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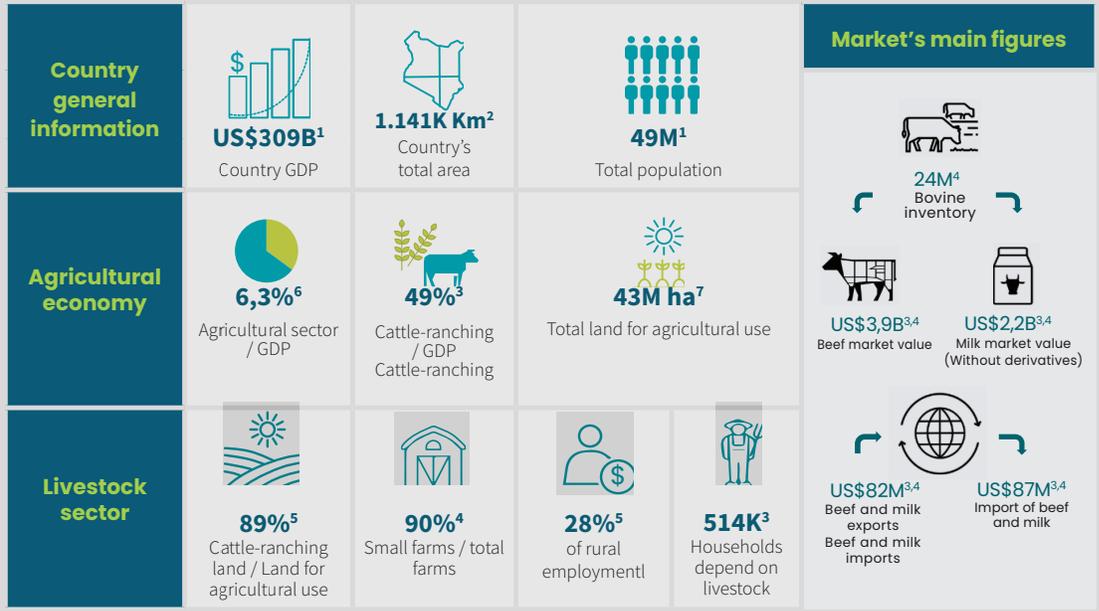
BUSINESS CASE

Mainstreaming Sustainable Cattle Ranching Project



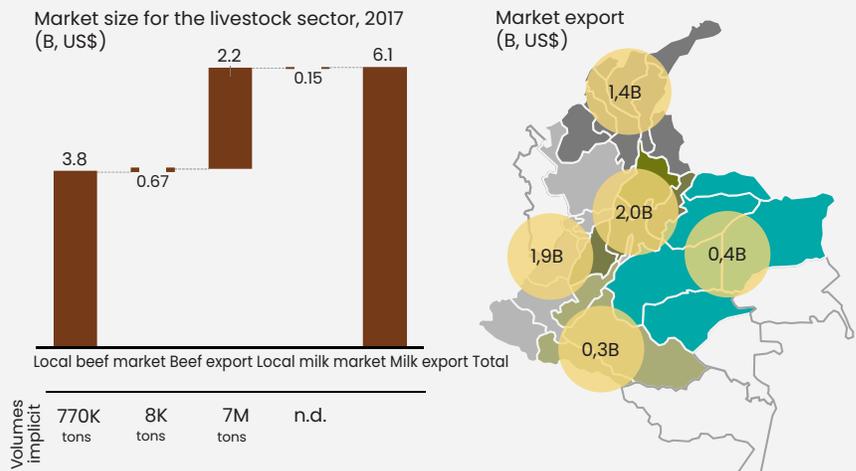
Cattle ranching context in Colombia

Cattle ranching, one of the most important sectors of the Colombian economy, generates income for more than half a million rural families, and guarantees national self-sufficiency in meat and dairy production nationwide. It also contributes 6.3% percent of the agricultural sector's gross domestic product (GDP).



