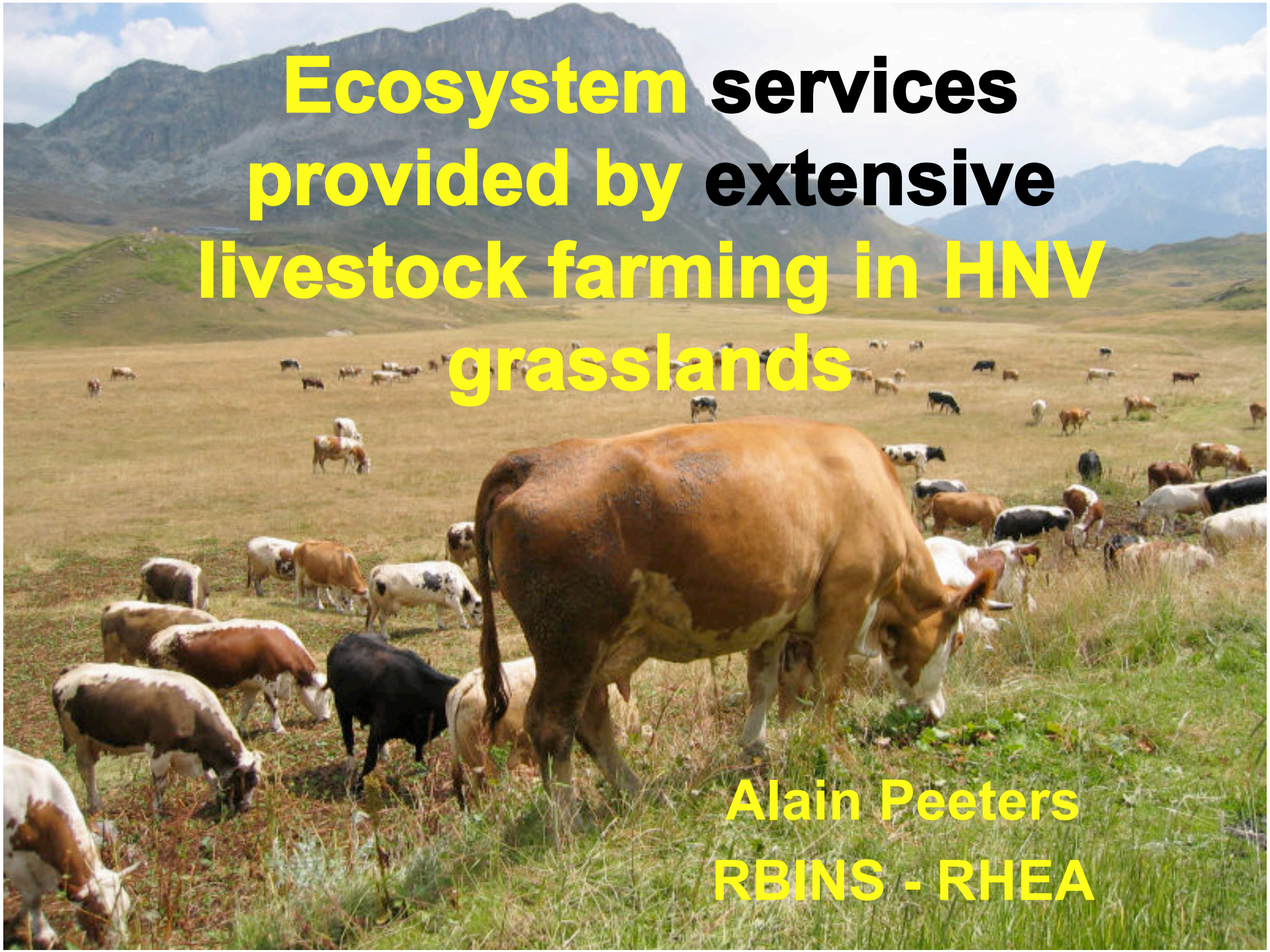

Ecosystem services provided by extensive livestock farming in HNV grasslands
Alain Peeters
RBINS - RHEA

Public goods and public services

Public goods (ecosystem goods)
5 components or natural resources:

- Water
- Air
- Soil
- Energy
- Biodiversity (organisms, communities)

These resources (especially biodiversity) can produce public ecosystem services (provisioning, regulating, cultural and supporting services)

Services		Comparison	
		Extensive	Intensive
provisioning			
	food quantity	+	+++
	food quality	++	+
	feed	+	+++
	fibre	+	+++
	fuel	+	--- to +++
	water	++	--/++
	timber	++	0
regulating			
	climate	0 to ++	---
	flood	++	---
	disease	++	--
	wastes	+++	---
	water quality	+++	--

Services		Comparison	
		Extensive	Intensive
cultural			
	recreational	+++	---
	aesthetic	+++	---
	spiritual benefits	+++	- to 0
supporting			
	soil formation	+ to +++	-
	nutrient cycling	+++	- to ---
Public goods	biodiversity	+++	--
	soil	+++	--/++
	water	+++	---
	air	+++	---
	energy	+++	---

Public good	Public service	Private good	Private service
Biodiversity	Provision of forage for grazing animals Provision of quality food	Labelled food Typical products	Tourism industry (restaurant, hotel, travel agency...) Agro-food industry
Habitat diversity	Pollination and pest control	Food	Crop production Agro-food industry
Socially valued landscapes: species and habitats, agricultural heritage, archaeological heritage, rare livestock breeds	Recreation/tourism Production of ecological knowledge Sport and military training Physical and psychological health Social cohesion		Tourism industry Sport industry

Public good	Public service	Private good	Private service
Habitat characteristics	Fire control Forest and human habitat protection	Timber Residences	Real estate industry
Soil quality	Climate regulation: C sequestration, Control of GHG		
Water quantity	Storage of water and recharge of aquifers	Water for irrigation, domestic use and industry	Water distribution
	Flooding control	Residences Industries	Insurance companies
Water quality	Water purification	Potable water	Water distribution
Air quality	Air purification		Tourism industry

Most significant public goods associated with agriculture in the EU

ECOSYSTEM GOODS		
Farmland biodiversity including livestock, wild species, habitats	inherent	
Agricultural landscapes	inherent	
Water quality		Not dependant on agriculture
Water quantity		Not dependant on agriculture
Soil quality		Not dependant on agriculture
Air quality		Not dependant on agriculture

