

Global Research Alliance (GRA) Livestock Research Group (LRG) Network on Feed and Nutrition in Relation to Greenhouse Gas Emissions (FNN)

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Research Updates: Feeding and Nutritional Strategies to Improve Productivity of Beef and Dual-Purpose Cattle in Colombia

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- Introduction
- Feeding and nutritional strategies
- Conclusions

Colombia Natural Regions



The most megadiverse country per square kilometer

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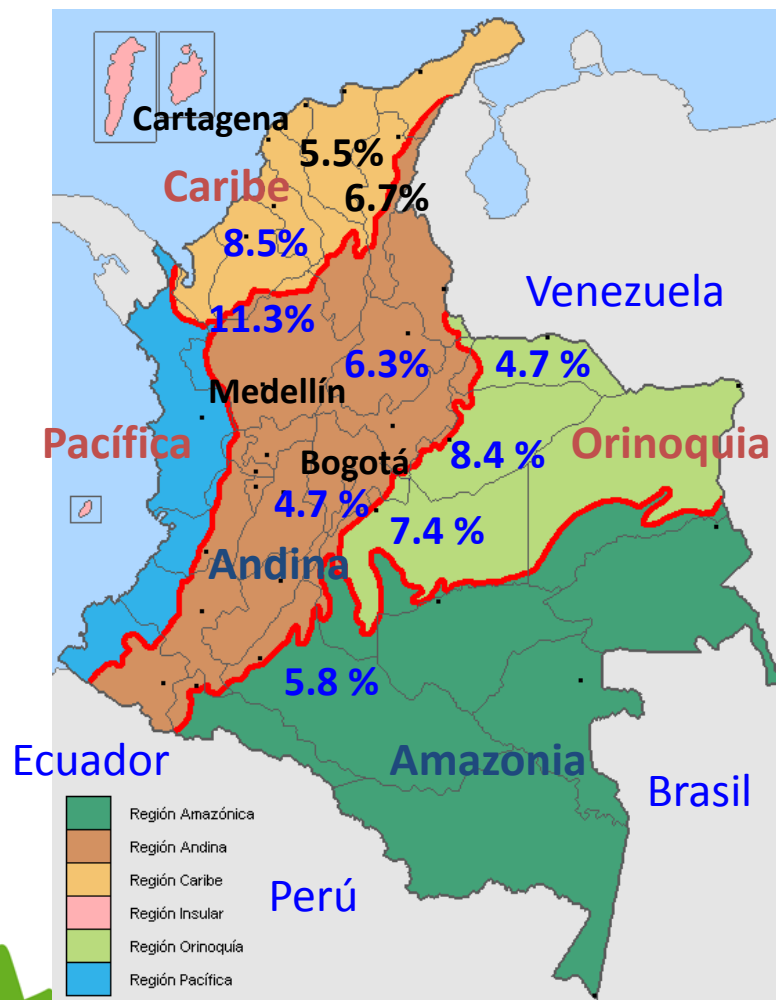


	C.I. La Libertad	Taluma	C.I Carimagua
Location	V/cio Km 17 vía Pto. López	Km 92 vía Pto. López- Pto. Gaitán	V/cio - Carimagua 390 km
Area, ha	1330	488.9	3200
Altitude, masl	320	149 -201	110 - 240
Mean temperature, DC	26	27	27
Annual Prec. (mm)	2950	2200	2200
Latitude	4°3'10''	4°21' 20.7"	4°40'22.5"
Longitude	73°29'0''	72°12'53.2"	71°23'51.3"

Source: CORPOICA C.I. La Libertad, (2010).

Colombian Cattle Inventory

(million head)



*ICA, (2015)

Colombia	22.527.783
Antioquia	2.535.479
Córdoba	1.903.913
Casanare	1.900.000
Meta	1.662.000
Cesar	1.418.675
Santander	1.416.644
Caquetá	1.304.408
Magdalena	1.238.017
Cundinamarca	1.068.386
Arauca	1.059.000

Use of lands for agricultural and cattle production (ha)

Use	Colombia	Meta Dept.
Agricultural	3.354.349	223.943
Cattle	39.196.000 (77%)	4.661.859 (86%)
Forests	7.425.041	454.802
Other uses	966.294	73.298
Total	50.941.744	5.413.903