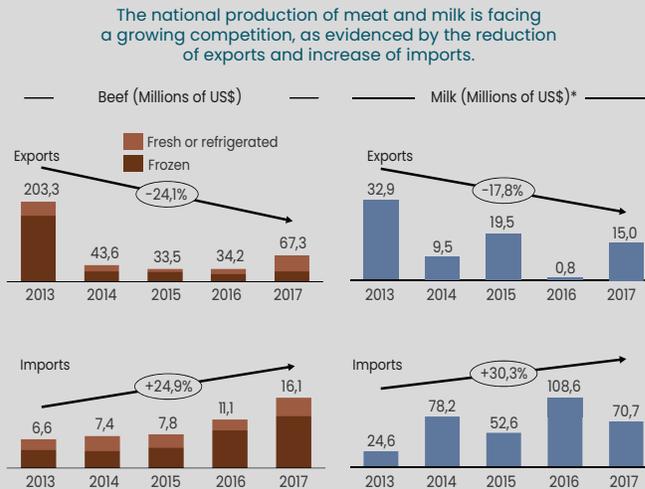
1) International Monetary Fund – 2018, 2) IGAG, 3) FEDEGAN 2016-2017 4) ICA - Bovine census 2017 (small farms < 100 bovines) 5) Sustainable beef global conference 6) DANE, 2017, TechnoServe analysis 7) National agricultural census 2014.

Cattle ranching is the agricultural subsector that occupies the largest share of the nation's agricultural land, with extensive livestock production systems predominating on about 35 million hectares of pasture land. Cattle ranching systems are characterized by low profitability and high vulnerability to variations in climate, and they have considerable impacts on the environment and greenhouse gas emissions.

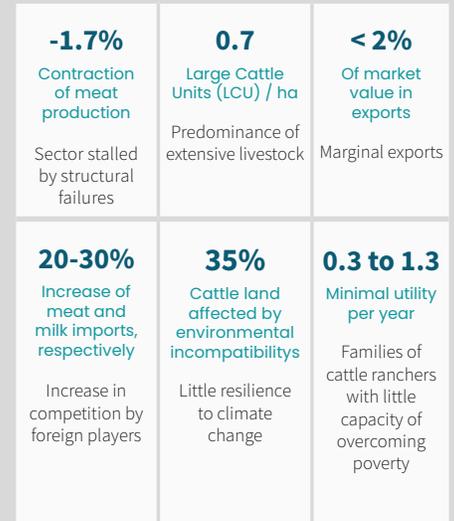


Source: FEDEGAN, DANE, Cattle-ranching Sacrifice Survey; Trademap, TechnoServe analysis

Cattle ranching faces significant productivity and competitiveness challenges. The production of meat and milk has remained stagnant at the national level, and exports of these products are weak. Colombia faces strong international competition from other exporters. Profits are so low that most families that rely on cattle ranching for a livelihood have few prospects of overcoming poverty.



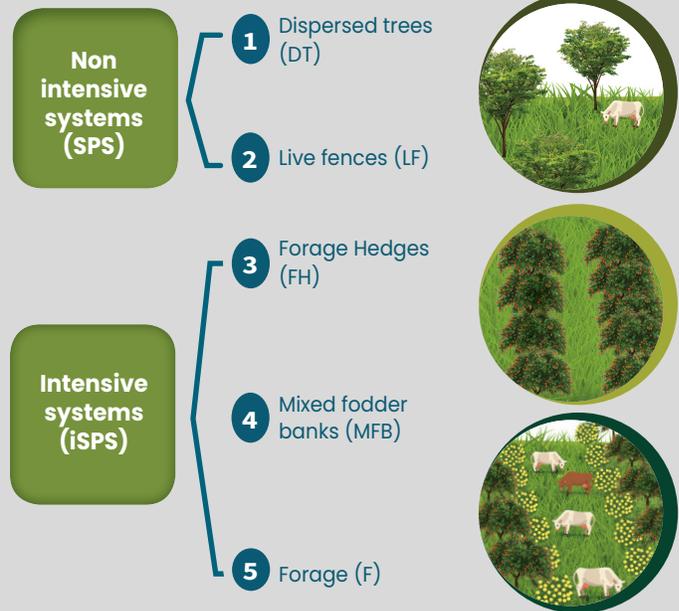
Source: Trademap, DIAN
* Powdered and liquid milk statistics. Other milk derivatives not included