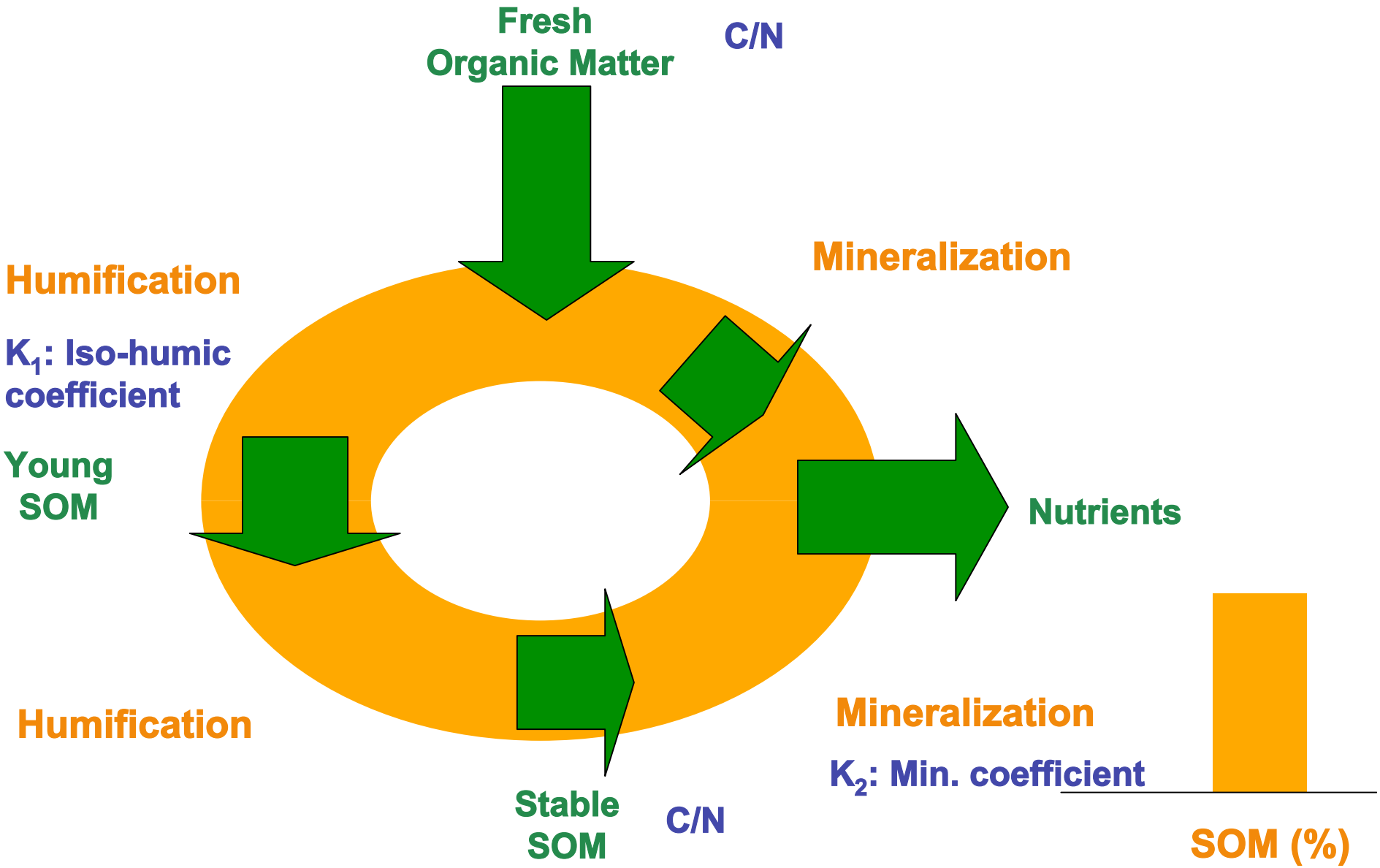
Most significant public services associated with agriculture in the EU

ECOSYSTEM SERVICES		
Provision of quality food	inherent	
Pollination and pest control	inherent	
Recreation/tourism	inherent	
Fire control	inherent	
Climate regulation: C sequestration Control of GHG emissions		Not dependant on agriculture
Storage of water and recharge of aquifers		Not dependant on agriculture
Water purification		Not dependant on agriculture
Air purification		Not dependant on agriculture
Flooding control		Not dependant on agriculture

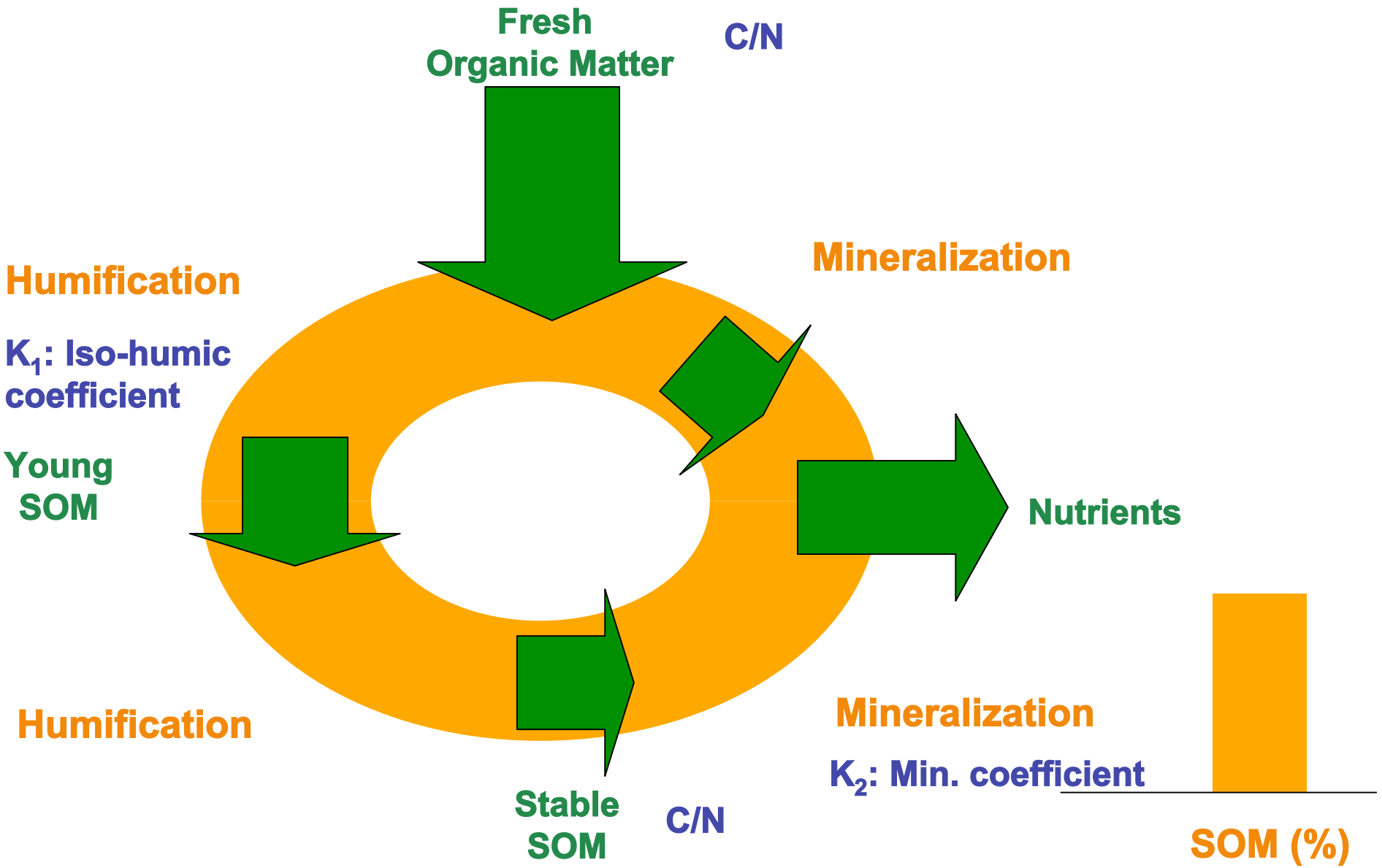
Most significant public goods and services associated with EU agriculture