Source: CCI-MADR. Encuesta Nacional Agropecuaria 2009; Rincón, 2010

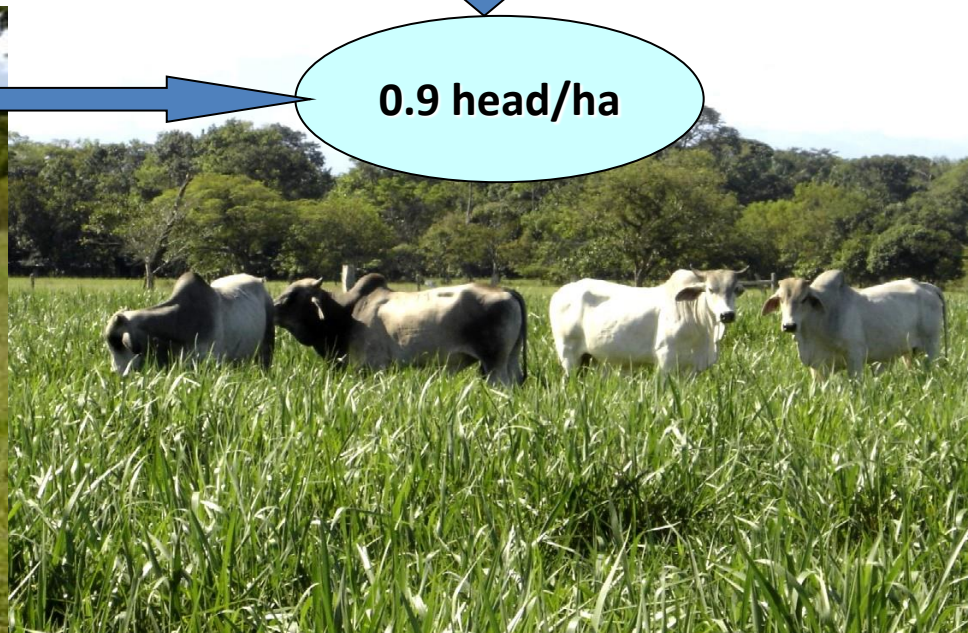
Projection of cattle inventory in Colombia

23 million head
39 million hectare
(year 2015)

27 million head
30 million hectare
(year 2023)

0.59 head/ha

0.9 head/ha



Source: Rincón, 2010; Fedegan, 2014

Photos: Rincón A.

