Livestock activities and ecosystem services

A tool to enhance the estimation of Agri-Environment-Climate payments in Trentino Rural Development Program 2014-2020

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Outlines

- Art.28 or Reg.1305/2013 refers to Agri-Environment-Climate payments, introducing the importance to include environmental benefits and externalities in the payment justification.
- Payments shall compensate beneficiaries for all part of the additional costs and income foregone resulting from the AEC commitments, justified by evidence of likely environmental benefits.

OBJECTIVE: TO INCLUDE THE ECOSYSTEM SERVICES IN THE ECONOMIC JUSTIFICATION OF PAYMENTS

(Trentino Rural Development Program 2014-2020, Measure 10, Operation 10.1.1 related to Meadows management)

- Environmental issues in the next Rural Programming period
- The Ecosystem service approach: the case of livestock
- The model ARIES: methodology and results
- The micro-economic results (Italian FADN/RICA)
- Conclusion

The project: build the justification for Agri-Environment- Climate payments by using an approach based on Ecosystem Services

- Step1: to build a model for livestock related activities
- Step2: scenario analysis on the management variables of the livestock related activities model
- Step3: linkage with the economic justification based on FADN

What is the agrosystem service for livestock related activities?

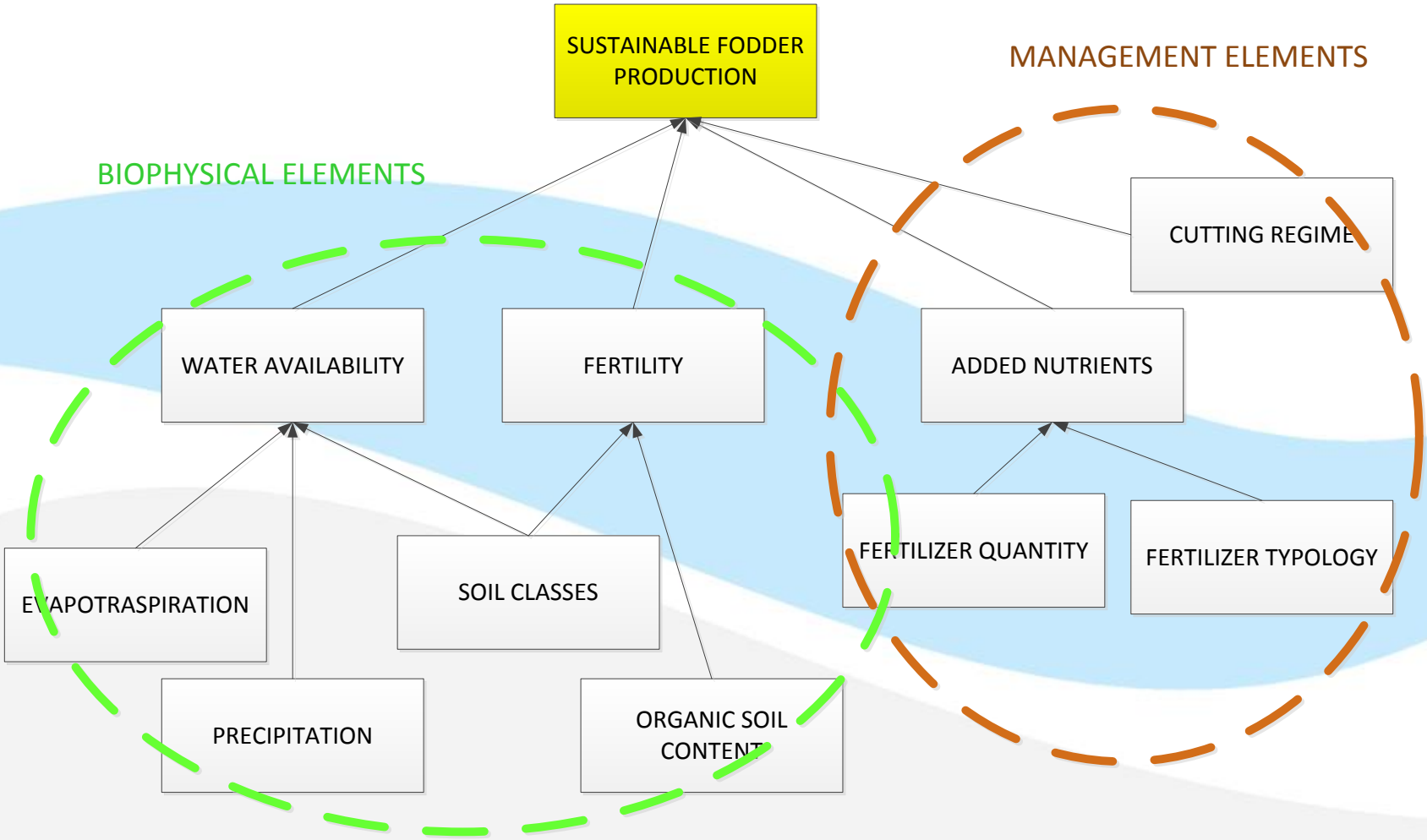
- There is no livestock ecosystem service; need to identify related provisioning services

  Need to distinguish between meadows and pasture

  - when you focus on meadows the goal becomes fodder production for feeding
  - when you focus on pasture the goal is grassland regeneration for grazing

- Like other provision services, the borderline between agro-system services and agronomic equations is not clearcut