	Arable land	Intensive grassland	SNG	Forest
Agricultural landscapes	+	++	+++	- -
Farmland biodiversity	+/-	+	+++	- - -
Water quality	- - -	- -	+++	+++
Water availability	-	++	+++	- -/+
Climate stability (carbon storage and climate stability)	- -	+	++	+++
Control of GHG emissions	-	- - -	+	+++
Air quality	-	+	++	+++
Resilience to flooding	- -	+	+++	+/-
Resilience to fire	+++	+++	+++	- - - /+

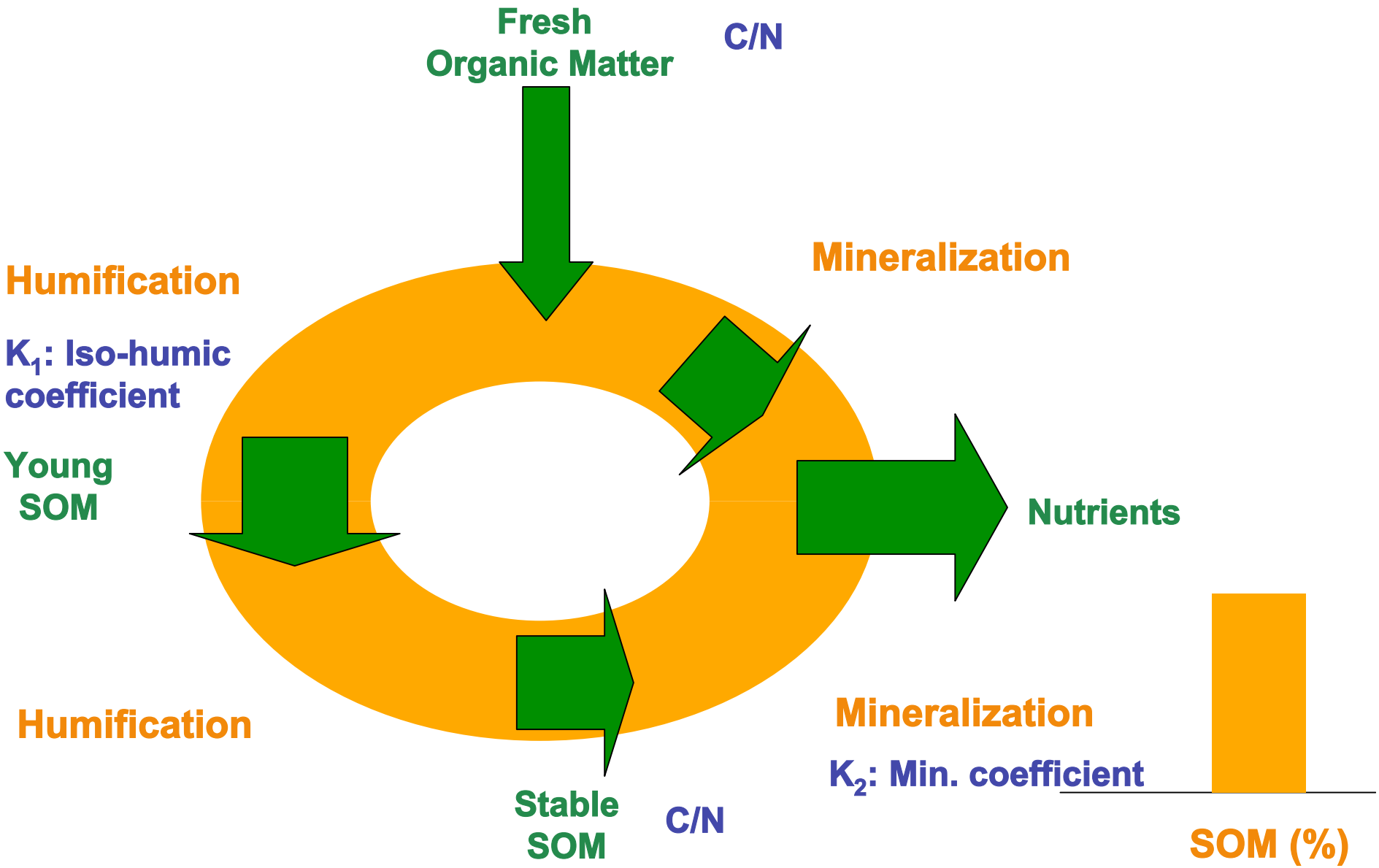
Carbon cycle and storage - Theoretical case



