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Development of an *in situ* database inventory - on the way to a Swiss solution for forages

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Background

- Swiss National Plan of Action for the conservation and sustainable use of plant genetic resources (NPA-PGR): established in 1997 - based on the Global Plan of Action (GPA), adopted in 1996 in Leipzig
- Implemented in 1998 through the Federal Office of Agriculture
- Projects in collaboration with different organisations, mainly NGO's



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Bundesamt für Landwirtschaft BLW

Background

- Forages as a priority area
- First projects pointed to great potential of *in situ* conserved forages in permanent grassland
- A concept for the *in situ* conservation of forages was developed:

Weyermann, I. 2007. Konzept zur *in situ* Erhaltung von Futterpflanzen. Bundesamt für Landwirtschaft, Bern,

<http://www.bdn.ch>

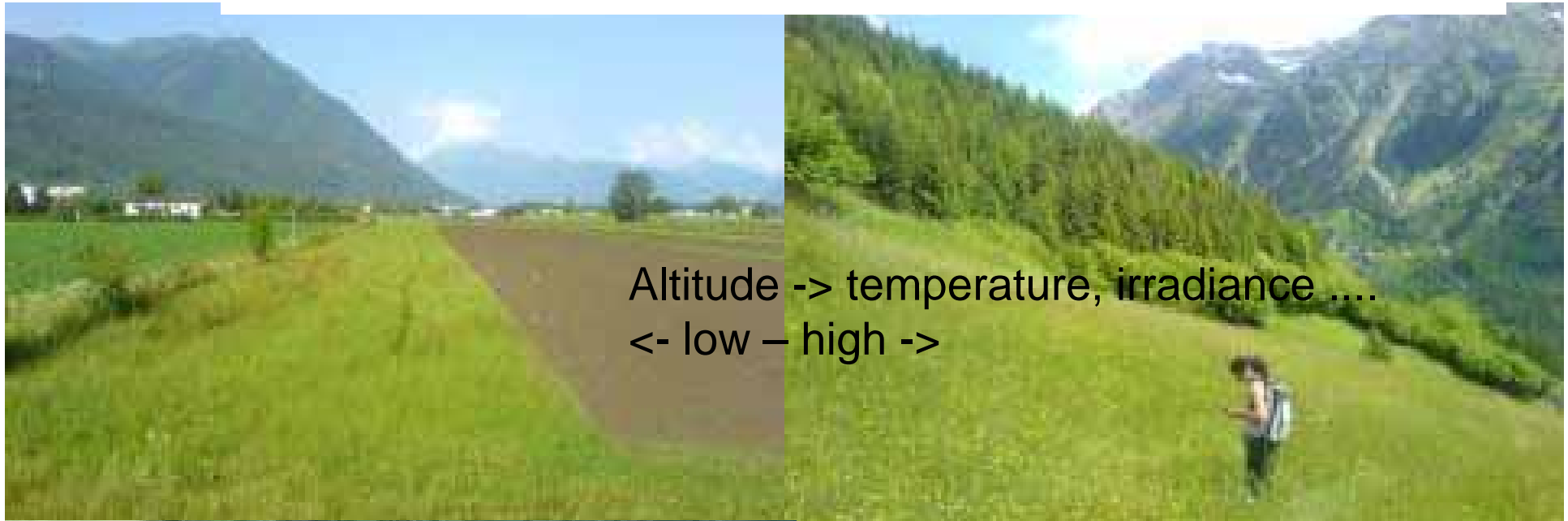


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Complexity of site factors



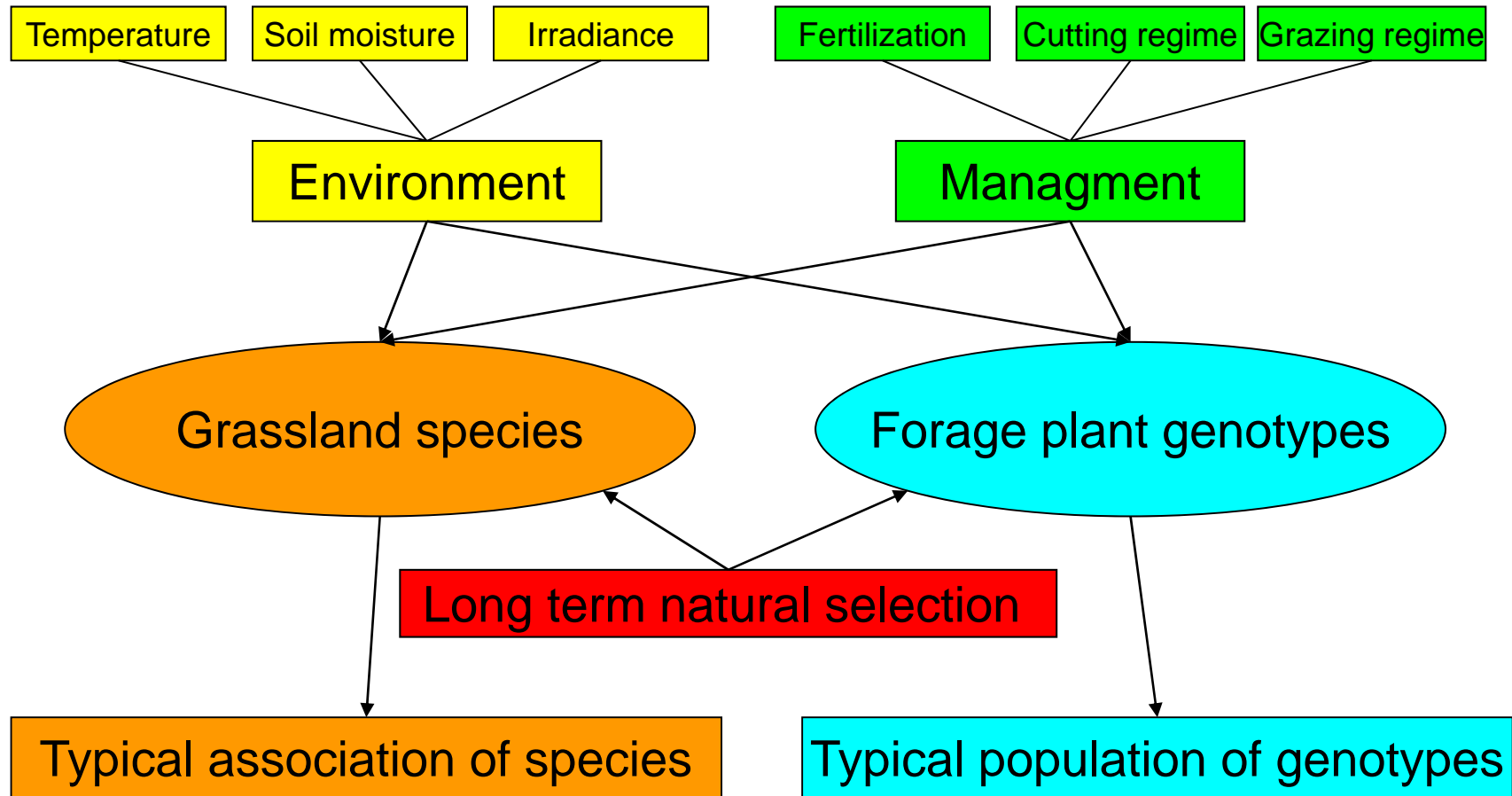
Altitude -> temperature, irradiance
<- low – high ->



management intensity: competition,
nutrient availability, grazing pressure...
<- low – high ->



Species composition of sward as an indicator of complex site factors





Basic criteria for site selection in concept for *in situ* conservation

A Grassland alliances relevant to forage production

B Biogeographic region

Suggestion: Describe (and eventually protect?) 5 to 9 sites for each alliance in each biogeographic region



