

### Introduction

• The area of Magallanes Region (Chile) is **13 million hectares**.

• Approx. 28% areas for livestock use.

• Mainly **extensive sheep** farming, 55% of the sheep population in Chile.

• The average of farm size in the region is approximately 4,000 has.





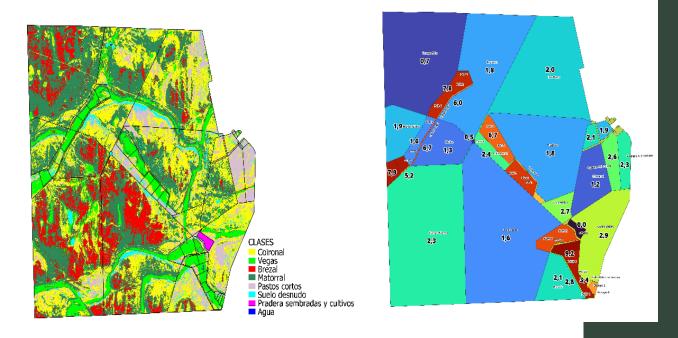


### Introduction

• It is necessary to make a **vegetation inventory** by remote sensing to improve the grazing management.

• Classification of land cover provides key inputs for sustainable management → and allow to make a Livestock Value (LV)

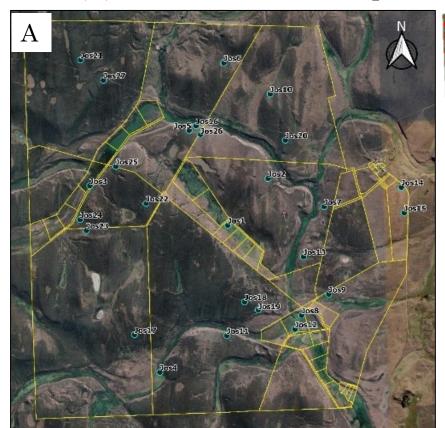
• The LV will provide information on the quality and quantity of pastures.

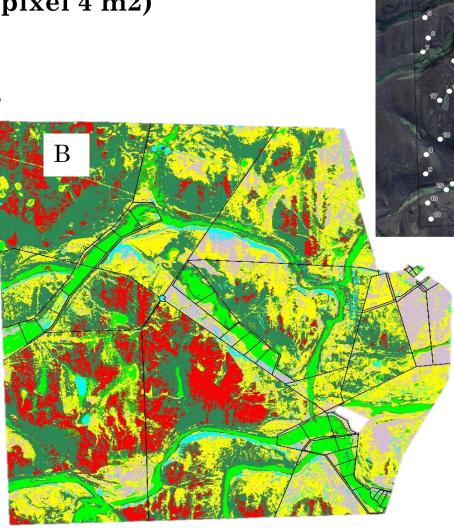




#### Methodology Determination of LV

- 1. To classify the land cover on farm by remote sensing (satellite image of pixel 4 m2)
  - (A) Fences
  - (B) Vegetal classification
  - (C) Validation with 187 points





#### Methodology Land cover classification

- 8 land covers were defined:
- 1. Tussock rangeland
- 2. Messic grasslands/Valley greens
- 3. Dwarf shrub heath
- 4. Shrub
- 5. Short turf grasses
- 6. Bare soils
- 7. Swards and fodder crops
- 8. Water