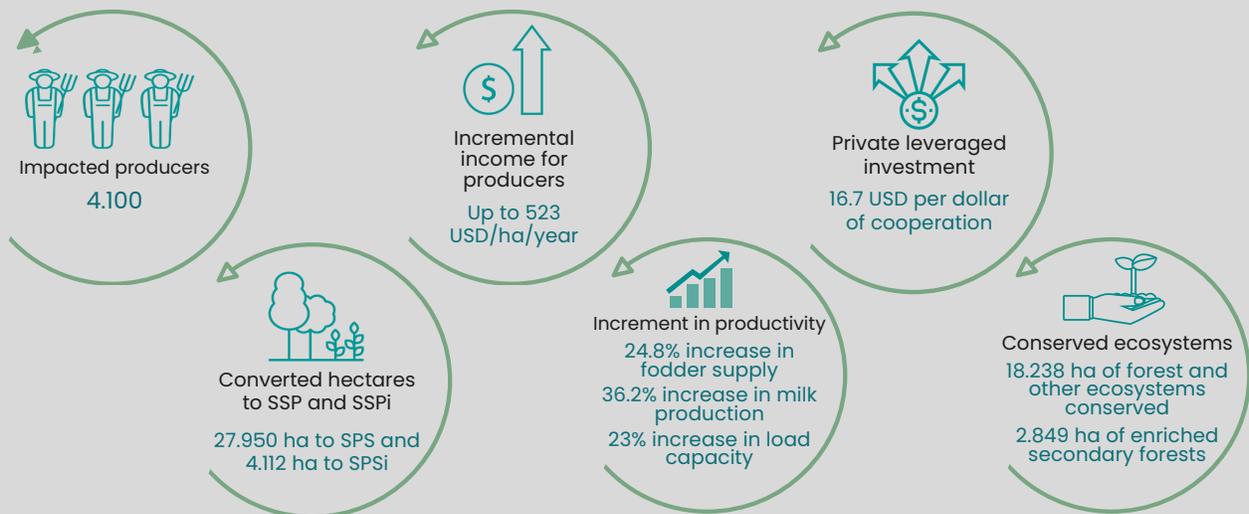
Mainstreaming Sustainable Cattle Ranching Project (MSCR)

With the objective of generating more efficient and productive conditions for raising livestock, the Mainstreaming Sustainable Cattle Ranching Project (MSCR)* is being implemented in five regions of Colombia. The project builds capacity to implement silvopastoral systems (SPS) that integrate agroforestry and livestock production, provides incentives to support good cattle ranching practices, and validates and integrates approaches to monitor the impacts of different productive systems on changes in land use, biodiversity, carbon emissions, and productivity.

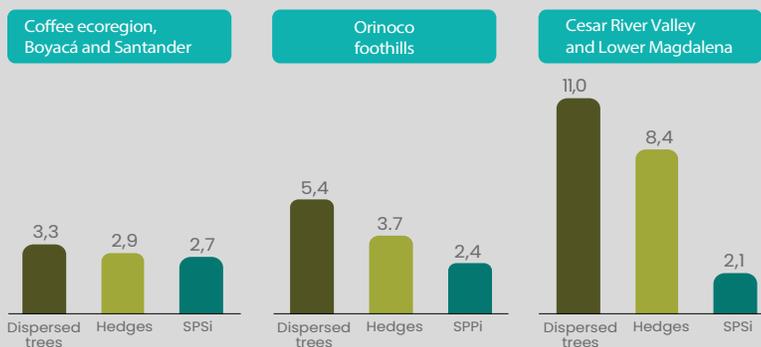
* TMSCR is an alliance between the Federation of Colombian Cattle Breeders (FEDEGAN), The Nature Conservancy (TNC), The Fund for Environmental Action and Children (Action Fund), the Center for Research in Sustainable Agricultural Production Systems (CIPAV), and the World Bank, with financial support from the Department of Business, Energy and Industrial Strategy (BEIS) of the United Kingdom and the Global Environment Fund (GEF). The project also has institutional support from the Ministry of Environment and Sustainable Development (MADS) and the Ministry of Agriculture and Rural Development (MADR).