Initial model



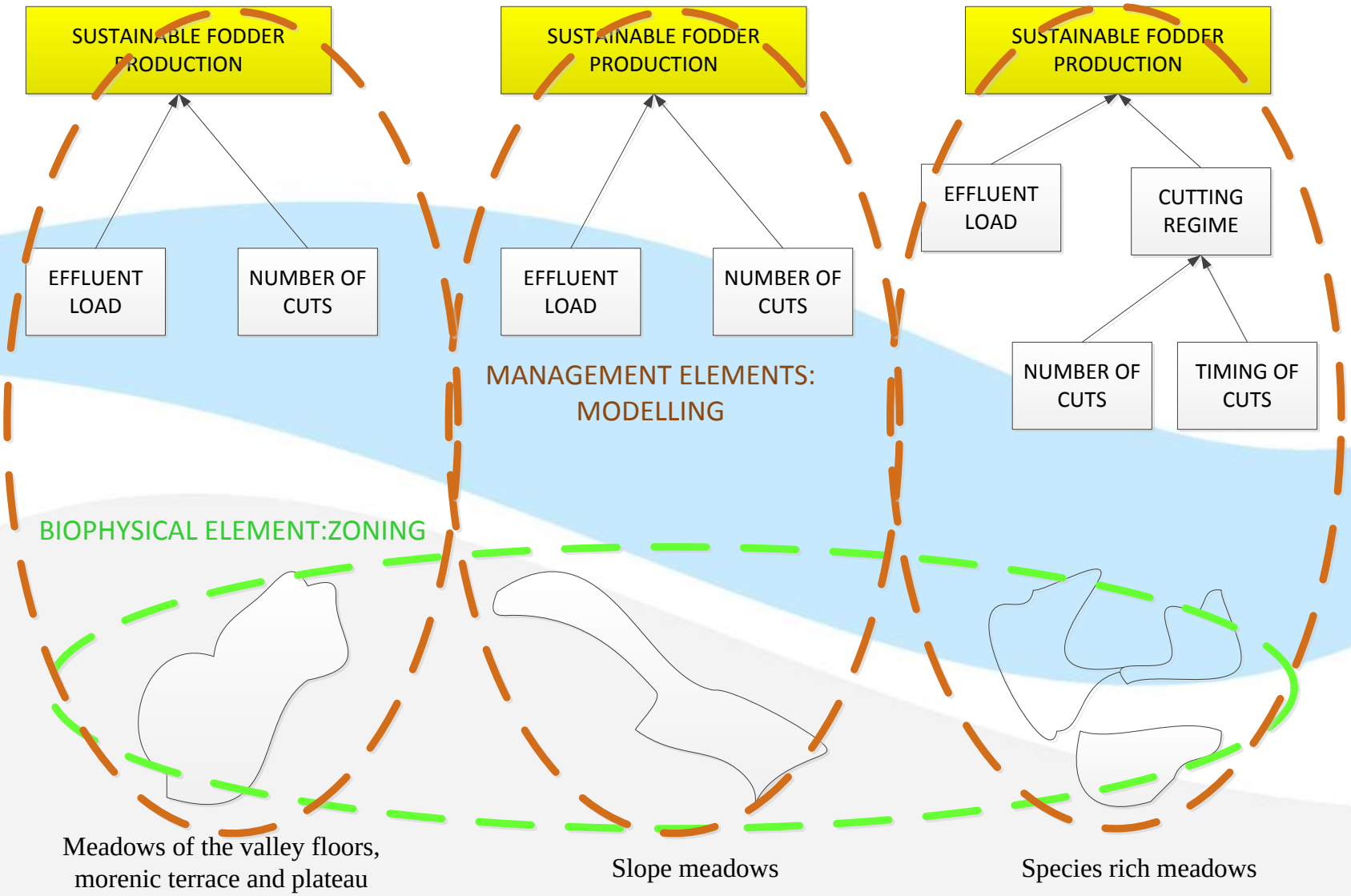
Issues related to the use of ES-based approach within a public administration

- There is the need for a simpler framework
- All the data of the model must be available
- Variables must be controllable and verifiable

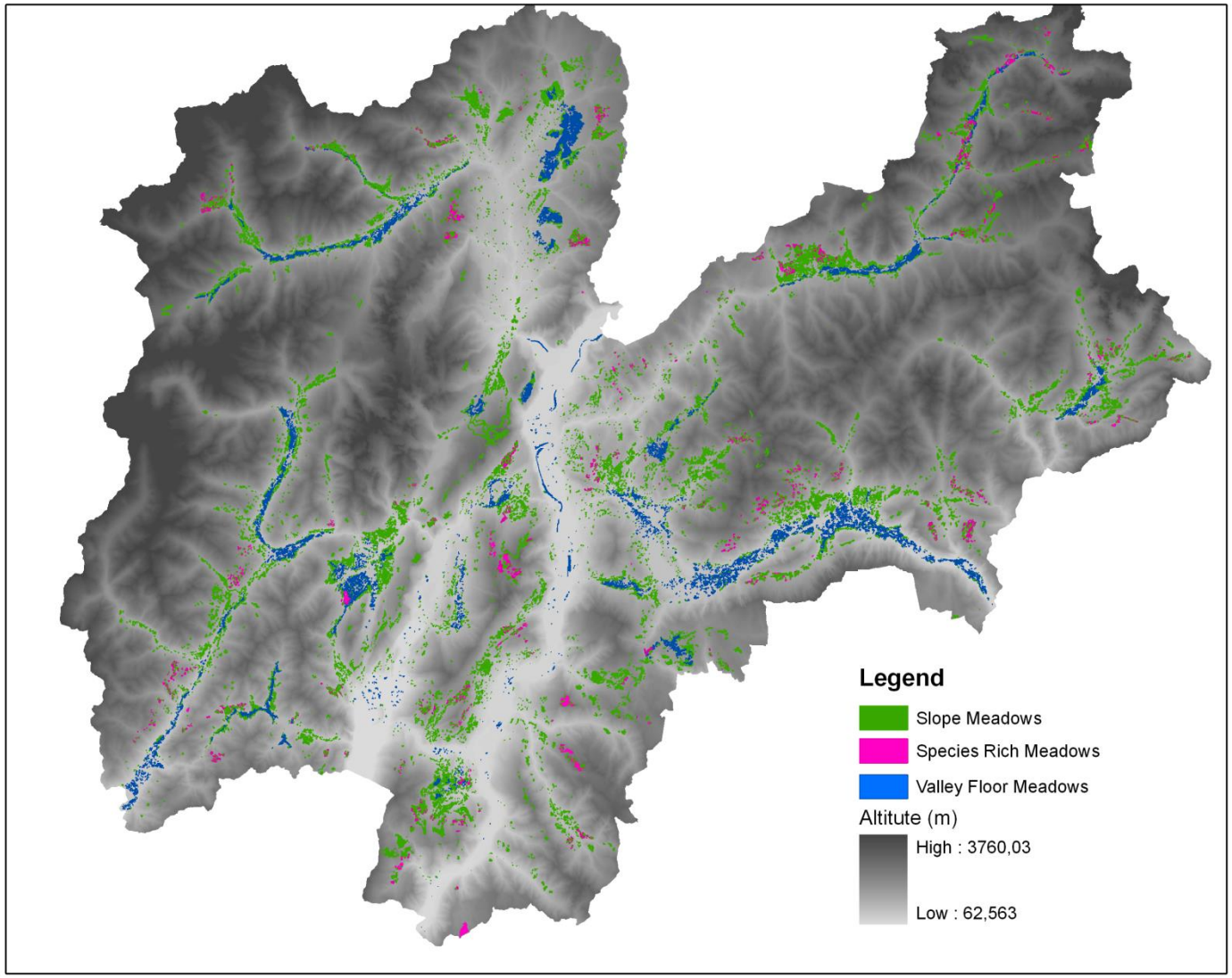
Zoning substitutes the biophysical elements