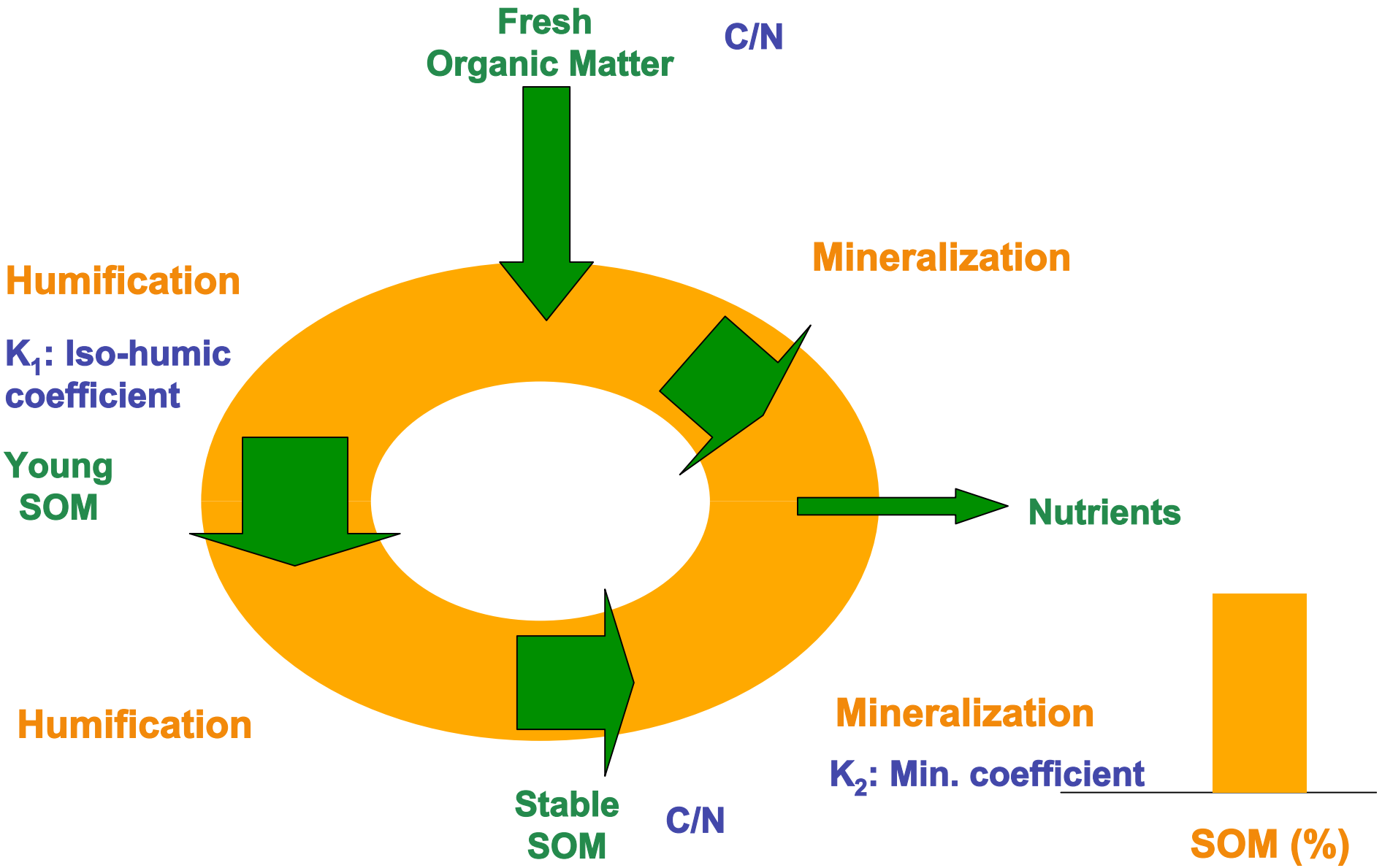
Intensive grassland



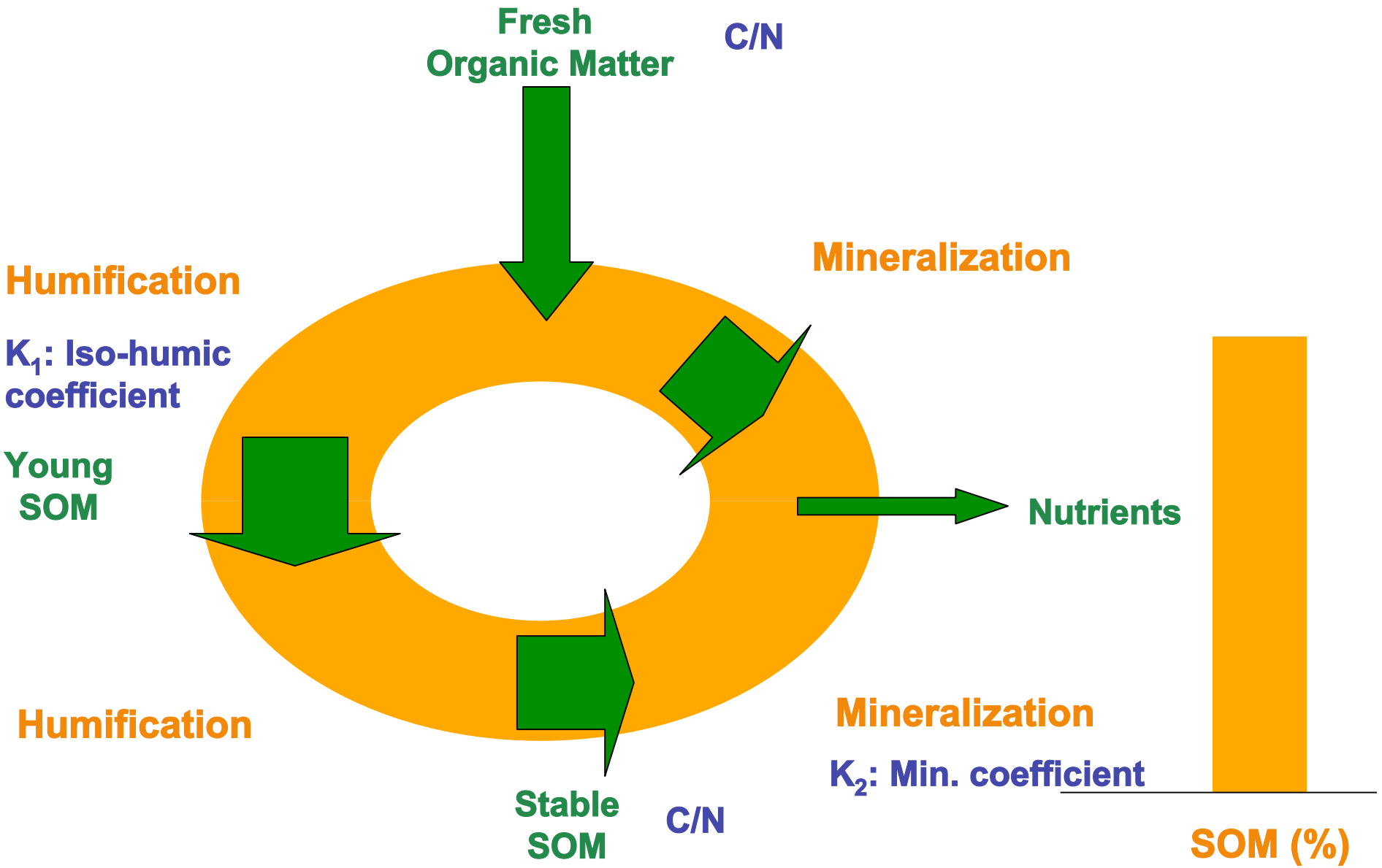
Acid species-rich grassland



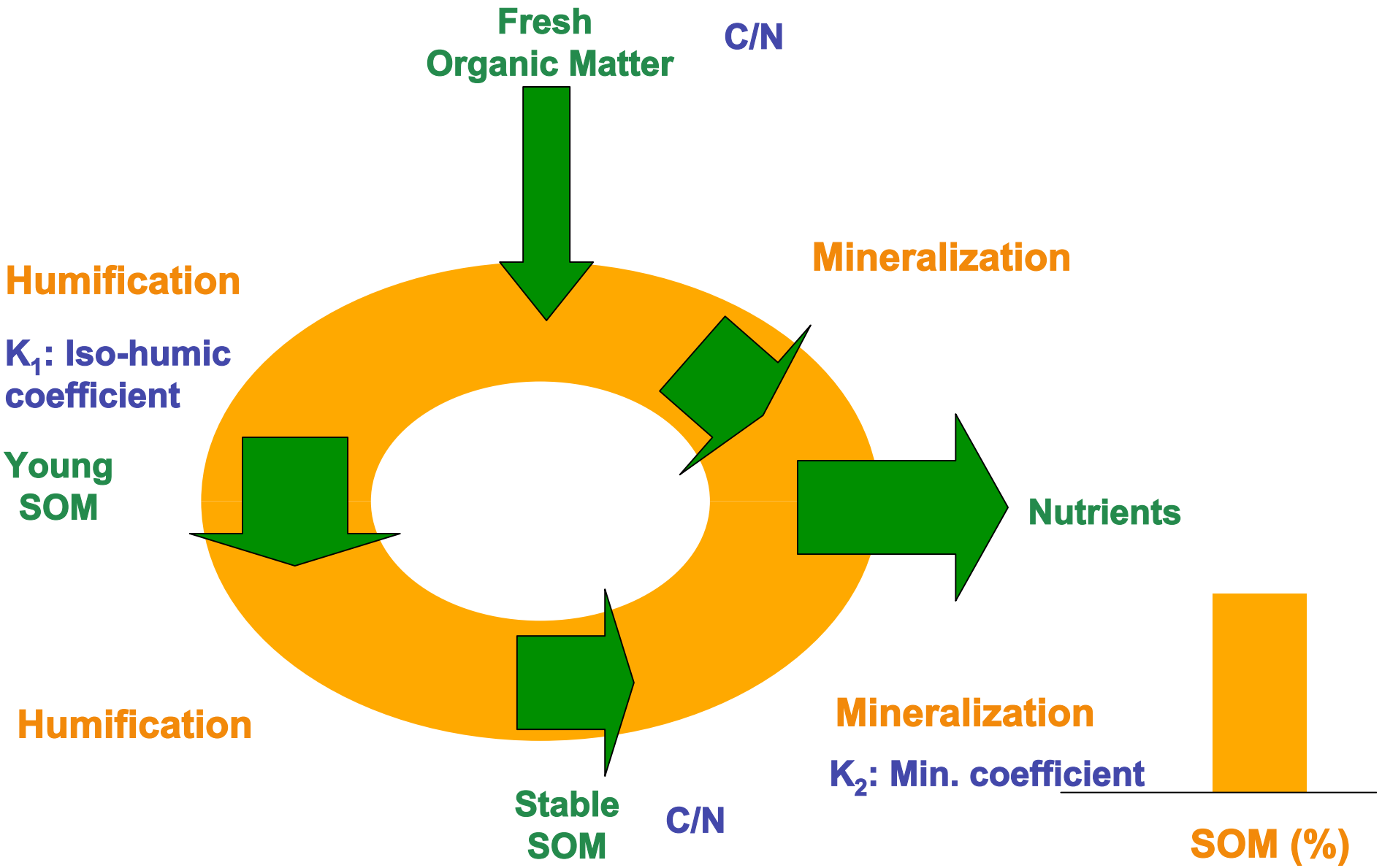
Acid species-rich grassland



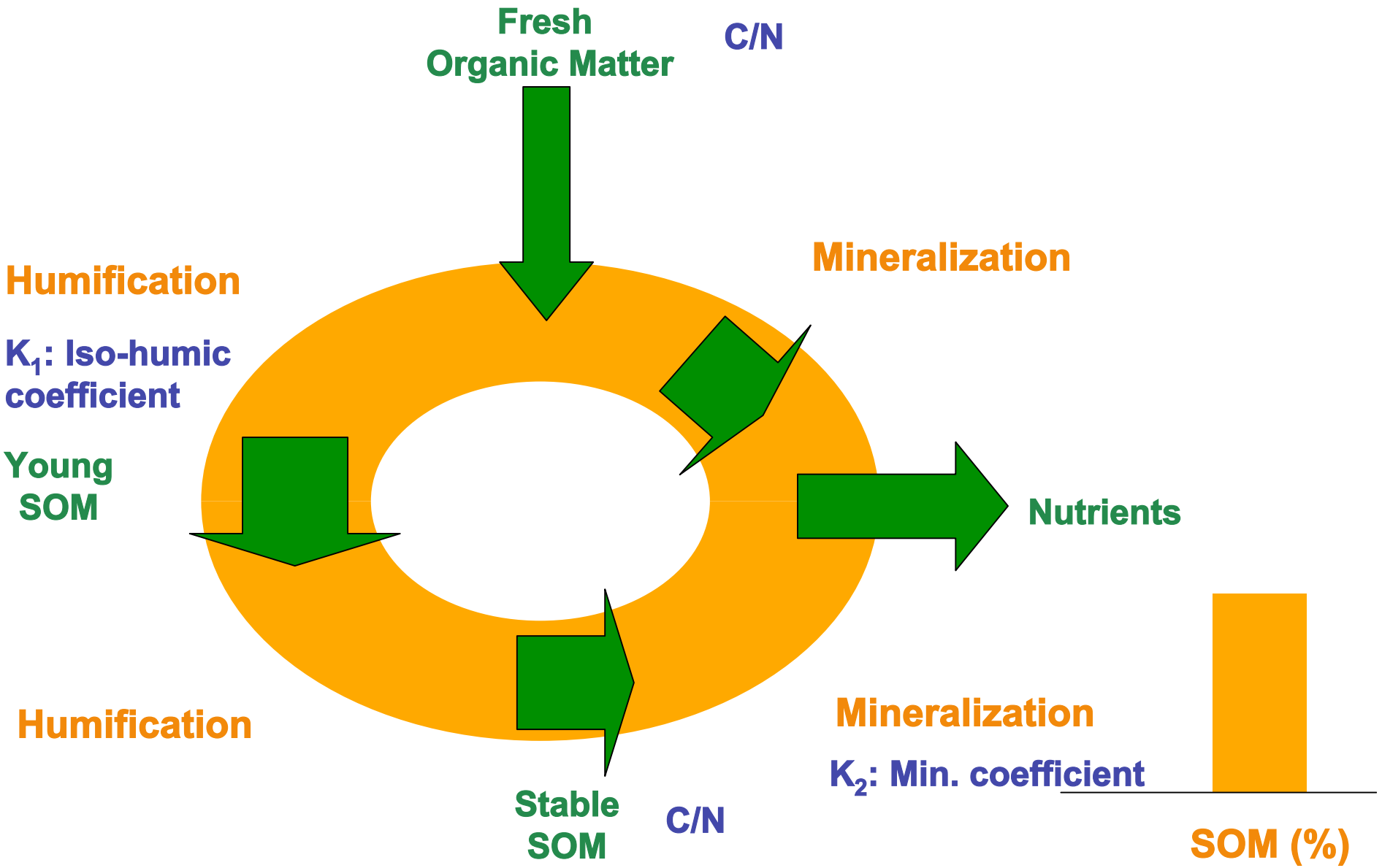
Acid species-rich grassland



Arable land