Project Colombian Sustainable Ranching Results,



Carbon capture validated by the Mainstreaming Sustainable Cattle-Ranching Project in tons of CO₂ per hectare / year



At the end of 2018, the MSCR project has registered acumulative CO₂ capture of 1,050,000 tons



Approach to SPS and iSPS business case development in Colombia

To capitalize on results from the MSCR and support decision makers, TechnoServe developed a study of the “Business case for the implementation and expansion of silvopastoral systems in Colombia.” The study, based on a cost and profitability analysis of SPS, defines the potential for scaling up SPS, identifies investment opportunities, and outlines the mechanisms required to shift livestock production towards sustainable SPS and intensive SPS (iSPS).

The analysis:

- 1 Analyzes the characteristics, challenges, and opportunities in the cattle ranching subsector.
- 2 Develops a typology of representative cattle ranching systems and identifies the most commonly implemented SPS.
- 3 Analyzes gains in profitability for each type of ranching system in which silvopastoral practices were implemented.
- 4 Evaluates the incentives needed to profitably scale up the implementation of SPS and iSPS in each type of system.
- 5 Identifies scenarios for scaling up SPS and iSPS in each type of system and the mechanisms required for this transformation: public and private investments and incentives.

Silvopastoral systems selected for analysis



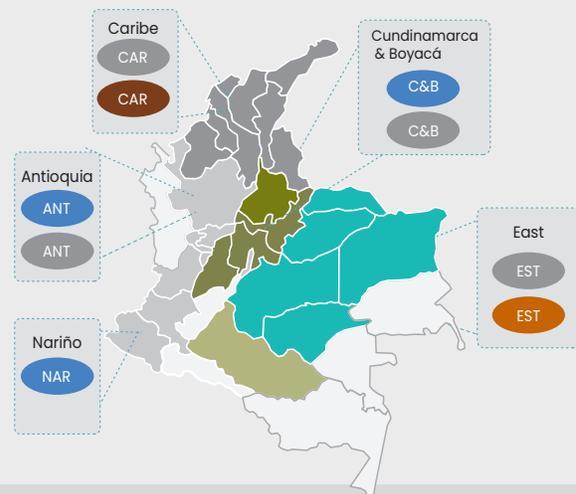
System selection criteria:

1. Systems selected for the analysis represented 90 percent of the area where SPS were implemented under the MSCR.
2. Data on system benefits were collected systematically.

Selected archetypes

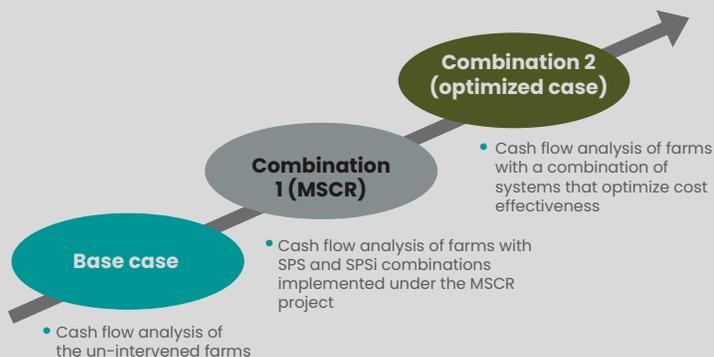
Production focus	Region	Estimated representation*	Symbol
Specialized milk	Cundinamarca & Boyacá Plateau	> 80%	C&B
	Antioquia	> 80%	ANT
	Nariño	> 80%	NAR
Dual purpose	Cundinamarca & Boyacá	17%	C&B
	Antioquia	10%	ANT
	Caribbean /Atlantic	12%	CAR
	East, center and south	21%	EST
Breeding	East, center and south	30%	EST
Fattening	Caribbean /Atlantic	30%	CAR

* Total percentage of farms



Scenarios for profitability analysis:

