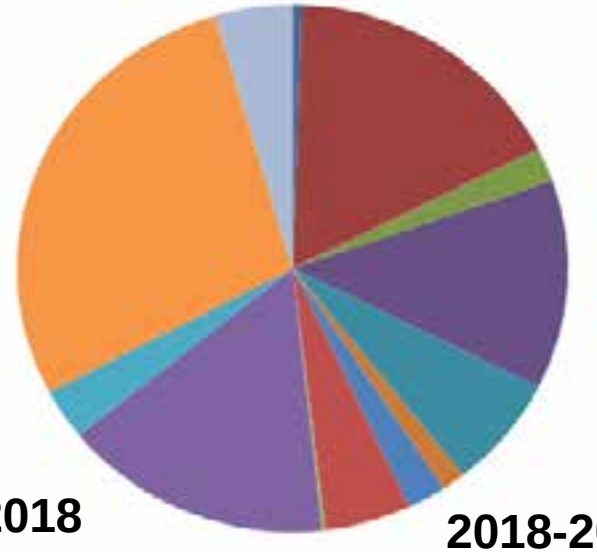
Time-averaged carbon stock for each land use system (ton/ha)

	Altillanura ...
Arroz	3
Bosque	81
Caucho	120
Mosaico	120
Otros	0
Otros cultivos transitorios	3
Palma de aceite	120
Pastos arbolados	125
Pastos enmalezados	102
Pasturas	122
Plantación forestal	120
Sabana nativa	104
Vegetación secundaria	80

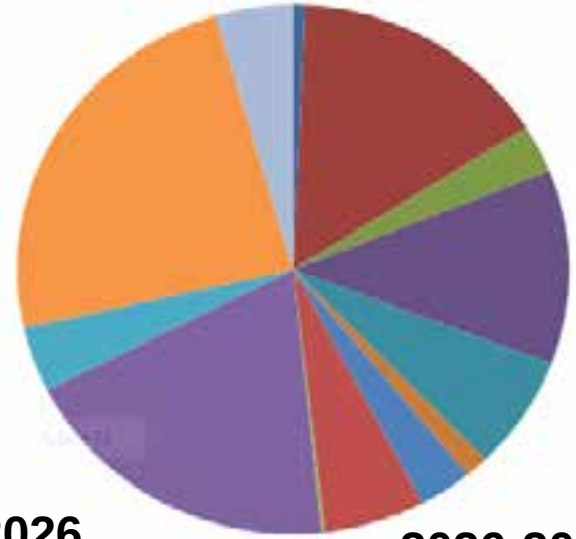
Simulations of changes in emissions and carbon capture, based on land use changes in five (5) periods with intervals of eight (8) years