LSU/ha substitutes the N input

Current model



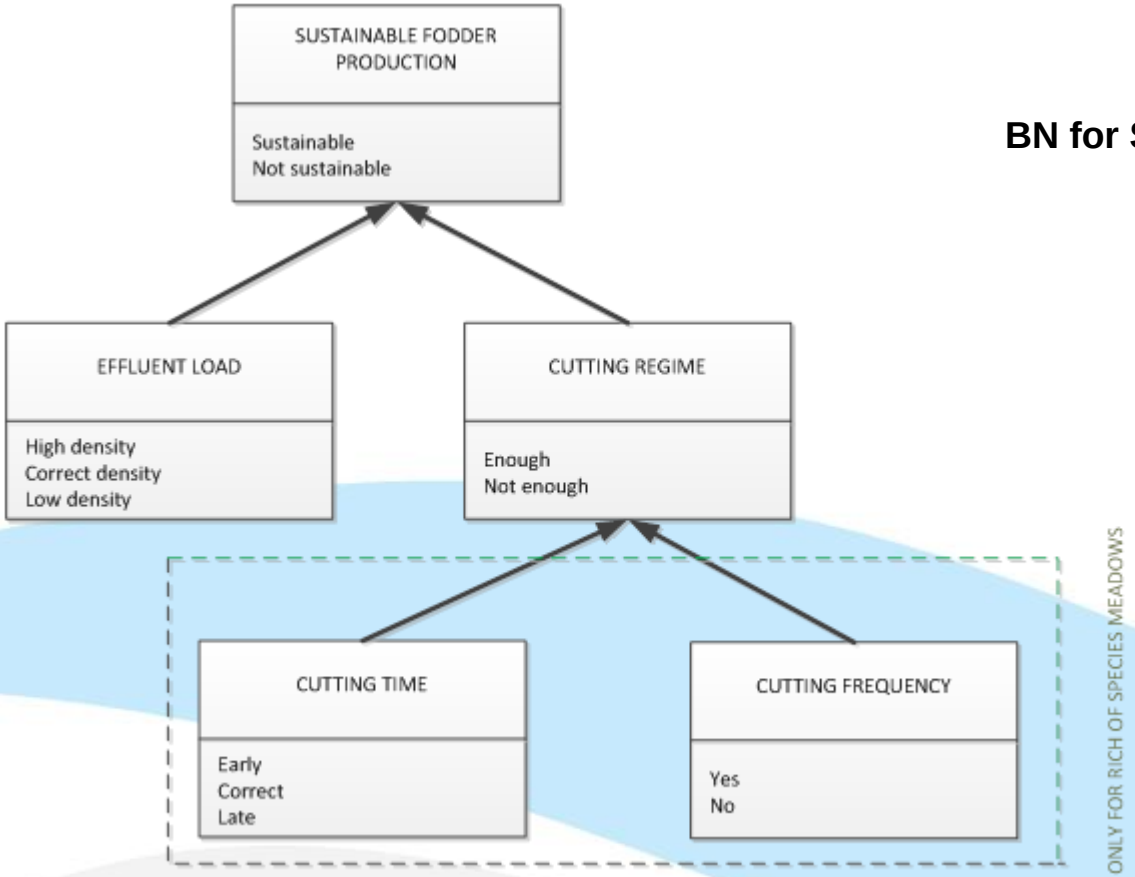
Zoning: outcomes



Typologies of meadows

	Added nutrient allowed	Number of cuts	Production	Fodder quality	Zoning class	proxy LSU/ha
Bromion erecti	<25	1	4.5-5.0	low	rich of species	0,26
Arrhenathrion elatioris	25-50	2	5.8-6.2	low	rich of species	0,53
Festuca rubra	0-50	1 or 2	4.5-5.0	low-medium	rich of species	0,53
Centaureo transalpinae	0-50	1	4.4-4.8	low-medium	slope	0,53
Centaureo carniolicae	75-100	2	5.8-6.4	medium	slope	1,05
Anthoxantho	50-75	2	6.0-6.5	low	slope	0,79
Arrhenatheretum elatioris	100-150	2 or 3	7.6-8.0	high	slope	1,58
Arrhenatheretum el. facies	225-275	3 or 4	7.5- 8.4	high	valley floor	2,89
Ranunculo repentis	200-225	2 or 3	7.0- 7.4	high	valley floor	2,37
Lolietum multiflorae	200-250	3	9.2-9.6	high	valley floor	2,63
Agropyron repens	200-275	2 or 3	8,0-9,0	high	valley floor	2,89