Climate Orinoquia

Villavicencio, Meta, Elevación: 336 masl

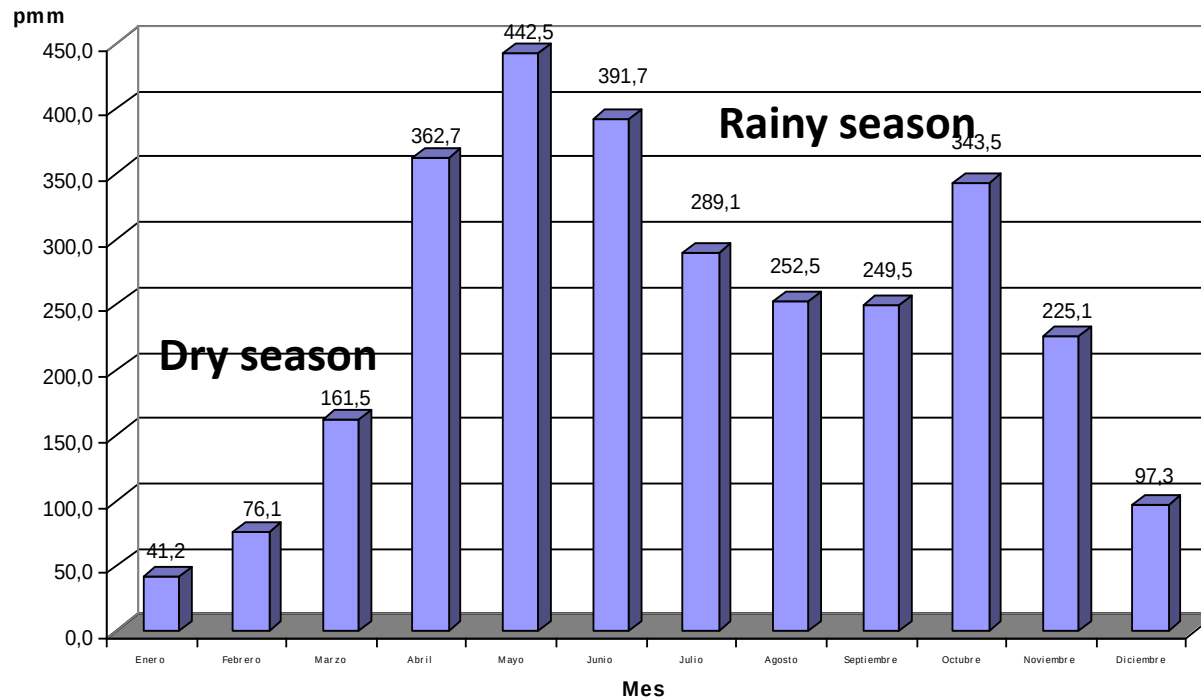
Lat: 04°03' north Long: 73°29' west

Mean temperature: 26° C

Humidity: 80%

Annual precipitation: 2900 mm

Promedio histórico de 28 años de precipitación en el C.I. La Libertad



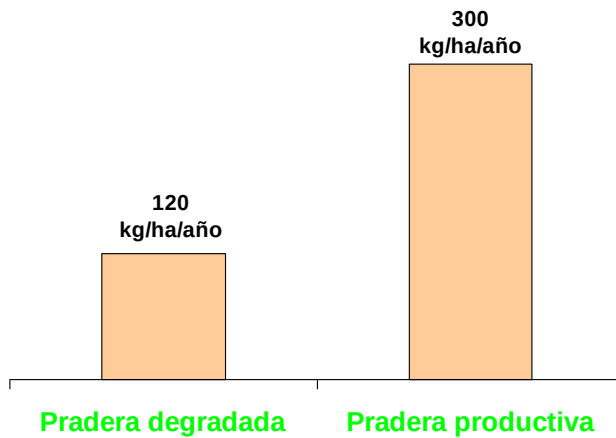
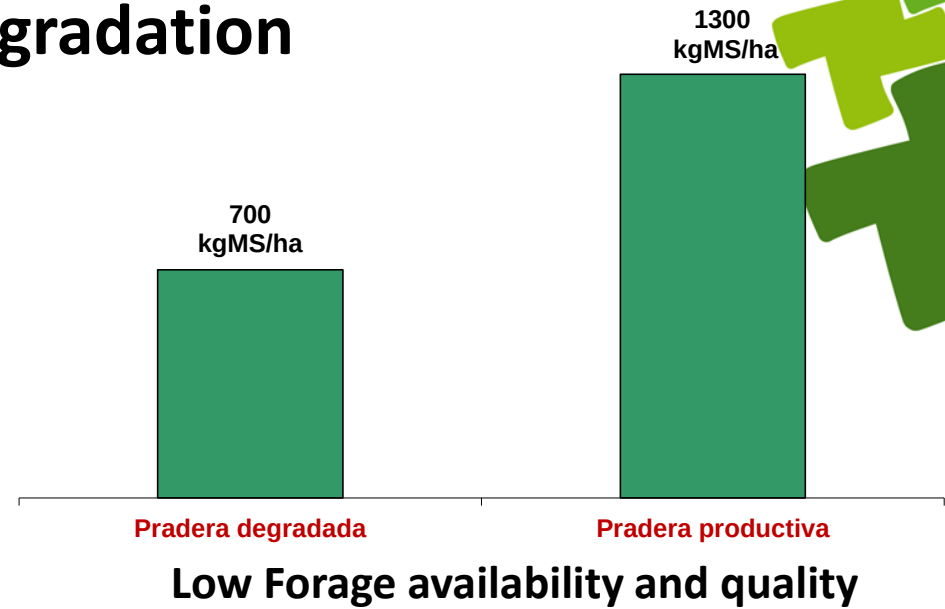
Main issues: Pasture degradation

More than 50% of the pastures area



Photo: Rincón A.

Pasture degradation



Low Animal Production



Source: Rincón, 2010

Photos: Rincón A.

Dry Season (4 to 6 months)

Low forage production: < 800 KgMS/ha

Crude protein: 4 - 6%

Forage digestibility: 55- 60%



Photo: Rincón A.

Forages

Pasto amargo (*Brachiaria decumbens*)

Pasto llanero (*Brachiaria dictyoneura*)

Pasto dulce (*Brachiaria humidicola*)

Pasto Toledo (*Brachiaria brizantha*)

Pasto Mulato (híbrido de *Brachiaria*)

Pasto Marandú (*Brachiaria brizantha*)

Panicum maximum (Tanzania, Mombaça)

Photo: Rincón A.