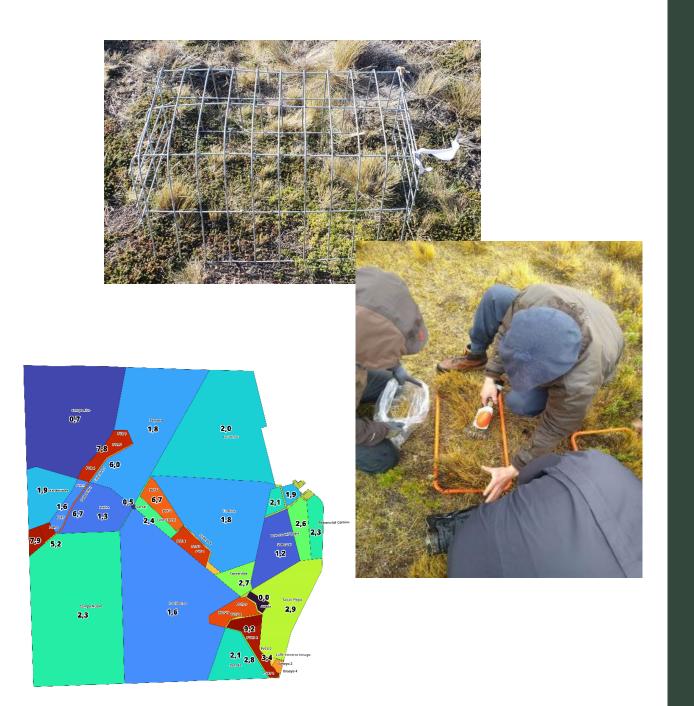






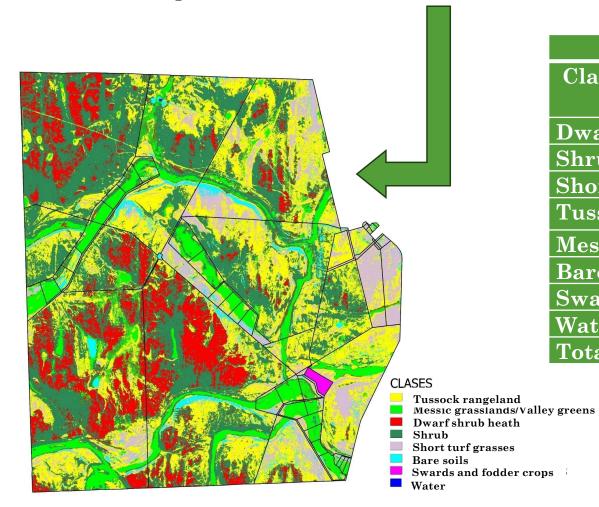
#### Methodology Determination of LV

- 2. Estimate the productivity (kgDM/Ha) of each type of vegetation
- Installation of exclusion cages (28)
- Mowing plant material at the end of the season
- 3. Quality analysis of each type of vegetation (crude protein and metabolizable energy).
- 4. Obtaining the Livestock Value



# Results Land cover classification

Surface area of plant communities on the farm and in each paddock



	I	arm
Class	Surface	Occupation
	(ha)	(%)
Dwarf shrub heath	312	12,9
Shrub	850	35,1
Short turf grasses	237	9,8
Tussock rangeland	702	29,0
Messic grasslands/Valley greens	239	9,9
Bare soils	74	3,0
Swards and fodder crops	6	0,2
Water	2	0,1
Total	2,419	100%

# Dry Matter productivity of farm

DM productivity from each vegetal community

#### Paddock surface

	(	Cover producti			Coverage	Surface (ha)			
Paddock	Tussock rangeland	Messic grasslands/ Valley greens	Dwarf shrub heath	Short turf grasses	Paddock	Tussock rangeland	Messic grasslands /Valley greens	Dwarf shrub heath	Short turf grasses
Paddock 1	161	3,225	28	151	Paddock 1	79,6	13,5	7,4	16,2