BN for Sustainable Fodder Production model



Management elements of the model: the variables as set in AEC Measure

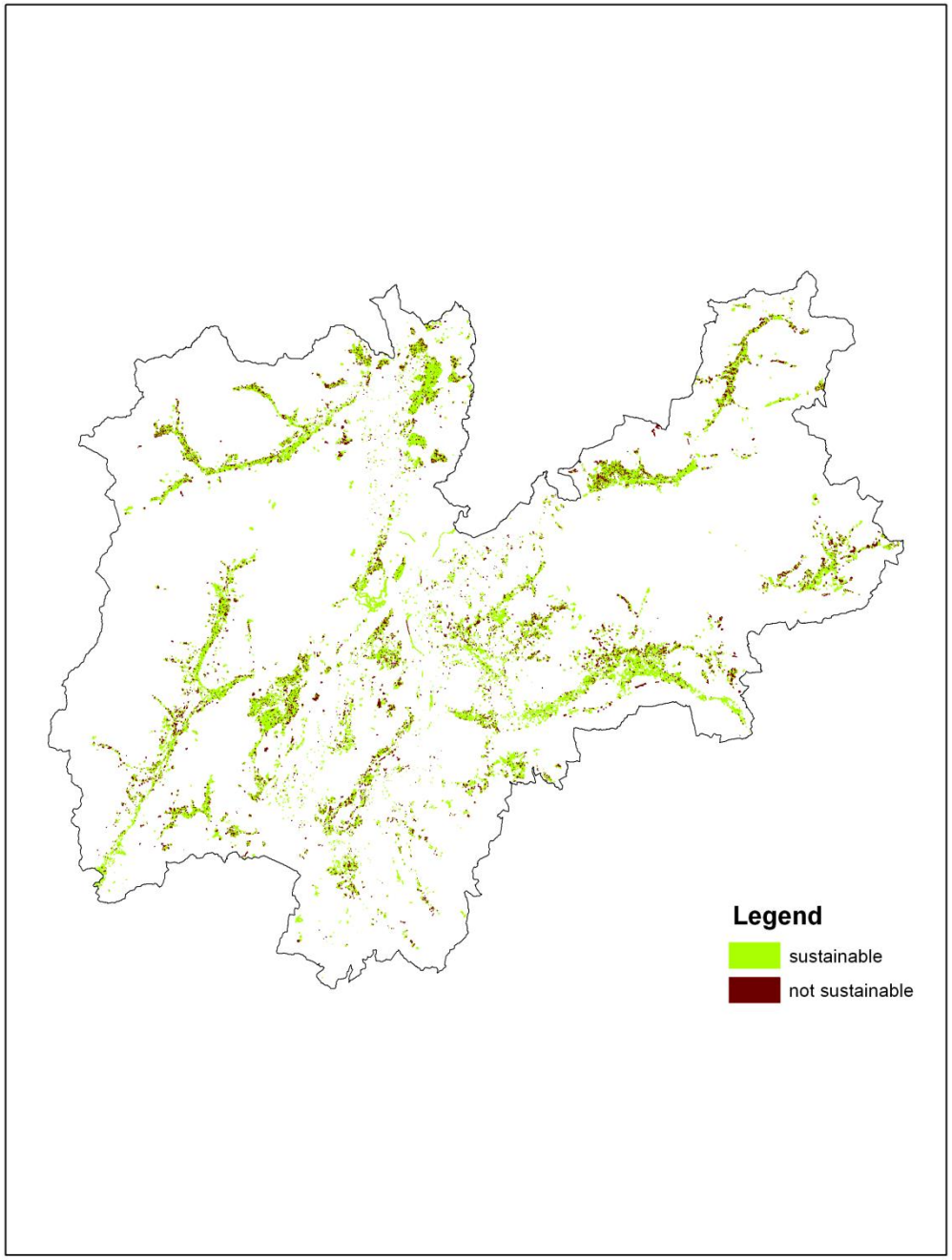
	LSU/ha	Cutting frequency	Cutting time
Rich of species meadows	1,5	1	15/06-15/08
Slope meadows	2,0	2	-
Valley floor meadows	2,5	3	-