A: 21 Grassland alliances relevant to forage production in Switzerland

- 5 wetland alliances: Caricion fuscae, Caricion davallianae, Calthion, Filipendulion
- 9 alliances typical of fertilized grassland of lower altitudes
 - Moderately intensive meadows: **Arrhenatherion**, typical and Taracacum-APIACEAE association
 - Very intensively used meadows: **Trifolio-Lolion** with 4 associations: Lolietum multiflori, Trifolio-Alopecuretum, Poo pratensis-Lolietum perennis, Poo trivialis-Ranunculetum repentis
- 3 alliances typical of fertilized grassland of higher altitudes: Polygono-Trisetion, Cynosurion, Poion alpinae
- 4 alliances typical of unfertilized (xerophilic) grassland: Seslerion, Nardion, Caricion ferrugineae, Mesobromion



B: 7 Biogeographic regions of Switzerland

Legende

- Alpe Höhen
- Westliche Mittelland
- Ostliches Mittelland
- Sperrgebiete
- Westliche Zentrallanden
- Ostliche Zentrallanden
- Basenallende



From: Weyermann, I. 2007. Konzept zur in situ Erhaltung von Futterpflanzen. Bundesamt für Landwirtschaft, Bern, http://www.cpc-skek.ch/pdf/ConceptFutterpflanzen_Vprovisoire.pdf



Results pointing to importance of region and vegetation classification

Example from Boller et al. (2009), Swiss Italian ryegrass

Arrhenatherion / Non-Arrhen.	No. of sites	Vegetation	Yields (dt/ha)		Vigour (9=best, 1=poorest)		Resistance (9=best, 1=poorest)		
			YTOTH 1	YTOTH 2	VGEND	VGALT	SNOM	RUST	XANT
N	1	Polygonum-Dactylis type of Trisetetum	109.1	143.1	7.1	5.9	6.3	5.9	6.8
N	2	Poo trivialis-Ranunculetum repentis	104.9	133.1	7.2	6.3	6.5	5.1	7.2
N	5	Lolietum multiflori	103.8	138.2	7.5	3.7	6.1	5.4	7.2
N	2	Trifolio repentis-Alopecuretum	103.9	136.0	6.9	4.1	6.2	5.2	6.9
A	4	Lolio perennis-Arrhenatheretum	100.7	127.2	6.4	2.1	5.8	6.1	6.1
A	6	Dactylis-Heracleum type of Arrhenatheretum	101.2	125.4	6.2	4.2	5.8	5.3	6.5
Ecotypes mean			102.8	131.7	6.8	4.0	6.0	5.5	6.7
Cultivars mean			100.6	125.3	6.3	3.1	5.4	7.2	6.7

- Extreme values found in sites of different vegetation class, depending on characteristic



Database for *in situ* data for forages

- Developed to implement the Swiss concept for the *in situ* conservation of forages
- Based on and integrated in national *ex situ* inventory:
<http://www.bdn.ch>
- Concepts developed by national „Working Group on forages“ of CCP (Swiss Commission for the Conservation of Cultivated Plants)
- Database is developed by CCP
- Database was made fit to allocate data collected in a pilot project (Bosshard et al. 2008)

Bosshard A. S. Eggenberg, C. Huber & G. Volkart (2009): In-situ-Erhaltung von Futterpflanzen - Pilotprojekt Alpennordflanke. Bericht im Rahmen des Nationalen Aktionsplanes zur Erhaltung und nachhaltigen Nutzung von pflanzengenetischen Ressourcen (NAP), NAP 03-113. Ö+L Büro für Ökologie+Landschaft GmbH, 8966 Oberwil-Lieli / pro.seco, UNA, 3007 Bern.

<http://www.bdn.ch>



Database for *in situ* data for forages: basic concept

- Input data: farmer questionnaires, GPS and other **site data** and **botanical relevé**
- „Accession“ is defined as the population of plant genotypes of a given **species** occurring at a given **site**
- For each site, two lists are stored in the database:
 - A list of **site data**
 - A list of **species** occurring at the site
- Search procedures are planned for retrieval e.g. of all sites containing the target species at a predefined abundance



In situ database: descriptors in species list

Descriptor Name	Details
FAMILY	
GENUS	EURISCO-5
SPECIES	EURISCO-6
SUBSPECIES	EURISCO-8
ISFS_ID	Code from Index Synonymique de la Flore Suisse (www.crsf.ch)
ABUNDANCE	Abundance scores according to Braun-Blanquet (1928)