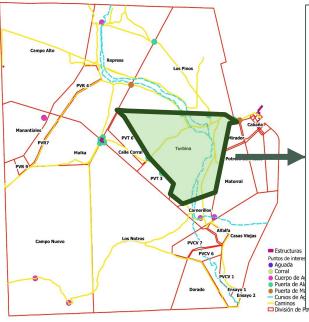
Tussock rangeland

Messic grasslands/ Valley greens

Dwarf shrub heath

Short turf grasses





Total **Tussock rangeland** production= 161\*79,6 =12,785 kgDM/year

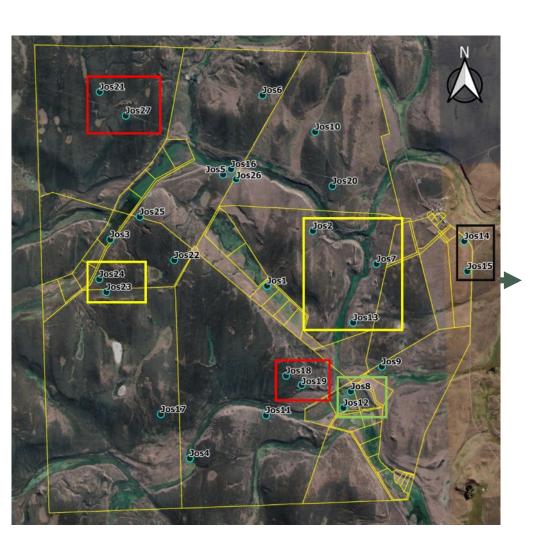
Total **Messic grasslands/Valley greens** production = 3125\*13,5=43,538 kgDM/year

Total **Dwarf shrub heath** production= 2,8\*7,4 =207 kgDM/year

Total **Short turf grasses** production = 151\*16,2 = 2,440 kgDM/year

Total DM production of the paddock =58,970 kgDM/year

### Quality analysis for each vegetal community



## Protein and energy from each type land cover

Class	ME Mcal/kg	CP %
Inter-Tussock	1,89	5,9
Tussock of Festuca gracillima	2,16	3,9
Messic grasslands/Valley greens	1,88	8,5
Dwarf shrub heath	1,92	4,5
Short turf grasses	1,83	8,0

ME: Metabolizable energy; CP: Crude Protein

#### Determination of Livestock Value

Indicator = Quantity + quality

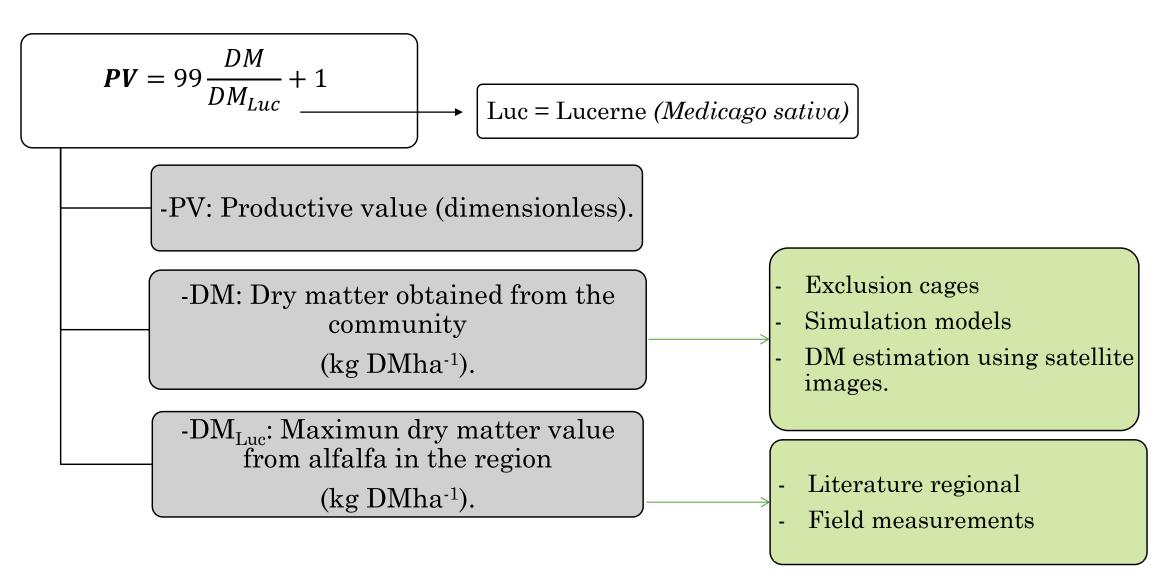
$$LV = 1/101 (PV * NV + 100)$$

Livestock Value (LV) = dimensionless figure (range of 0 - 100)

Productive Value (PV)= dimensionless figure (range of 0-100)