Forage availability: 1200 - 1500 kgMS/ha

Crude Protein: 6 -10%

Forage *in situ* digestibility: 60 – 65%

Stocking rate: 0,8 – 2,0 head/ha

ADG: 200-500 g/head/day

Finishing period: 16 – 30 months

Beef production: 120 – 350 Kg/ha/year

Herbaceous Legumes

Arachis pintoii



Stylosanthes capitata



*Desmodium
ovalifolium*



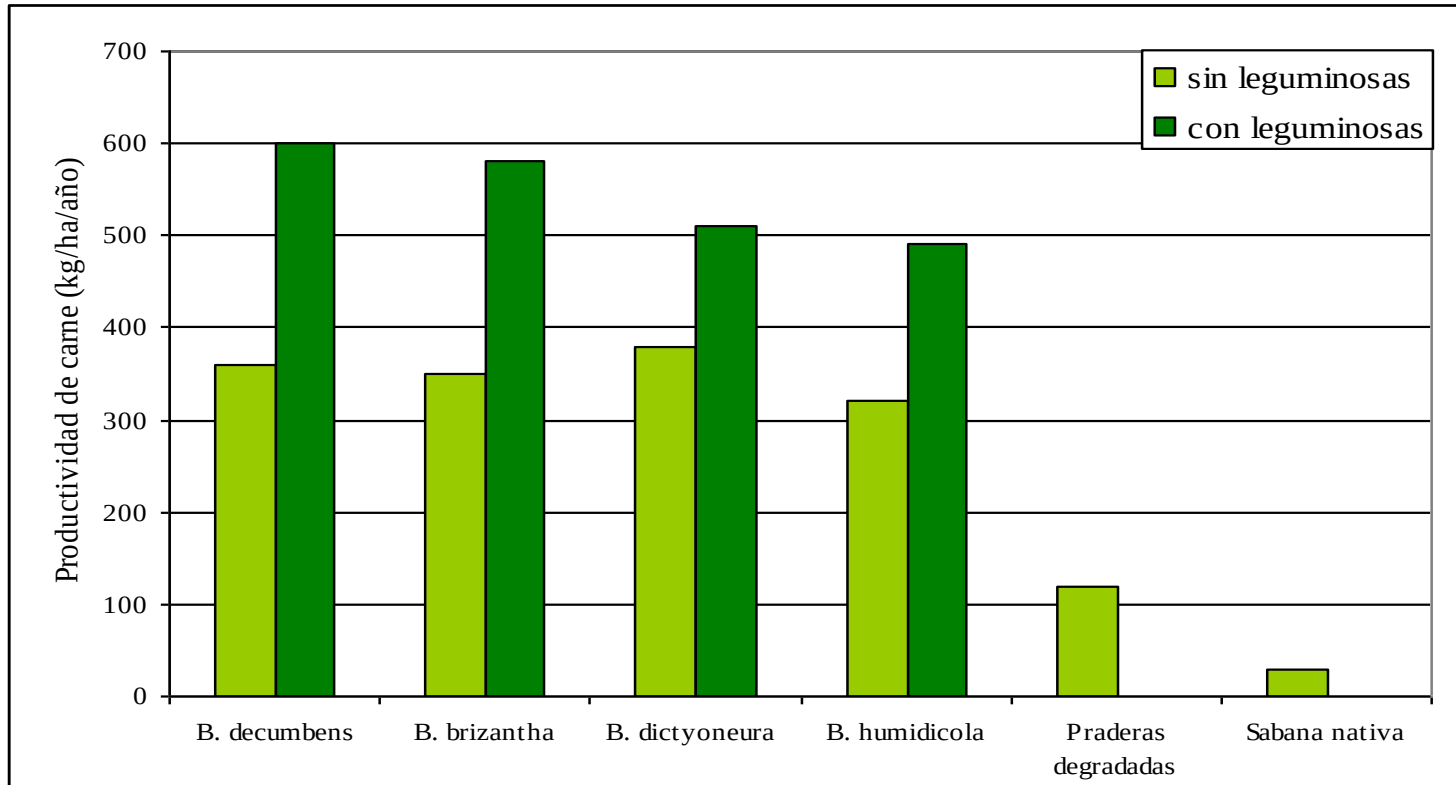
*Pueraria
phaseoloides*



Photos: H. Flórez; Rincón A.

Beef Production on *Brachiaria* with or without herbaceous legumes

Llanos orientales of Colombia



Source: Rincón, 2010

Shrub and tree legumes for cut & carry
Cratylia argentea



Photo. H. Flórez

Feeding Systems Base on Grazing



Photos: H. Flórez; A. Rincón

Corn - Grasses



Photo: Rincón A.