Fresh
Organic Matter
C/N
Humification
K_1: Iso-humic coefficient
Young SOM
Mineralization
Nutrients
Humification
Stable SOM
C/N
Mineralization
K_2: Min. coefficient
SOM (%)

Arable land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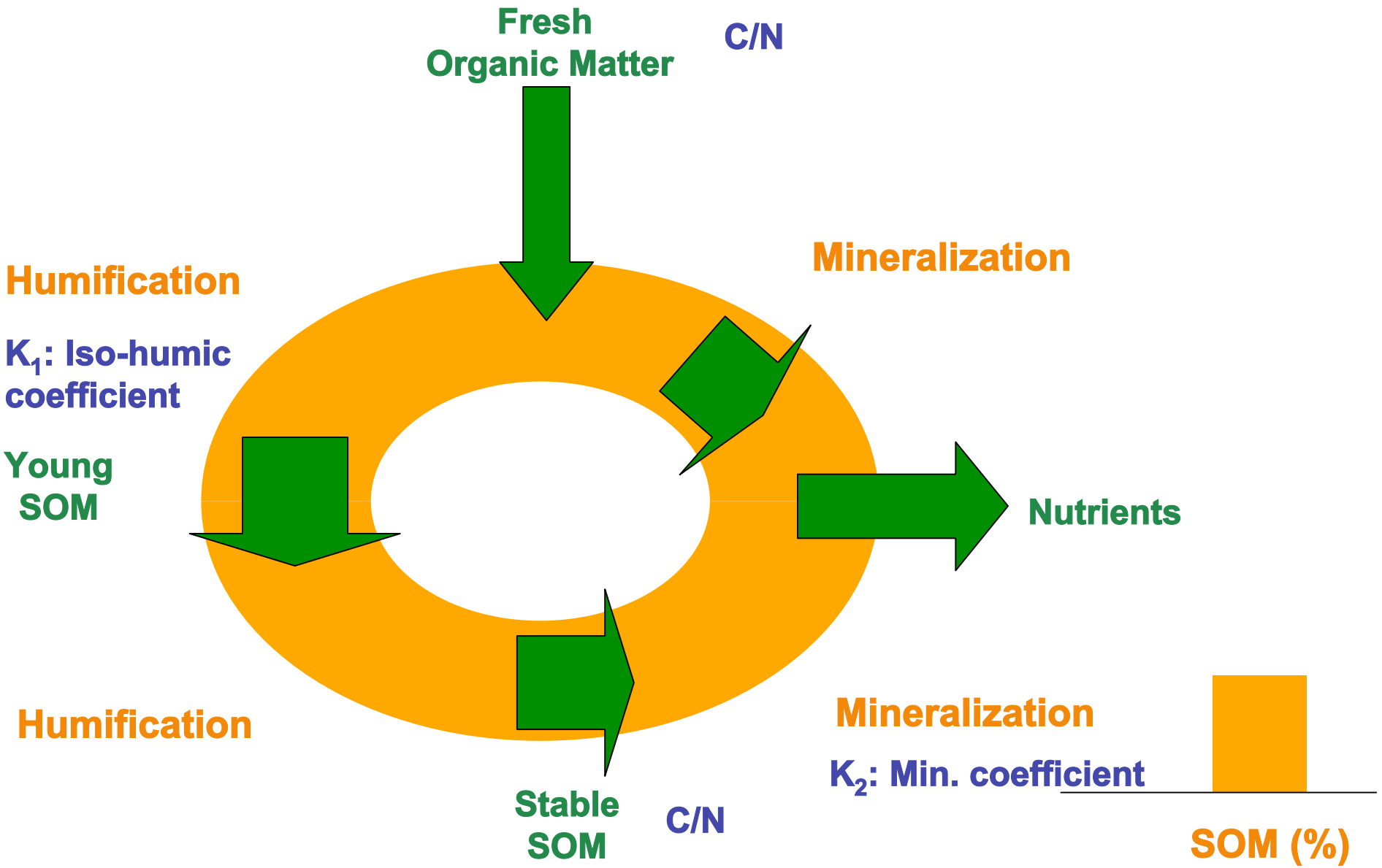
Arable land