Nutritional Value (NP)= dimensionless figure (range of 0-100)

## Determination of productive value for LV equation



# Determination of nutritional value for LV equation

$$NV = \frac{1}{2}(99 * (\frac{ME}{ME_{Luc}} + \frac{CP}{CP_{Luc}}) + 2)$$

- NV: Nutritional value (dimensionless)

- ME: Metabolizable energy

- CP: Crude protein

- ME<sub>Luc</sub>: Metabolizable energy achievable from Lucerne

- CP<sub>Luc</sub>: Crude protein achievable from Lucerne - Field measurements of vegetal communities at farm

- Literature regional
- Field measurements

# Determination of LV of each vegetal community



#### Example

- 1) PV (Messic grasslands/Valley greens) = 99 \* (2276/15700) + 1 = 15,35
- 2) NV (Messic grasslands/Valley greens) =  $\frac{1}{2}$  (99 (1,9/2,24 + 8,5/16,65) + 2) = 67,83
- 3) LV (Messic grasslands/Valley greens) = 1/101 (15,35\*67,83+100) = 11,30

Class	DM	DM luc	ME	ME luc	CP	CP luc	PV	NV	LV
Inter-tussock	189	15700	1,9	2,24	5,9	16,65	2,19	60,14	
Tussock of F.gracillima	123	15700	2,2	2,24	3,9	16,65	1,78	60,27	2,20
Messic grasslands/Valley greens	2276	15700	1,9	2,24	8,5	16,65	15,35	67,83	11,30
Dwarf shrub heath	19	15700	1,9	2,24	4,5	16,65	1,12	56,62	1,62
Short turf grasses	163	15700	1,8	2,24	8,0	16,65	2,03	65,27	2,30

The LV of the intertussock and tussock of *F.gracillima* were estimated separately and then, based on the surface of each one, the LV of the **tussock rangeland** cover was obtained.

Livestock Value (LV) = dimensionless (range de 0 - 100)

#### Determination of Livestock Value of one paddock

LV of each paddock on the farm

Example for 1 paddock

LV TR X TR Surface TR Result **TR=**Tussock rangeland MG/VG= Messic LV MG/VG X MG/VG Surface MG/VG Result grasslands/Valley greens Total surface of the paddock LV DS **DS**=Dwarf shrub heath X DS Surface DS Result (ha) LV ST X ST Result ST Surface ST=Short turf grasses

LV Coverage					Co	verage Su	ırface (h	a)	Paddock Surface (ha)
TR	MG/VG	DS	ST	Paddock	$\mathbf{TR}$	MG/VG	$\mathbf{DS}$	ST	Total
2,20	11,30	1,62	2,30	Number 1	79,6	13,5	7,4	16,2	204,8

LV Paddock 1 = [(2,20)\*(79,6)) + (11,30\*13,5) + (1,62\*7,4) + (2,30\*16,2)] / (204,8) LV Paddock 1 = 1,8

### Determination of farm LV

LV farm

Example

LV Paddock 1 X Paddock Surface 1 =

LV Paddock 2 X Paddock Surface 2 =

LV Paddock 3 X Paddock Surface 3 =

LV Paddock 4 X Paddock Surface 4 =

. . . .

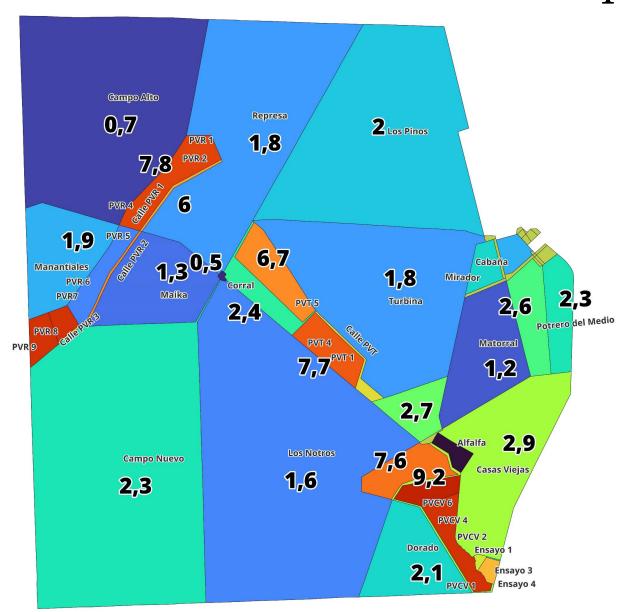
LV Paddock 54 X Paddock Surface 54 =

Paddock result 1 Paddock result 2 Paddock result 3 Paddock result 4 Paddock result 54