Change in chemical characteristics after crops (corn Soybean) in Colombia (Altillanura)

Characteristic	Before Crops	After 3 years
P (ppm)	1	20
Al (me/100 g)	2	1.2
Ca (me/100 g)	0.3	2.5
Mg (me/100 g)	0.12	0.35
K (me/100 g)	0.06	0.17
S (ppm)	2	33
Sat. bases (%)	22	49
Sat Al (%)	78	42

Source: Rincón, 2010

Corn silage + soybean

25 a 30 t/ha

Crude protein: 11-13%



Source: Rincón, 2010

Soybean silage + Grass

20 a 25 t/ha

Crude protein: 12 a 15%



Source: Rincón: 2010

Sweet Sorghum (JJT-18)



Source: Bernal et al., 2014

Supplementation during dry season

Silage intake: 18 a 20 kg/head/day

Weight gain: 500 a 600 g/head/day



Source: Rincón y Flórez, 2013

Photos: Rincón, A.

Silage supplementation during dry season



5 to 10 kg/head/day



Grass and legume hay



1-2 kg/head/day

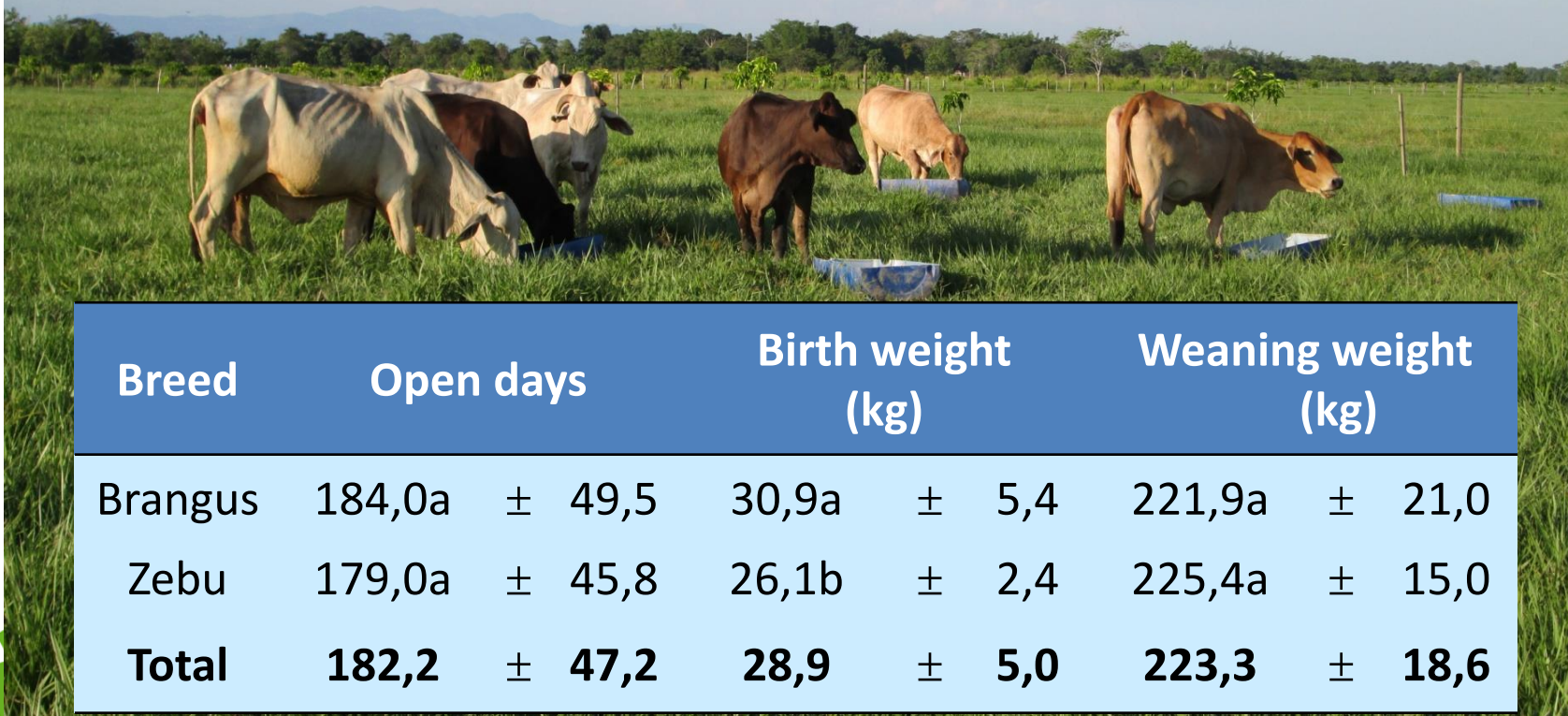
Pastures renovation in dual purpose Systems

variable	Before	After
Cows/ha	1	2
Milk Production (L/cow/day)	4	5
Milk production/ha (L/ha/day)	4	10
Lactation lenght (days)	253	270
Total milk production (L/lactation/ha)	1012	2700
Income milk production (\$ COP 600/L)	607.200	1.620.000
Diference (\$COP)		1.012.800