Costs and benefits resulting from the combination of SPS and iSPSi



Base Case	Indicators of farms with no intervention	
Combination 1 Combinations implemented by the MSCR program	System	Percentage of area converted to silvopastoral systems
	Dispersed trees	8 – 18%
	Hedges	10 – 17%
	iPS	1 – 2%
	Without system	71 – 74%
Combination 2 Optimized case	Dispersed trees	5%
	Hedges	10%
	iSPSi	20%
	Without system	65%

Business case results

The benefits of SPS and iSPS are evident in five aspects of cattle ranching that directly affect profitability:



1 Increased carrying capacity



2 Increased birth rates



3 Increased milk productivity



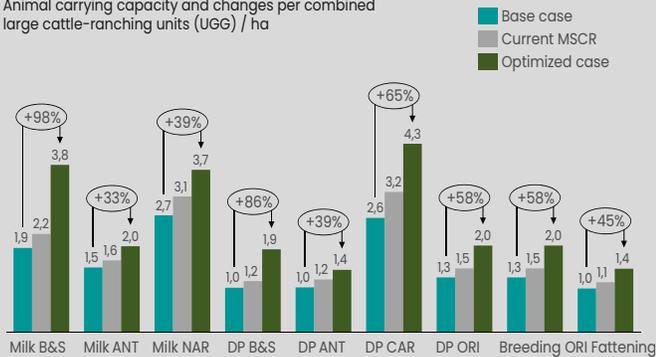
4 Increased animal weight gain



5 Lower production costs

1. Increased carrying capacity: For all types of cattle ranching system, combinations 1 and 2 with SPS and iSPS represent an increase in carrying capacity of ~2-4 livestock units per hectare (LSU/ha).

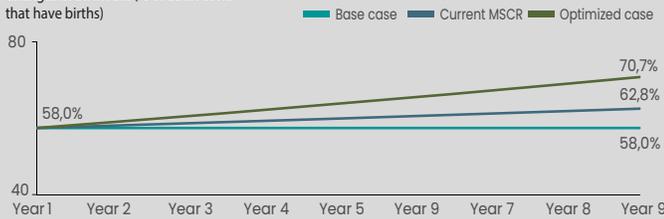
Animal carrying capacity and changes per combined large cattle-ranching units (UGG) / ha



B&S: Boyacá y Santander NAR: Nariño CAR: Caribe ANT: Antioquia ORI: Oriente

2. Increased birth rates: The birth rate increases as the area under SPS and iSPS increases.

Changes in birth rate (% of adult cows that have births)

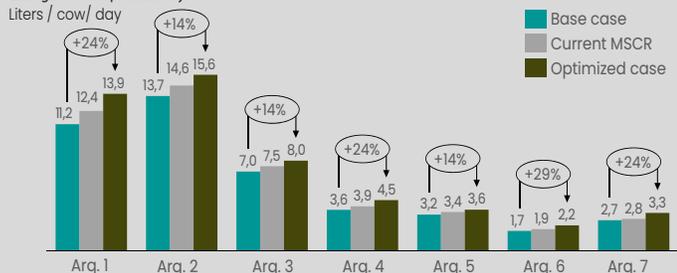


Notes:

- Two parameters were established to determine variations in birth rate:
 - 1) major variations for cases where farm transformation to SPS and iSPS is greater than 30% and
 - 2) major variations for cases where iSPS represents more than 5% of the total transformation of the farm.
- These rates were applied to all archetypes for the projection of herd dynamics and income
- The variation of birth rates is not subject to silvopastoral systems only. Results also depend on the implementation of good cattle-ranching practices in farm administration.

3. Increased milk productivity: Milk productivity increases up to 29 percent after three years of SPS and iSPS implementation