Fresh
Organic Matter
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Humification
K_1: Iso-humic coefficient
Young SOM
Mineralization
Nutrients
Humification
Stable SOM
C/N
Mineralization
K_2: Min. coefficient
SOM (%)

Examples for grasslands (2 000 t ground/ha)

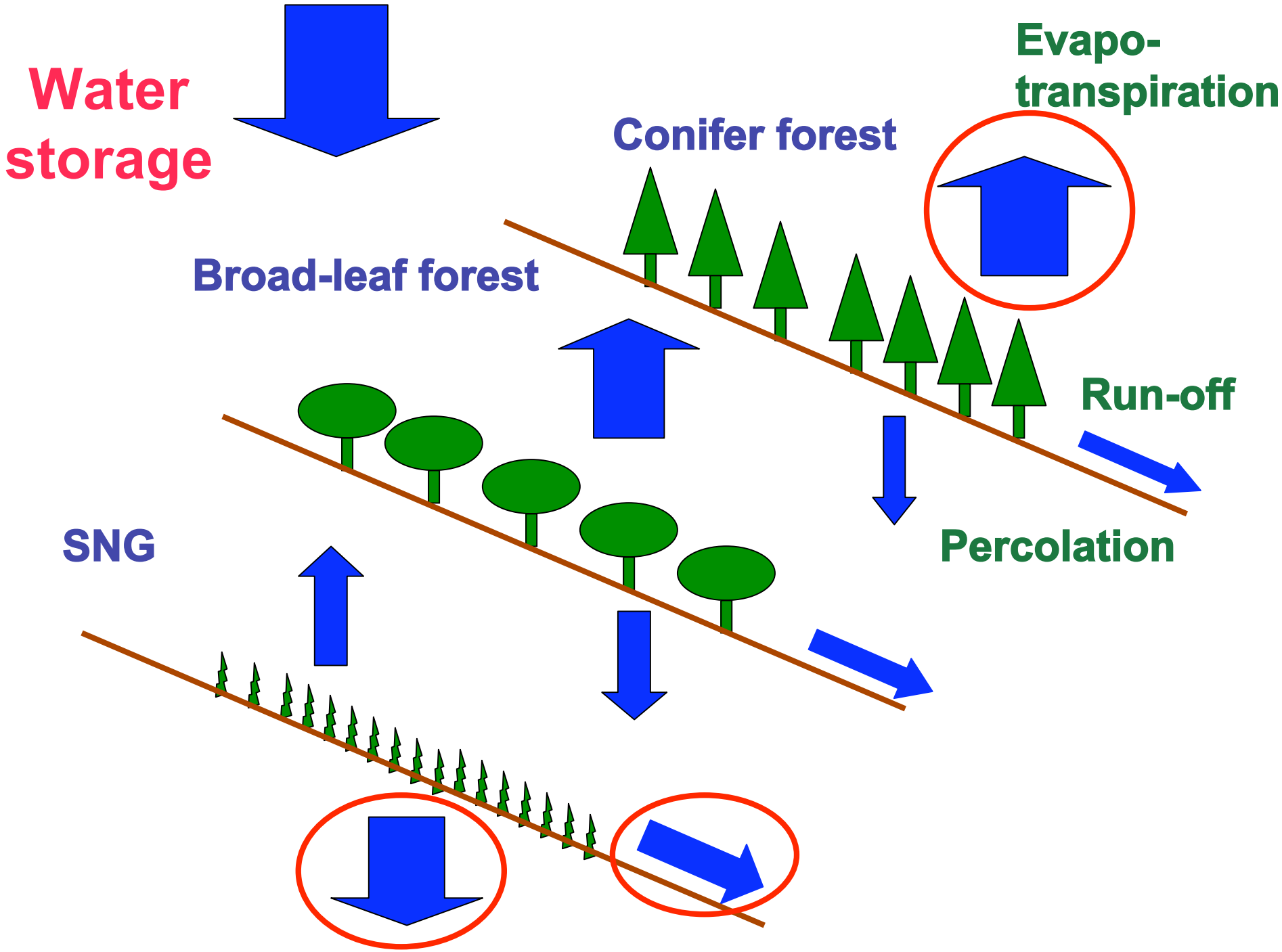
%SOM	4	5	6	7	8
%C	2.3	2.9	3.5	4.1	4.6
SOM (t/ha)	80	100	120	140	160
C (t/ha)	46	58	70	81	93

Examples for arable land (3 000 t ground/ha)

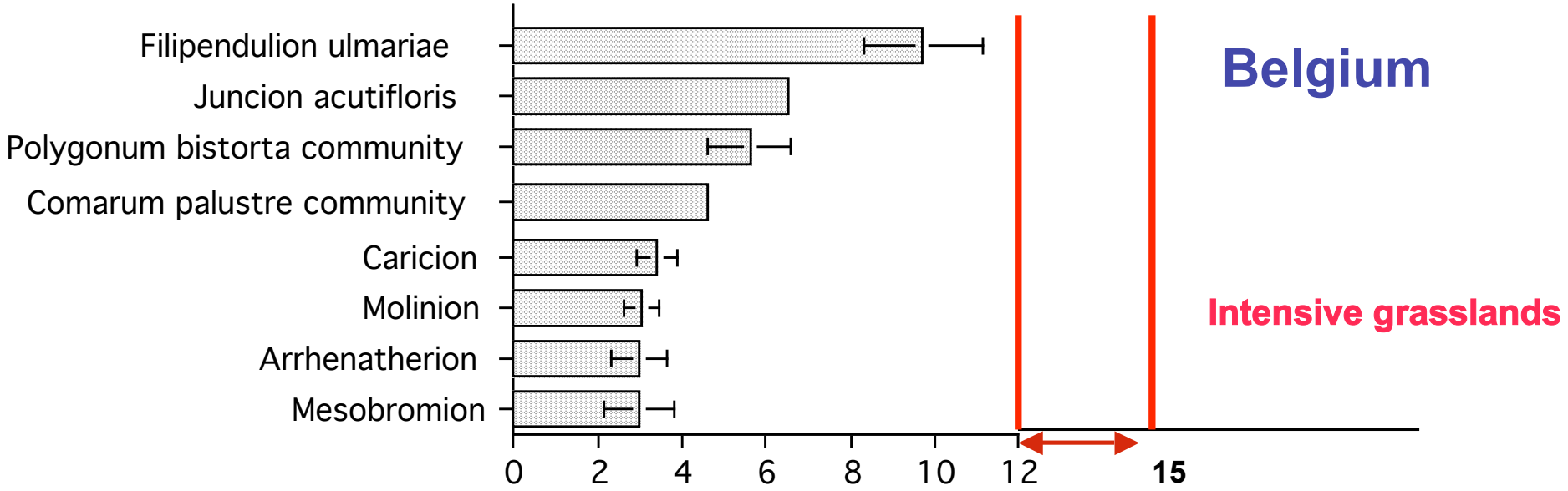
%SOM	1	2	3	4	5
%C	0.6	1.2	1.7	2.3	2.9
SOM (t/ha)	30	60	90	120	150
C (t/ha)	17	35	52	70	87