Total surface of the farm (ha)

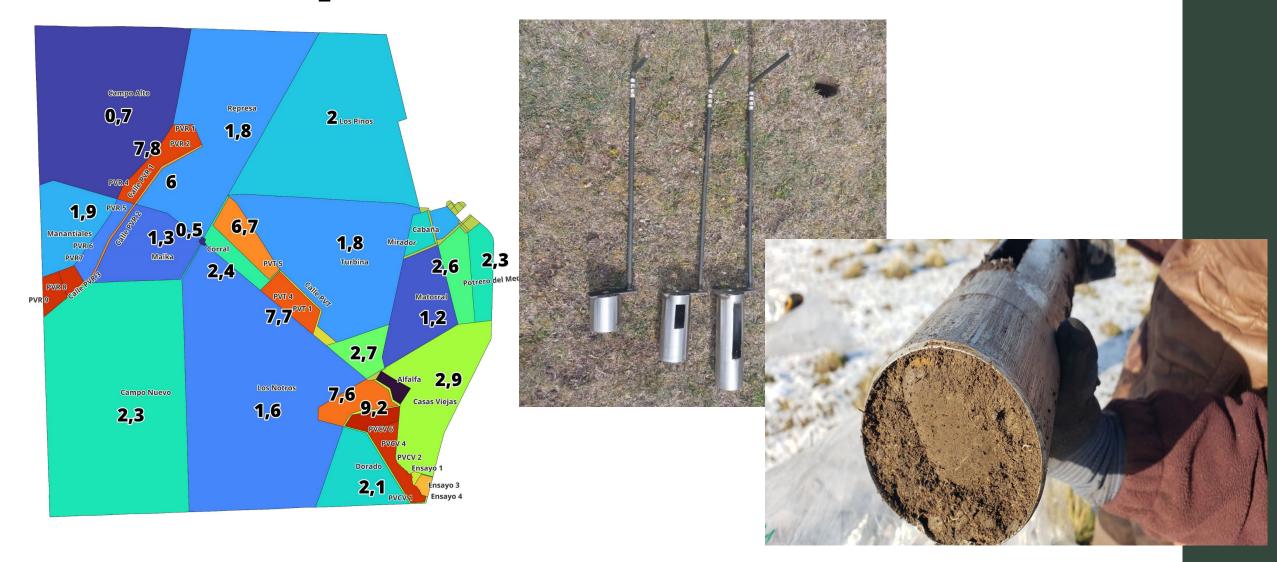
	LV of the pac	ldocks16	P	addocks surf	ace (ha)		Farm surface (ha)	
Paddock 1	Paddock 2	Paddock 3	$\mathbf{etc}$	Paddock 1 Paddock 2 Paddock 3			$\mathbf{etc}$	Total
1,8	7,3	1,9	•••	204,8	50,0	59,3	•••	2410,2

### "Livestock Value" of the paddocks and farm



LV farm = 2,2

# Developing work: "Livestock Value" for soil carbon sequestration



#### FINAL COMMENTS

- LV obtained will be useful to determine the carrying capacity of farms depending on respective vegetal community, and will improve the farm grazing management and the climate change mitigation.
- The final product for farmers is a map with all vegetal communities in farm and also a map with their LV.
- Also each farm could have a map with different characteristics of the vegetation or soil, associate for vegetal communities.
- In this sense Soil Organic Carbon map will help to the farmers to get baseline for carbon projects.

# Many thanks for your attention