Changes in milk productivity Liters / cow/ day

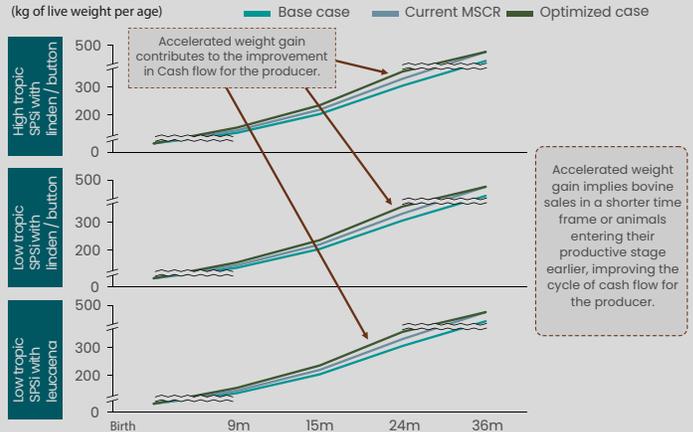


AD	16%	22%	22%	16%	22%	29%	10%
CV	48%	26%	26%	48%	26%	25%	15%
SSPi	92%	50%	50%	92%	50%	124%	111%

Impacts applied by the system*

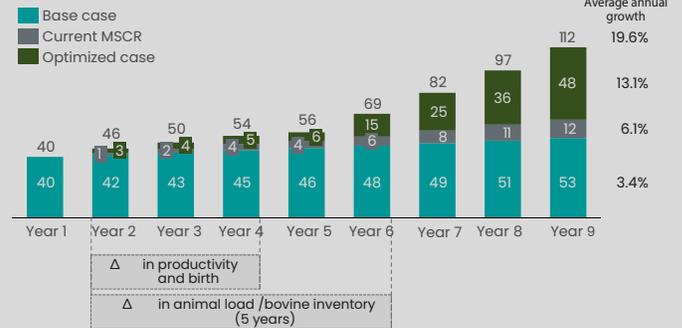
4. Increased animal weight gain: Under combinations 1 and 2, animals gain more weight in a shorter period.

Changes in live weight gain (kg of live weight per age)



5. Lower production costs: Combinations with SPS and iSPS represent a continuous increase in total annual revenue.

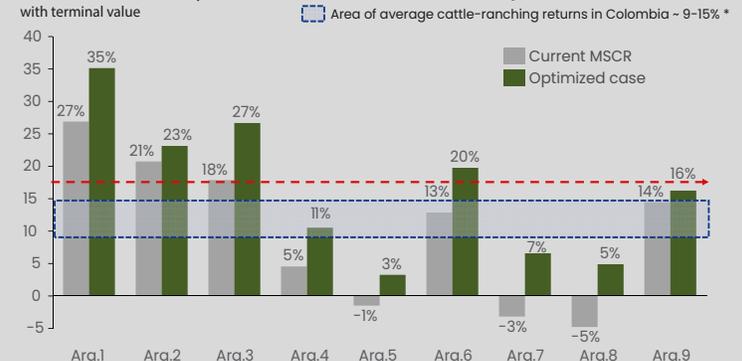
Incremental annual income of each combination * COP millions



* Incremental values from one combination to another Note: Revenue assumes that once the maximum impacts have been reached, the maximum impact remains stable for the remaining projection time

6. The SPS and iSPS combinations are profitable for all types of cattle ranching systems

IRR - Incremental flows for 9 years with terminal value



* Terminal value calculated by perpetuity ** Average financing cost with Banco Agrario *** Data supplied by FEDEGAN based on the observed returns of farms in database IRR: Internal rate of return.

7 Specialized dairy and animal fattening systems are the most profitable:

- Investments in SPS for dairy and animal fattening systems are profitable within less than 10 years.
- In dairy systems, total farm income flows could support a drop in milk prices of up to \$650 per liter. In dual-purpose (dairy and animal fattening) systems, total farm income flows are better protected from price volatility.
- Total farm income flows in meat production systems (cattle rearing and fattening) can withstand high volatility in meat prices.