A typical soil of mountain acid grasslands: Ranker

High soil carbon content


Water storage
Evapo-transpiration
Conifer forest
Broad-leaf forest
Run-off
Percolation
SNG

Order of magnitude of biomass production



Belgium

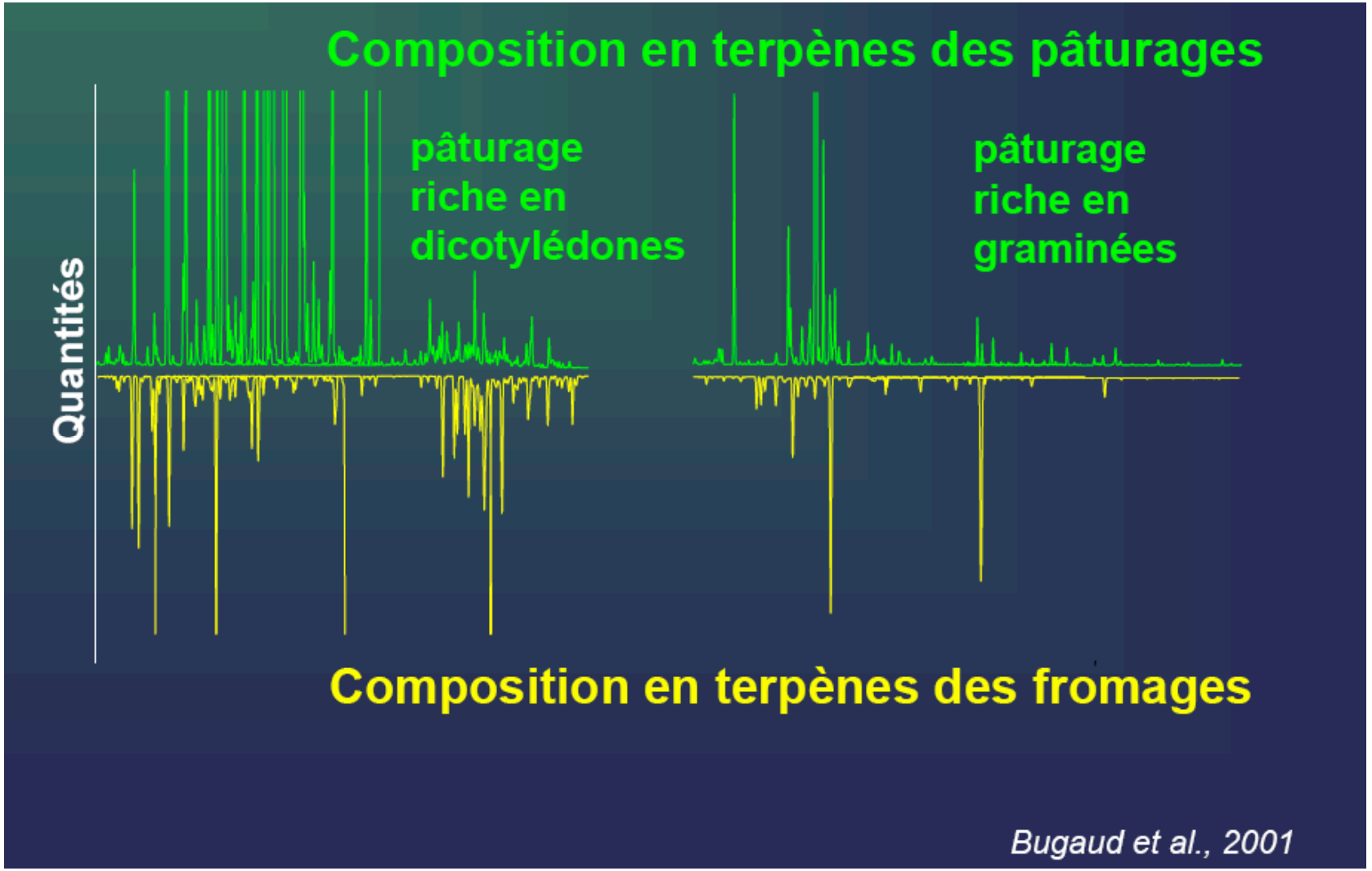
Intensive grasslands

Switzerland

Digestibility: 15-30% lower

Intensive grasslands

Terpens in HNV grasslands and Abondance cheeses



Forage quality - Digestibility

Secondary metabolites, including terpenes could have a positive effect on the control of gut parasites of livestock (helminth nematodes)

Some of these metabolites reduce digestibility or are toxic but livestock learn to avoid plants that contain them