Ecosystem services: outcomes for livestock_meadow

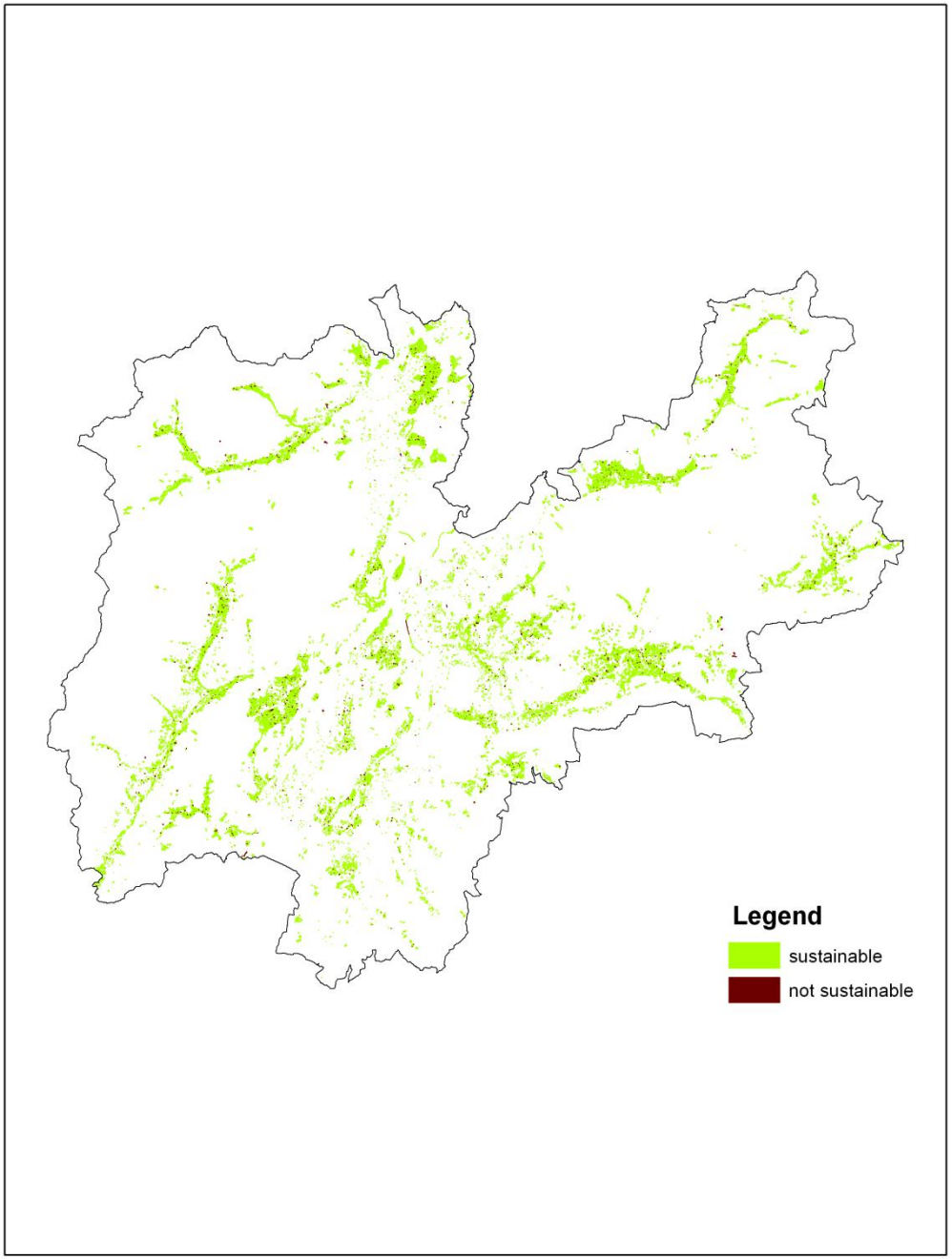
- Scenario 0: the current situation of Sustainable Fodder Production

- Scenario 1: the situation of Sustainable Fodder Production with the AEC payments

Scenario 0: current situation



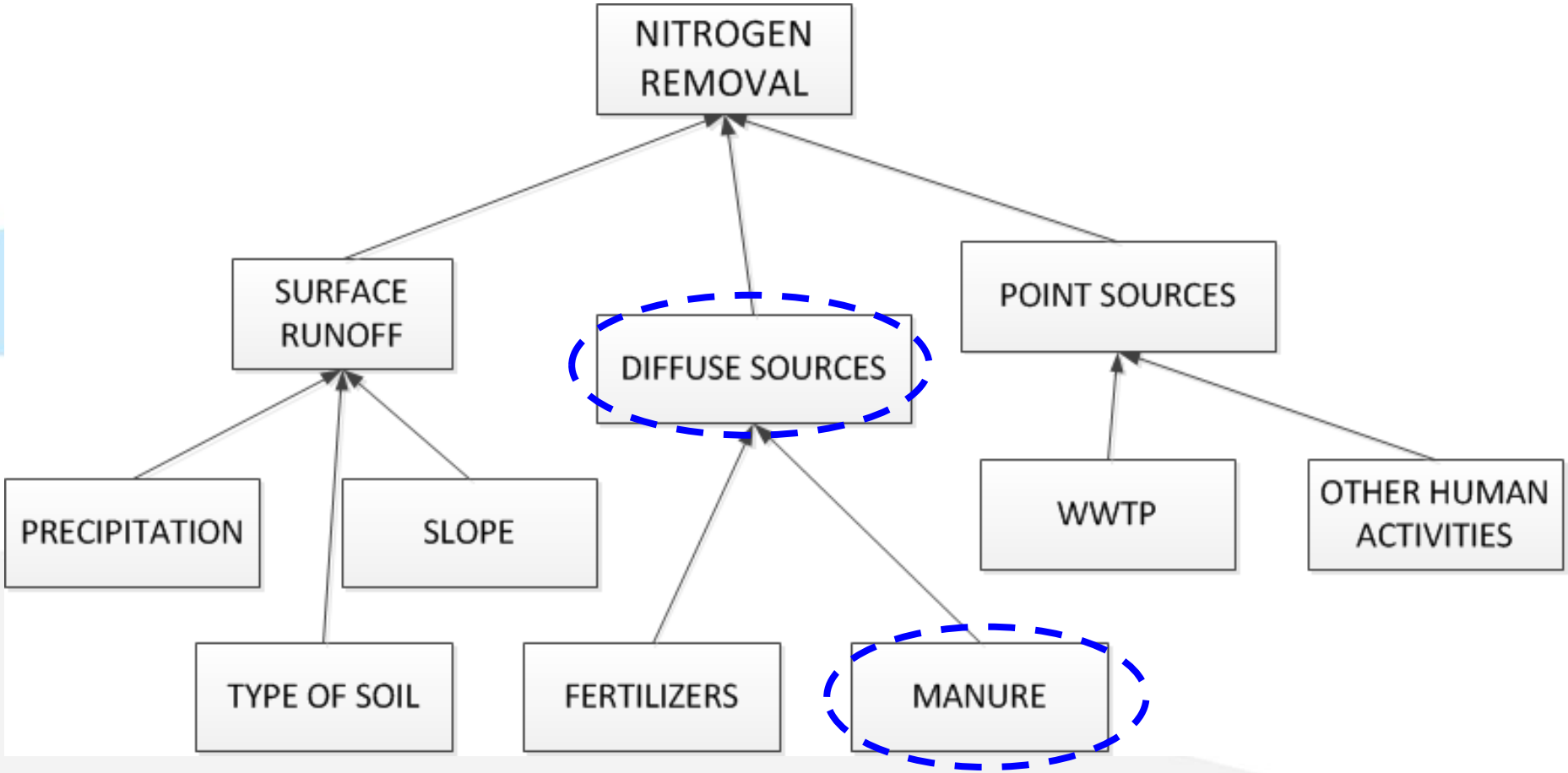
Scenario 1: Situation with AEC payments eligibility conditions and commitments