Pastures renovation in finishing cattle

variable	Before	After
Steers/ha	1	2
ADG (g/head/day)	350	600
Beef productivity (kg/ha/year)	128	438
Income (\$ COP 3.200/kg)	409.600	1.401.600
Diference (\$ COP)		992.000

Supplementation During pre and postpartum in Beef Cows



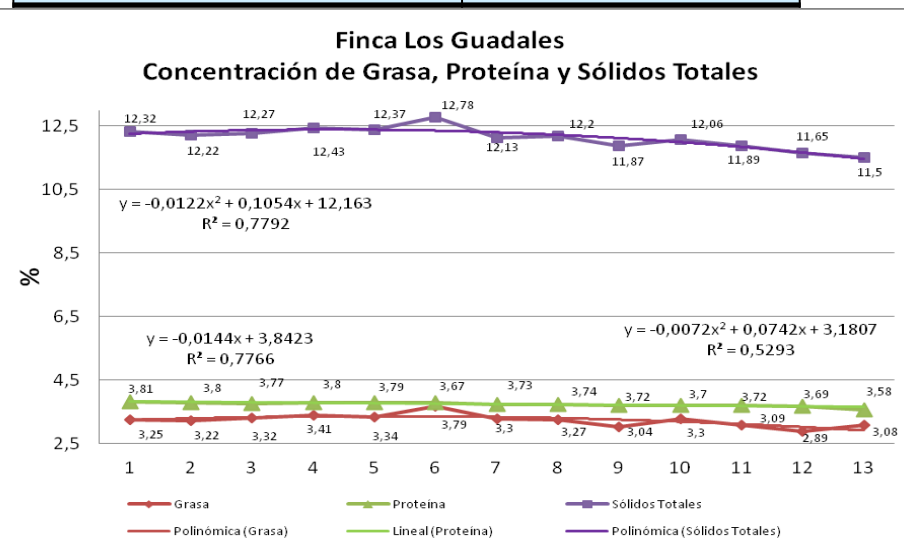
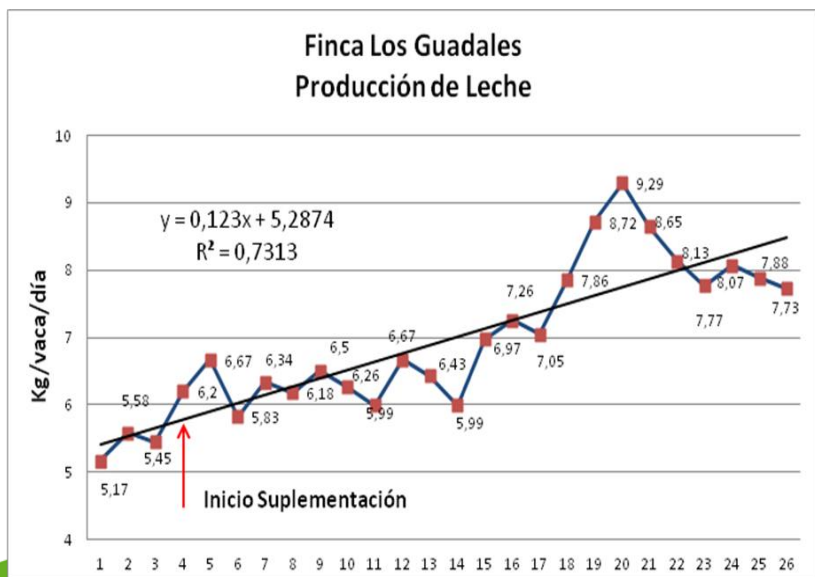
Breed	Open days		Birth weight (kg)			Weaning weight (kg)		
Brangus	184,0a	± 49,5	30,9a	± 5,4		221,9a	± 21,0	
Zebu	179,0a	± 45,8	26,1b	± 2,4		225,4a	± 15,0	
Total	182,2	± 47,2	28,9	± 5,0		223,3	± 18,6	

Source: Flórez et al., 2012

Balancing Rations (CNCPS) in Dual Purpose Cows

- Increase in total milk production: 29%
- Decrease in Calving interval: 6.6% and open days: 19.2%
- Decrease in Ration costs: 5.6%.