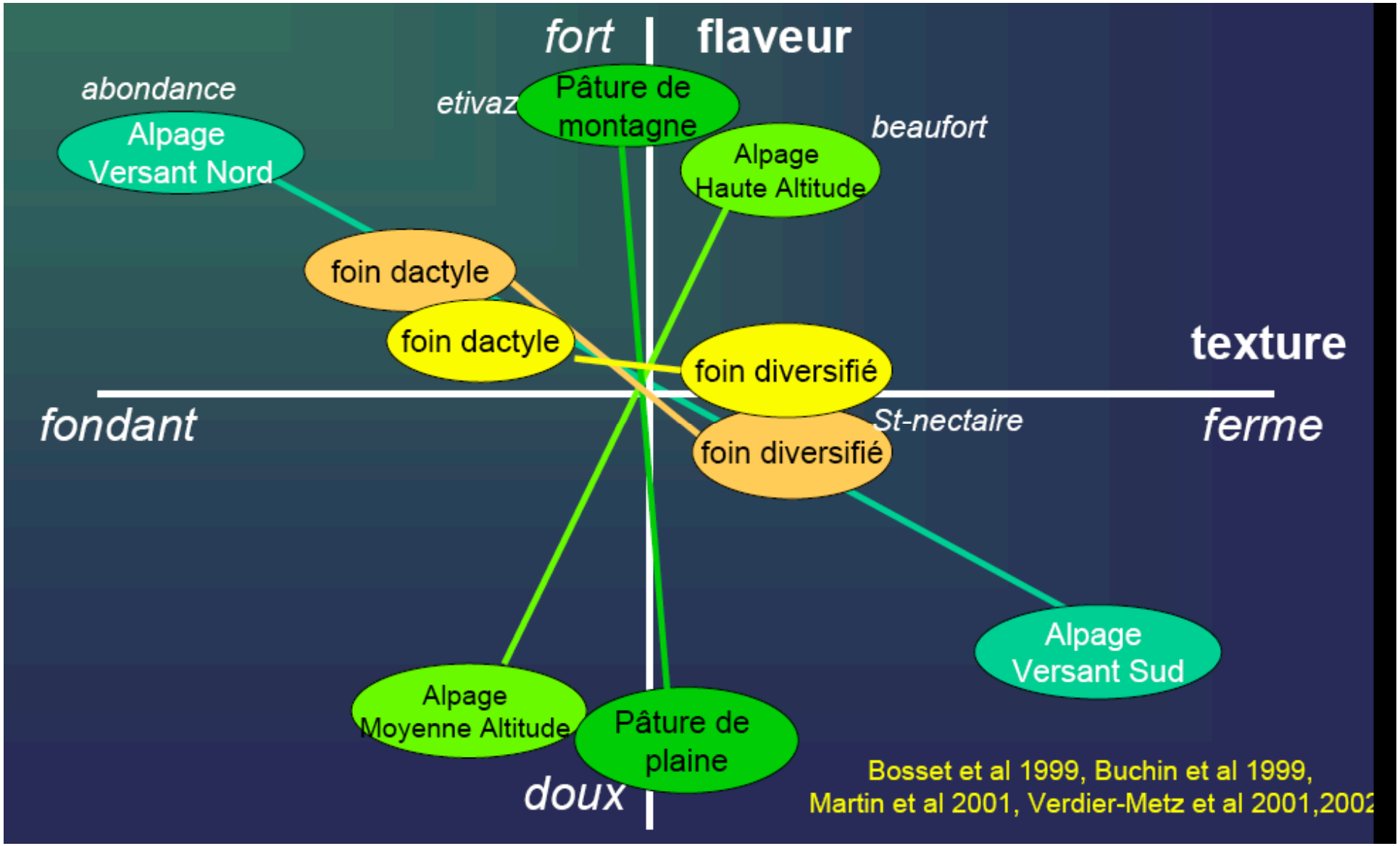
Quality of meat and cheese

Animals fed forage rather than concentrates or maize silage produce meat which is more attractive (better taste, appearance and smell) and healthy (greater concentrations of omega-3 fatty acids) to consumers (Wood et al., 2007).

The evidence for such benefits from animals fed on biodiverse (i.e. SNG) compared to agriculturally-improved grasslands is less clear.

?

Botanical composition of forages and sensory characteristics of cheeses



Recreation and tourism

South Downs National Park:
visitor survey in 2003, 7,342 people interviewed

> 90% relaxation or recreation
73% landscape and scenery
27% wildlife

12 month period:

Ø 35 million visitor-days from outside the South Downs
Ø 4 million visitor-days from residents
Ø spend was about 333 M £
Ø jobs supported > 8,000

+ physical and psychological benefits

(Bullock et al., 2010)

Policy response

High Nature Value Farming and Less Favoured Areas (Mountain and hill areas, Marginal areas, Areas under threat of abandonment)

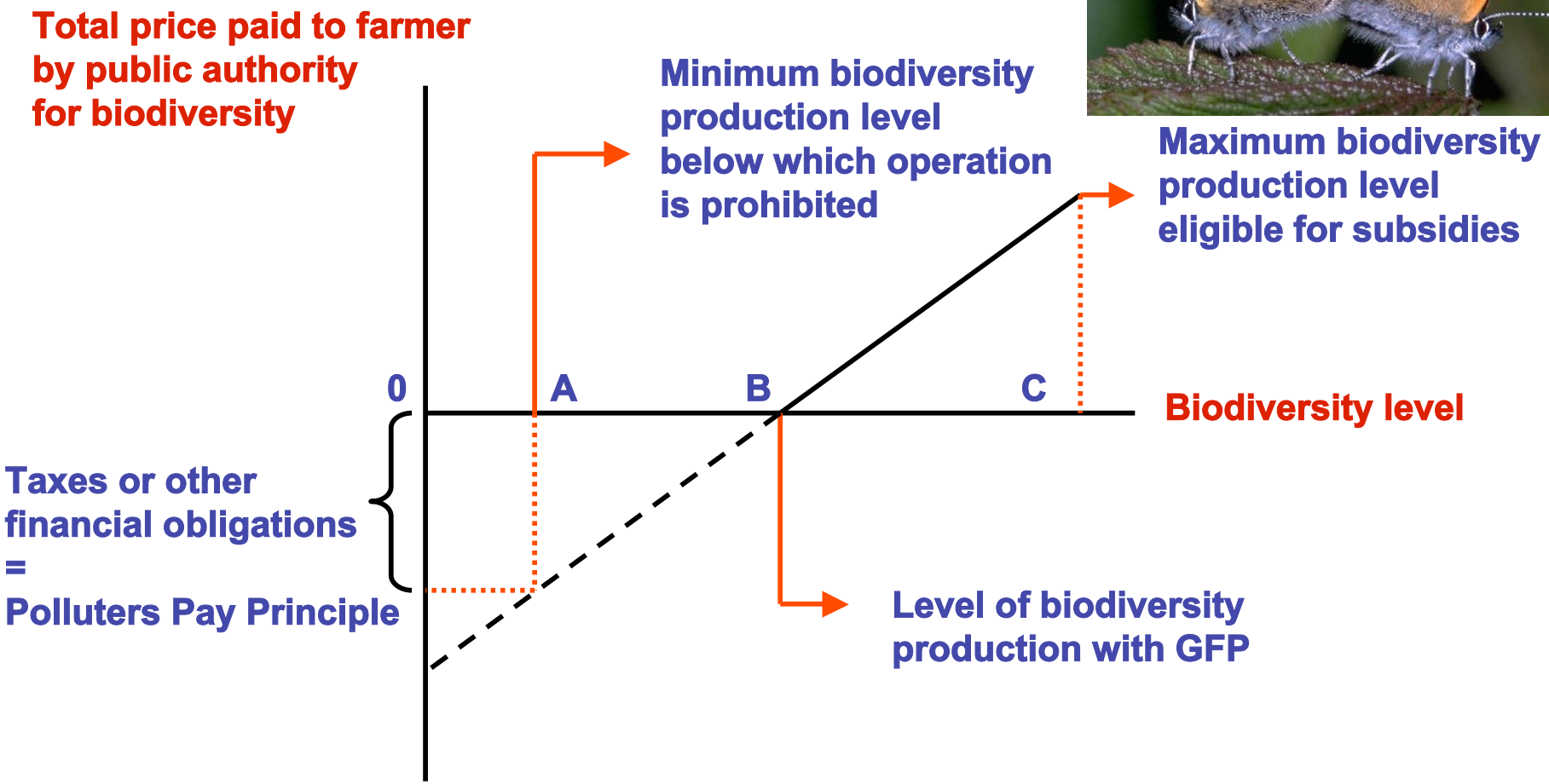
High Nature Value Farming and Less Favoured Areas could be merged and should be redefined in a positive way based on landscape and nature value.

Payments should refer to (value of landscape/nature), total costs or non-farming opportunity costs.

Should receive a higher proportion of supports than now.

AEM can alos be used in some cases.

POLICY RESPONSE



A could possibly equal B


Thank you
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