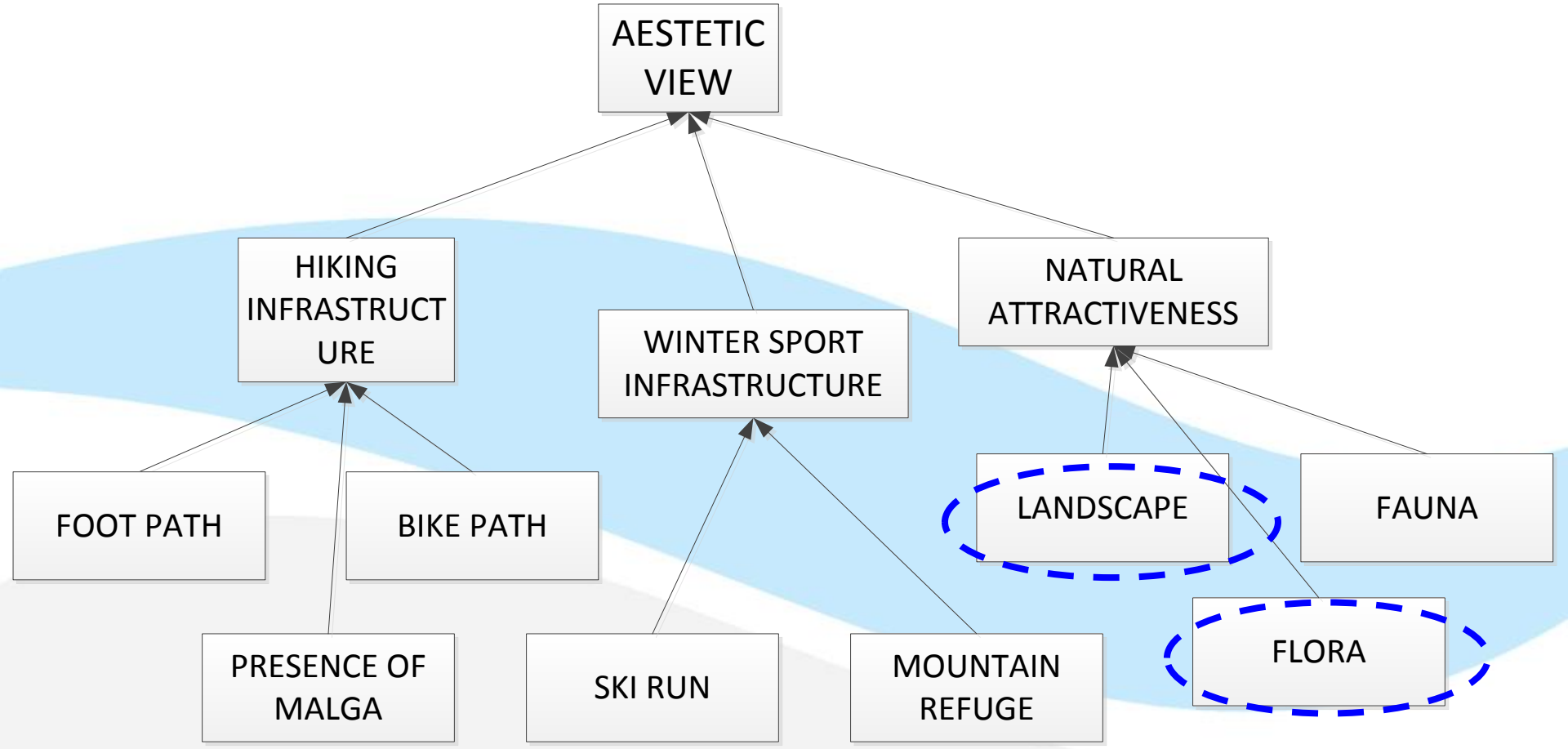
Biophysical side: the work in progress

- ARIES modelling platform has been applied for the ecosystem service Sustainable Fodder Production
- Scenarios have been run on Sustainable Fodder Production
- ARIES modelling platform is being applied for the ecosystem services related to Sustainable Fodder Production
- Scenarios are being run on the ecosystem services related to Sustainable Fodder Production linked to the results of the Sustainable Fodder Production