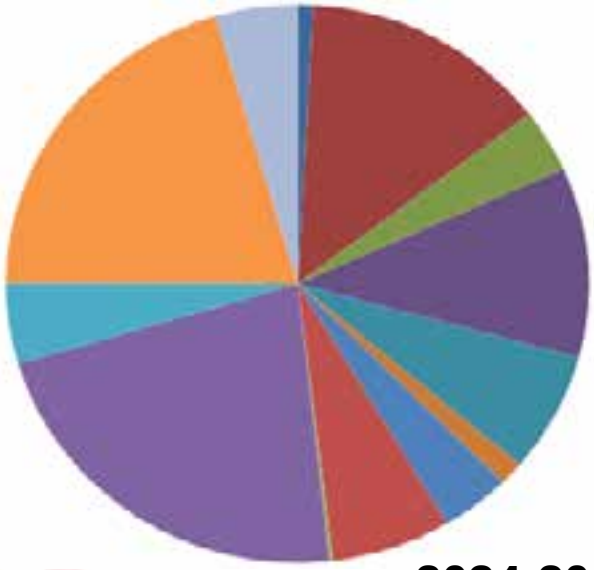
2010-2018



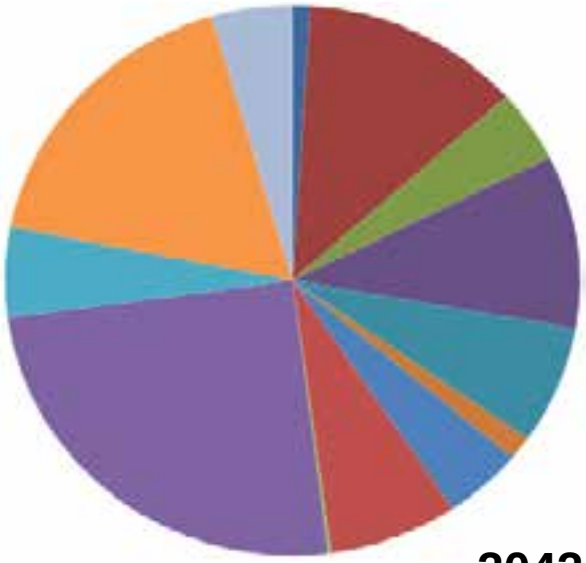
2018-2026



2026-2034



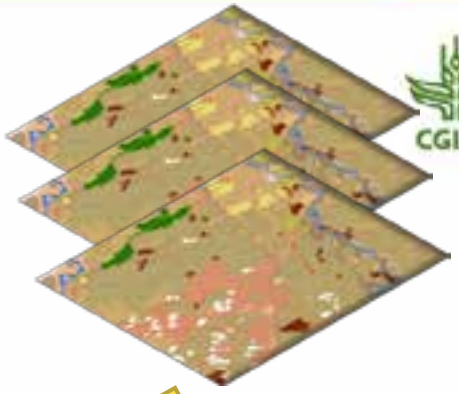
2034-2042



2042-2050

- Arroz
- Bosque
- Caucho
- Mosaico
- Otros
- Otros cultivos transitorios
- Palma de aceite
- Pastos arbolados
- Pastos enmalezados
- Pasturas
- Plantación forestal
- Sabana nativa
- Vegetación secundaria

$$\$\,CO_2 = 3.67 * \frac{NPV_{alternative} - NPV_{initial}}{Carbon_{initial} - Carbon_{alternative}}$$