Nutriente	Cantidad
Materia Seca, %	20.3
Forraje, %	88.3
Suplemento, %	11.7
Proteína Cruda, %	9.21
Fibra en Detergente Neutro, %	64.8
Extracto Etéreo, %	2.5
Energía Metabolizable, Mcal/Kg	2.08
Diferencia de Cationes y Aniones, meq/Kg	107



Semanas
Source: Flórez et al., 2012

Integrated Systems (crop-forage-livestock-tree systems)



Photos: Rincón, A.; Flórez, H.

Trees for Silvopastoral Systems



Acacia mangium



Eucalipto pellita



Gmelina arborea

Photos: Rincón, A.

Silvopastoral Systems



Improving **forage production (kg DM / ha)** in renovated pastures with different technologies

Technology	Degraded pasture	Renewed pasture	Increment (%)
Tillage + fertilization + legume introduction	800	1300	62
Renovation with crops ¹	800	1800	125
Corn-soybean rotation and grass ²	800	2200	175

1 Simultaneous planting of pastures with crops (corn, soy or rice)

2 Corn-soybean rotation for three years and then grasses (Toledo, *Panicum*, Mulato)

Source: Rincón, 2010

Improving **stocking rate (a.u./ha)** in renovated pastures with different technologies

Technology	Degraded pasture	Renewed pasture	Increment (%)
Tillage + fertilization + legume introduction	0.8	2	150
Renovation with crops ¹	0.8	3	275
Corn-soybean rotation and grass ²	0.8	4	400

1 a.u. equivalent to 400 kg live weight

2 Simultaneous planting of pastures with crops (corn, soy or rice)

3 Corn-soybean rotation for three years and then grasses (Toledo, *Panicum*, Mulato)

Source: Rincón, 2010

Improving of **beef productivity (Kg/ha/year)** in renovated pastures with different technologies

Technology	Degraded pasture	Renewed pasture	Increment (%)
Tillage + fertilization + legume introduction	120	450	275
Renovation with crops ¹	120	600	400
Corn-soybean rotation and grass ²	120	1000	733

1 Simultaneous planting of pastures with crops (corn, soy or rice)

2 Corn-soybean rotation for three years and then grasses (Toledo, *Panicum*, Mulato)

Source: Rincón, 2010

Beef Productivity after rotation of pastures with crops (first year)