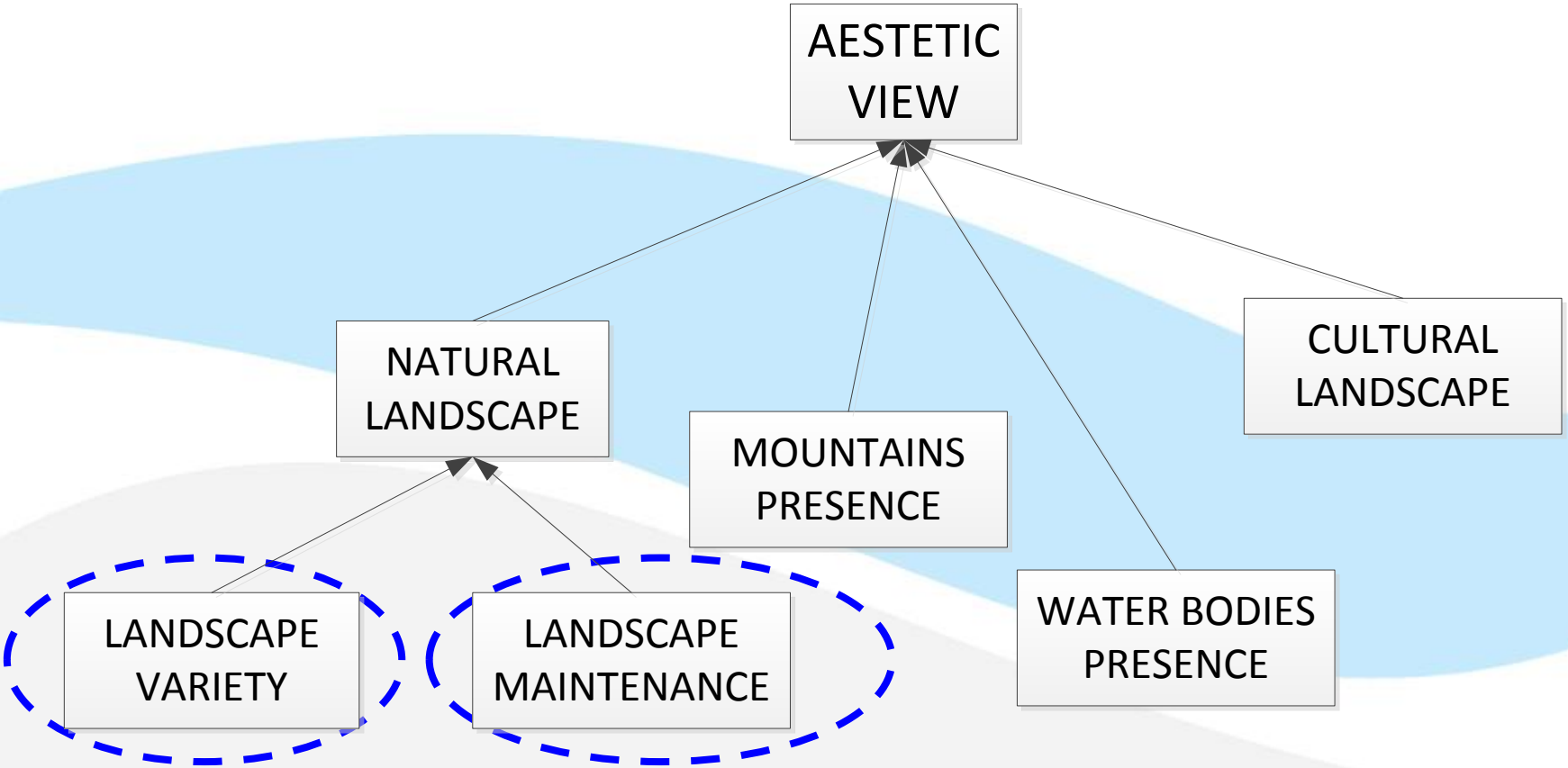
Water purification



Recreation


AESTETIC VIEW
HIKING INFRASTRUCTURE
WINTER SPORT INFRASTRUCTURE
NATURAL ATTRACTIVENESS
FOOT PATH
BIKE PATH
PRESENCE OF MALGA
SKI RUN
MOUNTAIN REFUGE
LANDSCAPE
FAUNA
FLORA

Aestetic view (scenic beauty)



Micro-economic results (Italian FADN/RICA)

Source of data: FADN 2008-2012 + meadows zoning procedure
Software GAIA (livestock production processes)

Objective: estimation of additional costs and income foregone resulting from the **sustainable** management of permanent meadows in livestock farming

(Op. 10.1.1 → Meadows management: improving the biodiversity and the extensive breeding systems, Measure 10, Trentino RDP)

Farm breeding systems

Extensive vs Intensive→ LSU/ha

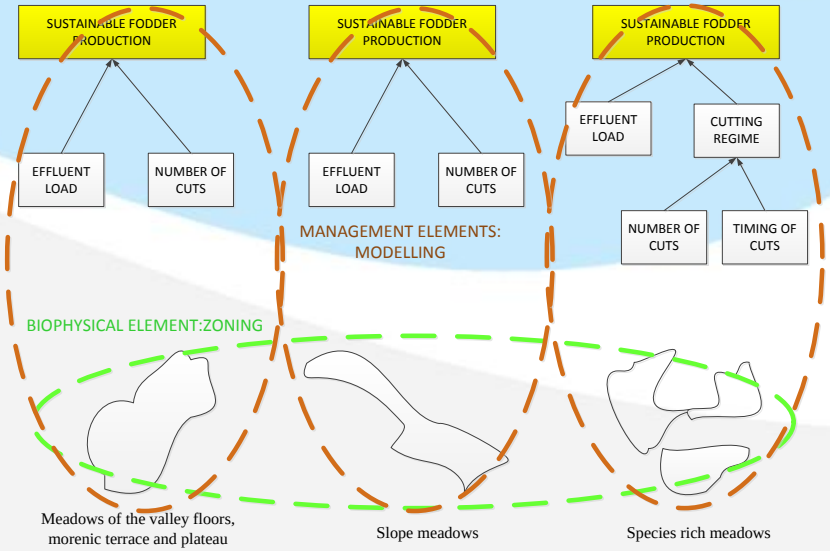
- Extensive: < 1.5 LSU/ha
- Intermediate: 1.5 – 2.0 LSU/ha
- Intensive: 2.0 – 2.5 LSU/ha

Grass species richness (zoning)

- Species rich meadows
- Slope meadows
- Valley floor meadows

Farm breeding system refers to the management elements: LSU/ha is a proxy for nitrogen input.

Meadows zoning refers to the biophysical elements (biodiversity)



Micro-economic results (Italian FADN/RICA)

Payment scheme: the aid intensity is defined considering animal density (LSU/ha) and meadow typology.

+ animal density - aid intensity
+ biodiversity + aid intensity

	Valley floor meadows	Slope meadows	Species rich meadows
0.5 < LSU/ha < 1.5	180	180+170 = 350	180+170+100 = 450
1.5 < LSU/ha < 2.0	180	180+170 = 350	180+170 = 350
2.0 < LSU/ha < 2.5	180	180	180

Eligibility condition: minimum 0.5 LSU/ha, maximum 2.5 LSU/ha
Not beneficiaries: 2.5-4.0 LSU/ha

1.How breeding system intensity can influence farm economic results?
2.How different kind of meadows can influence farm economic results?