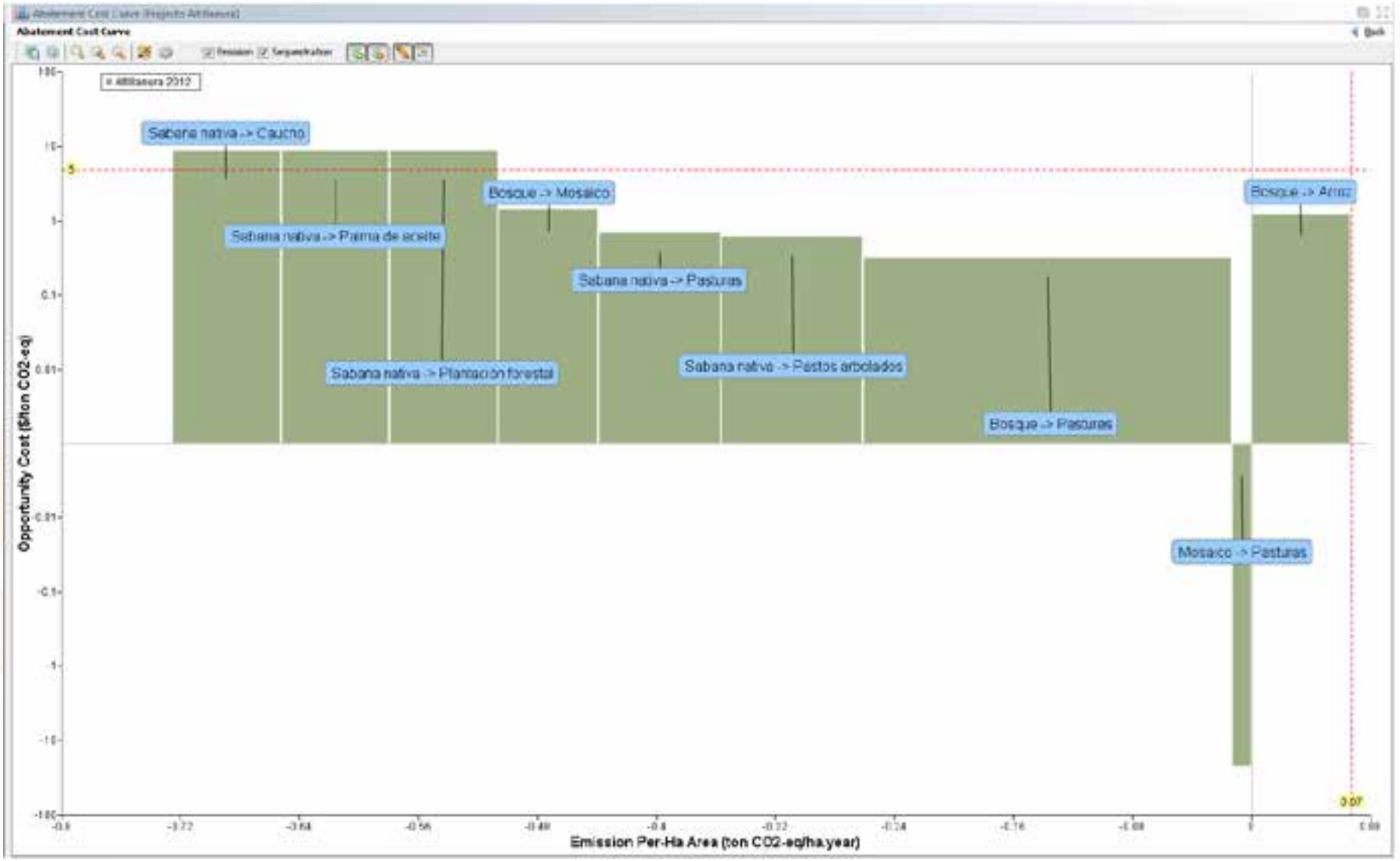


Land use change matrix

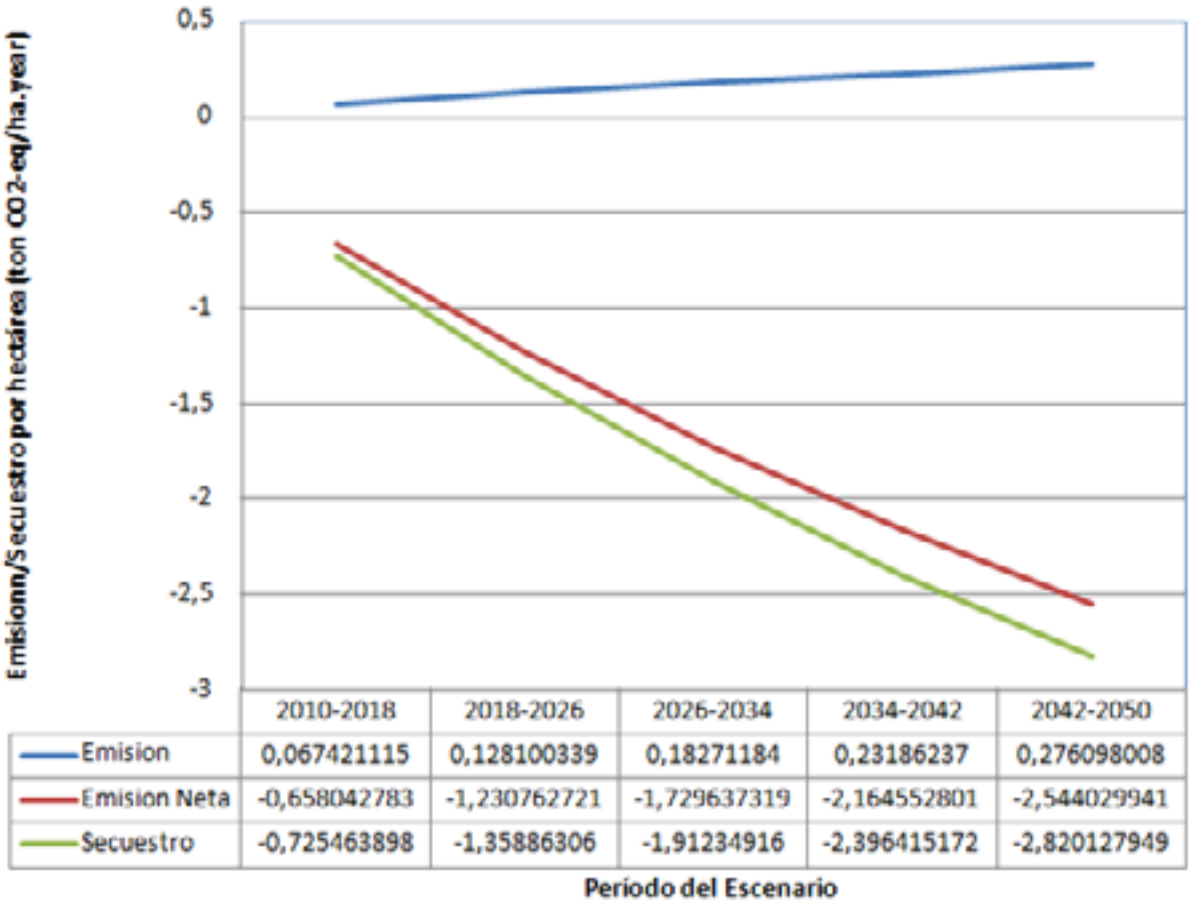
RS/GIS

Hacia: / Desde:	1 Bosque Montanoso	2 Bosque No Inundado	3 Bosque Periodicamente Inundado	4 Aguajal	5 Renacal	6 Pantanos Herbaceos Arbustivos	7 Tierra Agricolas y Regeneracion de Bosques	8 Cultivo	9 Ganaderia	10 Arenales	11 Urbano	12 Bosque no diferenciado	13 No Bosque no diferenciado	Año 2000	
1	1	203	0	0	0	0	0	0	0	0	0	71	5	279	Bosque Montanoso
2	10	1,324	2,245	6	0	0	37	100	23	0	0	33	0	3,780	Bosque No Inundado
3	0	20	2,445	858	130	118	53	120	57	24	0	74	6	3,905	Bosque Periodicamente Inundado
4	0	1	70	400	3	2	0	1	1	0	0	2	0	481	Aguajal
5	1	12	623	281	1,127	272	20	195	42	33	0	72	10	2,687	Renacal
6	0	18	86	18	145	567	21	116	92	44	2	71	19	1,199	Pantanos Herbaceos Arbustivos
7	0	22	80	7	22	14	109	268	87	4	0	6	1	621	Tierra Agricolas y Regeneracion de Bosques
8	0	4	24	4	45	62	55	218	137	33	1	35	8	627	Cultivo
9	0	8	16	4	16	24	22	123	483	26	4	25	8	759	Ganaderia
10	0	6	17	4	6	58	4	28	18	45	0	70	14	270	Arenales
11	0	0	0	0	0	0	0	0	19	5	40	1	1	68	Urbano
12	0	21	9	2	9	28	0	3	6	29	0	20,754	142	21,004	Bosque no diferenciado
13	0	6	4	1	2	14	0	3	4	20	0	257	64	376	No Bosque no diferenciado
Año 2010	13	1,646	5,623	1,588	1,511	1,167	327	1,185	978	275	39	21,484	291		
Cambio total	-266	-2,134	1,717	1,107	-1,176	-33	-294	558	219	5	-8	480	-85		
Cambio annual	-27	-213	172	111	-118	-3	-29	56	22	1	-1	48	-8		
Año 2000	*279*	*3,780*	*3,905*	*481*	*2,687*	*1,199*	*621*	*627*	*759*	*270*	*68*	*21,004*	*376*		

Opportunity Cost Curve



Output



	2010-2018	2018-2026	2026-2034	2034-2042	2042-2050
Emision	0,067421115	0,128100339	0,18271184	0,23186237	0,276098008
Emision Neta	-0,658042783	-1,230762721	-1,729637319	-2,164552801	-2,544029941
Secuestro	-0,725463898	-1,35886306	-1,91234916	-2,396415172	-2,820127949

Table 2. Principal forage-based livestock system alternatives: Environmental costs, benefits and impacts.