Abundance / coverage scores according to Braun-Blanquet (1928)

Surface to be scored: 25 m² (circle of 2.82 m radius)

+ = 1-5 individuals, <5% coverage

1 = >5 individuals, <5% coverage

2a = 6-15% coverage

2b = 16-25% coverage

3 = 26-50% coverage

4 = 51-75% coverage

5 = 76-100% coverage

Additional: o = outside of scored surface; r = one singular exemplar; 2 = 6-25%

Example of species list:

http://www.bdn.ch/lists/list_content?id=299



In situ database: descriptors in site data list

- Can be downloaded free from: <http://www.bdn.ch/>

- A total of 109 descriptors grouped into categories:
 - 13 Collection (details to collection of vegetation data)
 - 15 Farm (description of farm); not displayed online for reasons of protection of personal interests
 - 38 Farming (management details of surface)
 - 23 Habitat (vegetation description and classification)
 - 11 Parcel (description of plot, coordinates etc.)
 - 9 Soil (data such as pH etc.)



In situ database: „Collection“ descriptors

- Refer to collection of vegetation data on a reference surface

Descriptor Name	Details
NPANUMB	Project number NAP
INSTCODE	Institute code (FAO Code)
COLLNAME	Collector's name
COLLNUMB	Collecting number (identifies surface)
COLLDATE	Collecting date of botanical relevé
TAGGING	Tagging present yes/no
REFERENZTYPE	Type of tag (magnet/metal grains)
REFERENZDEPTH	Depth of tag
CORDINATEMETHOD	Method of collecting coordinates (GPS/Orthophoto/Map)
GPSPRECISION	Error of GPS data



In situ database: examples of „Farming“ descriptors

- Refer to agricultural management of the plot

Descriptor Name	Details
PARCELNUMB	Parcel number (given by the farmer or owner)
PARCELSIZE	Parcel size (in ares; refers to management unit)
PARCELUSE	Main type of utilization (mowing/grazing/mowing-grazing)
ACCESS	Accessibility
CUTTINGFORM	Cutting equipment
SLICEDATE	Usual date of first utilization in spring
SLICENUMB	Number of cuts
GRASSCONSERV	Type of use of mown grass (zero grazing/hay/silage)
FERTILIZINGTYPE	Type of farmyard fertilizer (manure/slurry/compost etc.)
PARCELENCROACHMENT	Importance of encroachment (bushes)



In situ database: examples of „Habitat“ descriptors

- Refer to characterisation of vegetation / assignment to alliance

Descriptor Name	Details
HABITATDETERMINATION	Possibility to classify as target alliance
HABITATREMARK	Remark to the classification
HABITATCARACT	Expression of target alliance
GRAMCOVER	Coverage by gramineae
LEGCOVER	Coverage by leguminosae
ALLIANCECLASSIFICATION	Alliance according to in situ concept
HABITATHOMOGENEITY	Homogeneity of target alliance
HABITATPORTION	Proportion of target alliance in surface (%)



In situ database: examples of „Parcel“ descriptors

- Refer to identification of the plot (passport data)

Descriptor Name	Details
MUNICIPALITY	Municipality
FIELDNAME	Name of field (under which it is locally known)
ELEVATION	Elevation (m above sea level)
EXPO	Aspect
SLOPE	Slope
BIOGEOREGION	Biogeographic Region
CANTON	Canton
SWISSLATITUDE	Latitude in Swiss coordinate system
SWISSLONGITUDE	Longitude in Swiss coordinate system

Summary and outlook

- A concept for in situ conservation of forage plants has been developed based on previous project results
- Grassland plant alliance and biogeographic region are basic criteria for choice of sites to be inventorised
- „Northern Foothills of the Alps“ were investigated in a pilot project
- A database was developed to allocate vegetation and site characterisation data
- Vegetation and site characterisation data of the pilot project have been made available online
- Search functions are yet to be developed and implemented