Variables (Italian FADN/RICA)

	Variables
LSU	Livestock Units
UAA	Utilized Agricultural Area (permanent meadows and pastures)
TSP	Total Saleable Production (Gross Saleable Production + Variation in Livestock valuation + Farm use)
Variable Costs	Livestock specific inputs (feed for grazing stock, certification, veterinary fees and reproduction costs, etc.)
Transaction Cost	Additional cost to implement the operation (administrative cost of application for support)
Gross Margin	Total Saleable Production – Variable Costs

Only specialist dairying system have been selected (Farm type=4, Bovines)

Farm breeding system (Italian FADN/RICA)

Characteristics of breeding systems → animal density

- Gross Margin/ha increase
- LSU/UAA increase
- Extensive breeding systems seem to have a different structure in terms of UAA

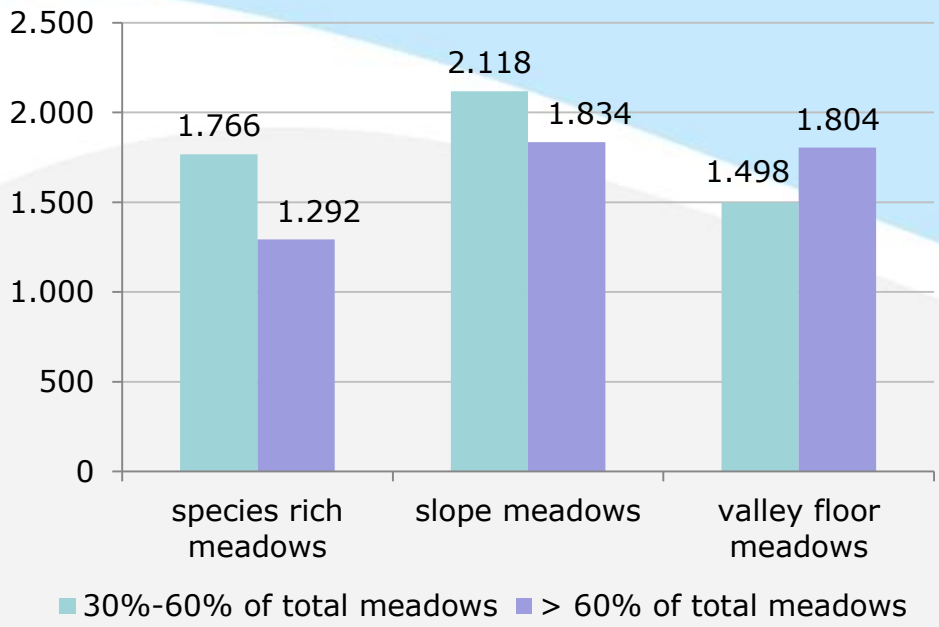
The differences in gross margin per hectare justify the expected payment; the reduction depending on animal density justify the lower payments for more intensive breeding systems.

	TSP/UAA (€/ha)	Variable Costs/UAA (€/ha)	Transact. Costs/UAA (€/ha)	Gross Margin/UAA (€/ha)	LSU/UAA (n./ha)	UAA (ha)	Δ Gross Margin/ha
Extensive breeding systems (0.5 - 1.5 LSU/ha)	2,287	1,492	13	782	1.0	35	**-1,755**
Intermediate breeding systems (1.5-2.0 LSU/ha)	3,573	2,167	17	1,389	1.8	16	**-1,148**
Intensive breeding systems 2.0 – 2.5 LSU/ha)	5,102	3,267	12	1,823	2.2	21	**-714**
Not beneficiaries (2.5 – 4.0 LSU/ha)	6,357	3,807	13	2,537	2.9	19	

Grass species richness (Italian FADN/RICA)

Characteristics of meadows → biophysical elements
- Percentage on total meadows extension
- Farms with more than 60% of species rich meadows are located over 1,000 m

	LSU/ha		Altitude (m)		UAA (ha)	
	30%-60%	**> 60%**	30%-60%	**> 60%**	30%-60%	**> 60%**
Species rich meadows	2.2	**1.7**	681	**1,033**	39	**20**
Slope meadows	2.0	**2.0**	837	**837**	36	**45**
Valley floor meadows	1.6	**2.1**	855	**639**	63	**42**



Gross Margin per hectare (€/ha)

The increase of species rich meadows species (biodiversity) determines a decrease of livestock gross margin per hectare.

Δ Gross Margin/ha (SRM) = -474 €/ha
Δ Gross Margin/ha (SM) = - 284 €/ha
Δ Gross Margin/ha (VFM) = + 306 €/ha

Δ Gross Margin/ha (SRM-VFM) = -512 €/ha
Δ Gross Margin/ha (SM-VFM) = +30 €/ha

Conclusions: a case of applied research within a government agency

- Input from theory to practice:
  - Advantages of using BN when operating at local level
  - Advantages of using zoning instead of modelling
  - Advantages of using proxies that can be controlled and verified

- Feedback from practice to theory:
  - What is meant by 'Livestock-Ecosystem Services'
  - Importance of understanding the 'character' of variables (eligibility conditions Vs. commitments)
  - Importance of distinguishing farms statistics from spatial-environmental database in order to be able to harmonize them

Conclusions from the numerical results

- The expected AEC payment scheme for operation 10.1.1 seems to be coherent with the economic results obtained analyzing FADN database: the subsample of breeding farms show lowest values of gross margin when LSU/ha decrease and species richness increase.

- The surface payment compensates the extensification efforts carried out by the Province in all the meadow typologies (Δ Gross margin/ha due to the LSU/ha variations); it compensates the totally the "species richness" element and partially the abandonment risk of slope meadows.

- The comparison between ARIES and FADN results in term of animal density shows that there is some margin to increase the sustainability in specie rich meadows (1.4 vs 1.7) and slope meadows (1.7 vs 2.0) while for valley floor meadows the index (LSU/ha) appears sustainable (2.4 vs 2.1).