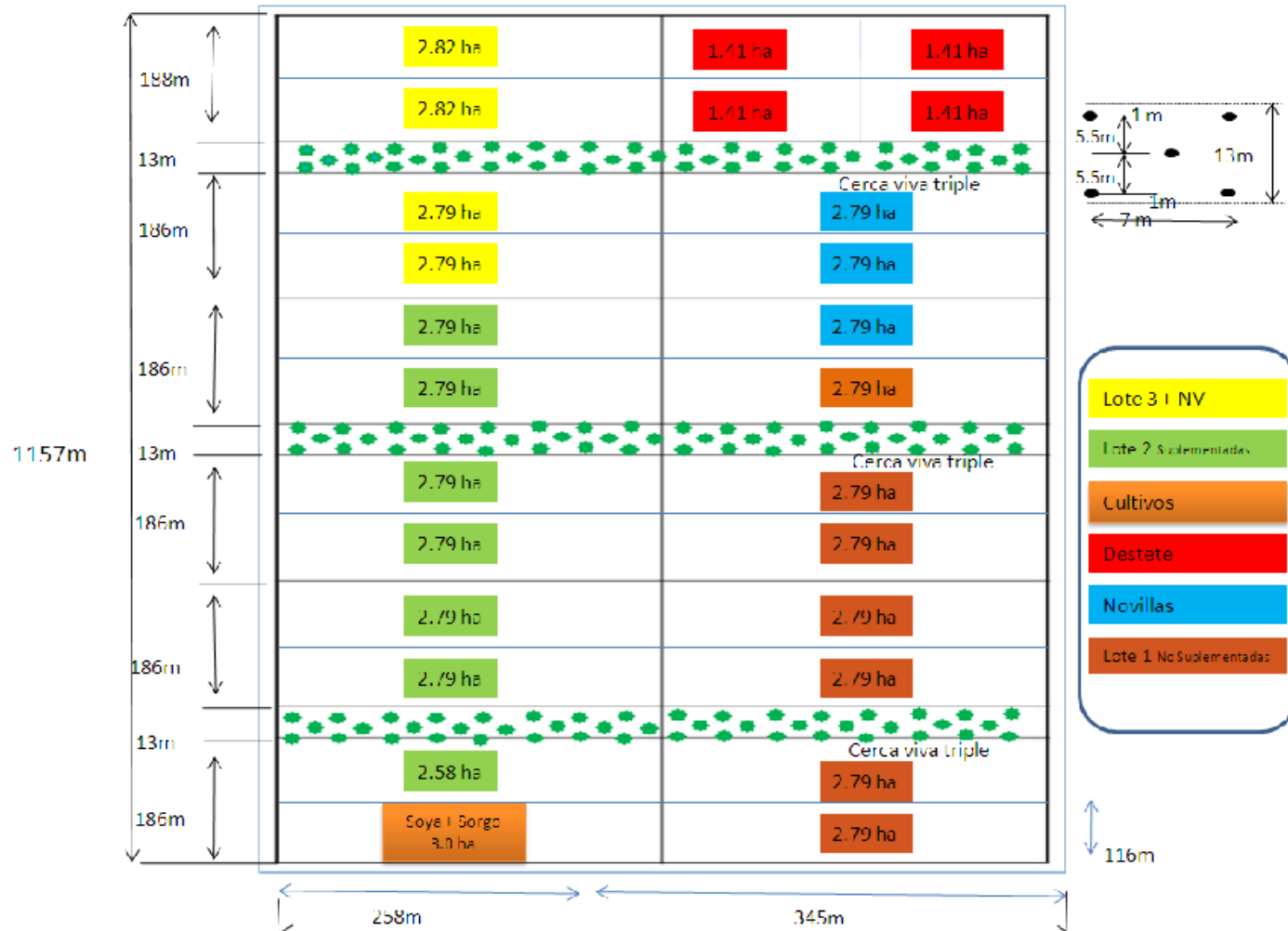


Stocking rate: 4 head/ha

ADG: 700 g/head/day

Beef productivity: 1000 kg/ha/year

Cow-Calf model Altillanura. Carimagua



70 has *Brachiaria dictyoneura*,

Source: Pérez et al., 2013

Experimental animals Cow-Calf Model

- Control: 28 Zebu cows and 4 heifers
- Supplement: 30 Zebu cows and 6 heifers
- Bulls: 3 BON

Forage availability *B. dictyoneura* y *B. brizantha* cv. Toledo during rainy season. Carimagua, 2013

Pasture	Green forage (kg/ha)	Dry Forage (kg/ha)
<i>Toledo</i> 2012	7480	2097
<i>Toledo</i> 2013	8.000	2216
<i>B. dictyoneura</i> + tillage 2013	3582	943
<i>B. dictyoneura</i> with tillage	4250	1114
<i>B. dictyoneura</i> fertilization 2013	5300	1334

Source: Pérez et al., 2013

Nutritional Composition Pastures Cow-Calf Model

Pradera	DM	CP	NDF	ASH	DIG.
	($\%$)				
B. dictyoneura no fertilization	29	7.4	70.8	8.4	70.5
B. dictyoneura fertilization	32	9.2	74.8	9.1	77
Toledo 2013	27	9.6	68.4	7.8	66.0

Source: Pérez et al., 2013

Nutritional Composition Crops and Supplement Cow- Calf Model

Material	DM	CP	NDF	ASH	Digest.
	% de la MS				
Soybean	53	20.1	44	6,9	77
Sorghum HT 70	41	4.4	62.2	4,0	60
Silage Soybean-sorghum	41.6	7.0	59.4	3,9	62
Supplement	91.7	21.4	18.0	9.0	89

Source: Pérez et al., 2013

Calving Interval (CI) and Open Days (OD) Cow-Calf Model

Birth number	Control			Supplement		
	n	CI	OD	n	CI	OD
0-2	1			9	600	330
2-5	23	596	326	16	487	217
>5	4	490	220	5	490	221
mean		583	313		517	247

Source: Pérez et al., 2013

Birth (BW) and Weaning Weight (WW) and ADG Cow-Calf Model

Treat.	Sex	Breed	BW	WW	ADG
			Kg		g
Control	Female	Bon x Cebú	28,63	165	505
	Male	Bon x Cebú	29	180	559
	mean		28,76	170,81	526
Supplement	Female	Bon x Cebú	28,57	173	535
	Male	Bon x cebú	29,27	194	610
	mean		28,88	184	575

Source: Pérez et al., 2013

Conclusions

- In Beef and dual purpose cattle systems in Colombia, main issues can be dealt with:
 - Pastures renovation
 - Forage supplementation during dry season
 - Using integrated systems
- These strategies can increase forage availability, improve feed digestibility and nutrient content and increase productivity