Meat - Breeding and fattening			
Arq.	Indicator	C.MSCR.	O. case.
EST	TIR	-5%	5%
	MCI-inc.	0.7x	1.5x
CAR	TIR	14%	16%
	MCI-inc.	2.9x	3.3x

Meat - Breeding and fattening			
Arq.	Indicator	C.MSCR.	O. case.
C&B	TIR	27%	35%
	MCI-inc.	6.5x	29x
ANT	TIR	21%	23%
	MCI-inc.	4.4x	5.1x
NAR	TIR	18%	27%
	MCI-inc.	3.9x	5.4x

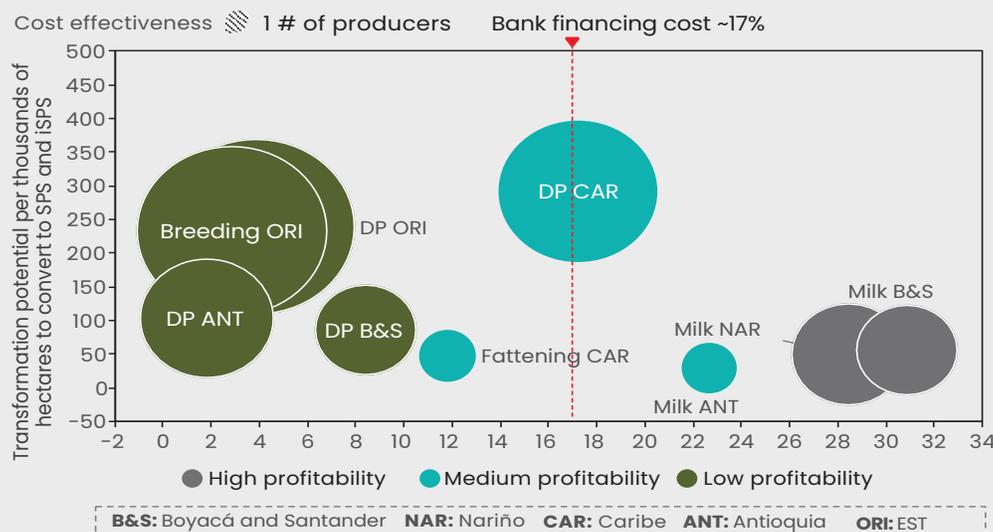
Archetypes	Investment / ha (COP, M)	Investment / ha (USD)
C&B, ANT, NAR, ORI	\$3.8	\$1,300
CAR	\$3.2	\$1,100

Dual purpose			
Arq.	Indicator	C.MSCR.	O. case.
C&B	TIR	5%	11%
	MCI-inc.	1.4x	2.3x
ANT	TIR	-1%	3%
	MCI-inc.	0.9x	1.3x
CAR	TIR	13%	20%
	MCI-inc.	2.6x	4.4x
ORI	TIR	-3%	7%
	MCI-inc.	0.8x	1.7x

Summary of profit indicators and investment needed per archetype.

Considerations for a scaling-up strategy

- Promoting the use of SPS will require a combination of intensive and non-intensive systems.
- Dairy, animal fattening, and dual-purpose systems in Colombia's Caribbean coast region are the most attractive for private investment.
- For the majority of the typical cattle ranching systems, a return on investment is seen in 5–7 years, so long-term financing will be required to promote these systems.
- Dairy production systems are the most vulnerable to price fluctuations.
- Meat production systems (cattle raising and fattening) can withstand price drops of up to ~ 50 percent.
- Efforts to convert land used in cattle ranching to SPS or iSPS should be carried out within the framework of an integrated land use planning strategy that ensures effective land use, forest conservation, and ecosystem restoration.
- Appropriate incentives will be based on an evaluation of criteria related to environmental benefits as well as profitability.
 - Dairy production systems are the most cost-effective option, but they have less potential for transforming land use through conversion to SPS and iSPS.
 - Cattle ranching for meat production is less profitable than the other types of systems but has greater potential to transform land use through the conversion to SPS and iSPS. To realize this impact, producers will require incentives from the private and public sector; the types and combinations of incentives will vary by region and production system.
 - The dual-purpose system in the Caribbean coast region offers medium profitability and a high potential impact on land transformation through the conversion to SPS and iSPS.
 - Regions with high potential to transform land use by moving toward sustainable cattle ranching systems will require specific packages of incentives so that producers can adopt SPS and iSPS.



The Business Case for Silvopastoral Systems in Colombia.

Sustainable Cattle Ranching Project in Colombia (GCS), February 2019. Consultancy commissioned by the World Bank and funded by the UK Department of Business, Energy and Industrial Strategy (BEIS). The consultancy was led by Technoserve, with information and data provided by the GCS Project.