System/ technology/ option	Costs and benefits to the farmer			Costs and benefits to society		
	Livelihood benefits	Initial investment	On-going investment	Climate change mitigation impacts	Biodiversity impacts	Hydrological impacts
Native savannas	Limited by low productivity	Usually little initial investment	Usually little or none	Emissions or sequestrations depend on stocking rate and pasture degradation	Maintained species biodiversity	Increased runoff and soil erosion when overstocked
Business as usual (improved forage species but subsequent pasture degradation)	Higher animal production initially with decrease as pastures degrade	Seeds, land preparation, planting, fertilizer; overall large initial investment	Usually very low	Initial reduction in carbon stocks with land clearing, higher biomass in improved pastures	Reduction in species diversity due to monoculture planting	Increased runoff with overstocking; soil erosion
Improved and well-managed pastures	Higher stocking rate and higher animal productivity	Seeds, land preparation, planting, fertilizer; overall large initial investment	Fertilizer	Higher biomass in improved pastures; carbon accumulation in the soil	Reduction in species diversity with monocultures, but could have positive effects on soil fauna	Higher water demand; less runoff
(Agro-) Silvopastoral systems	Income from livestock; income in long-term from trees; higher productivity benefits from soil maintenance	Forage and tree seeds, nursery, land preparation, planting, fertilizer, fencing; overall large initial investment	Fertilizer (but reduced when N-fixing trees are used)	Carbon stocks increased from biomass in trees; carbon accumulation in the soil	Biodiversity benefits from trees (not great)	Less runoff, higher regulation of discharge, high water demand

Participative work

The methodology is being tested in Panamá, Peru and Colombia

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