



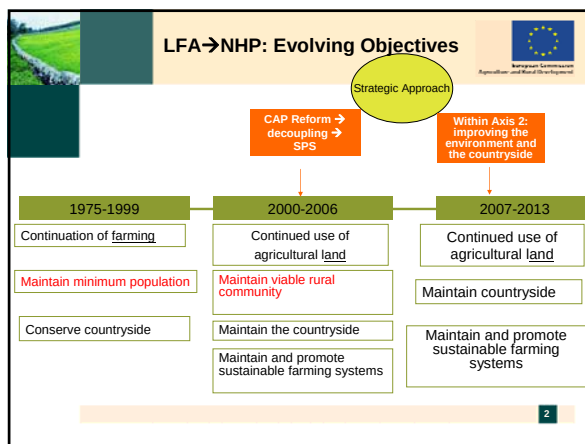

Recent developments in LFA scheme –Commission's Communication on better targeting of the aid to farmers in areas with natural handicaps

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*Joint Research Center, Institute for Environment
and Sustainability*

Multi-Country Workshop on Less Favoured Areas (LFA)
-criteria, determination, current policy March 21. 2011
Tirana, Albania

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First phase of LFAs

1970s - Council Directive 75/268 EEC on mountain and hill farming in certain less favoured areas

- Inspired by UK and France
- Legal framework for aid paid by EAGGF and national funds
- Three categories – 1/ mountains, 2/ LFAs in danger of depopulation and where conservation of countryside is necessary, 3/ Areas affected by specific handicaps

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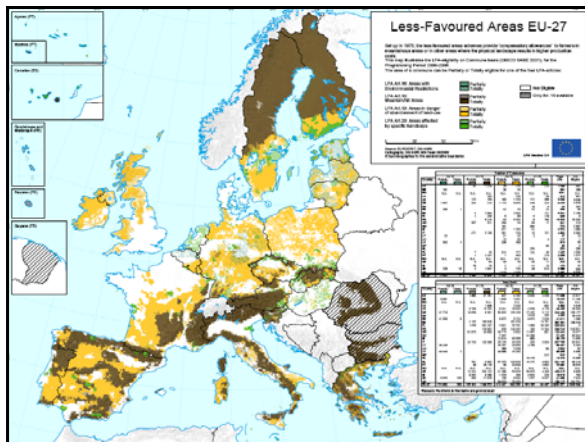



New millennium

Council Regulation 1257/1999

- Shift from a productivist to postproductivist agriculture
- Provision of multifunctional goods – environmental and landscape function
- Areas with environmental restrictions introduced
- Payments per area, not per livestock unit
- Good farming practice
- Flexibility given to Member States

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Current situation

Council Regulation 1698/2005

- Natural handicap payments
- Article 50(3): areas... must be... affected by a significant natural handicap
- GAEC
- Socio-economic objectives no longer pursued with this measure

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NHP position within the CAP

Single Payment

NHP

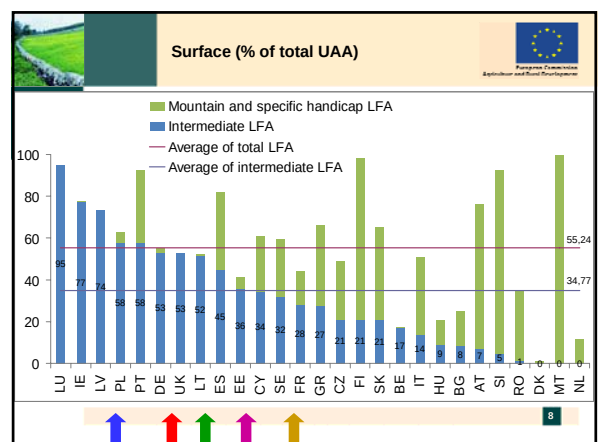
Agro-Environment

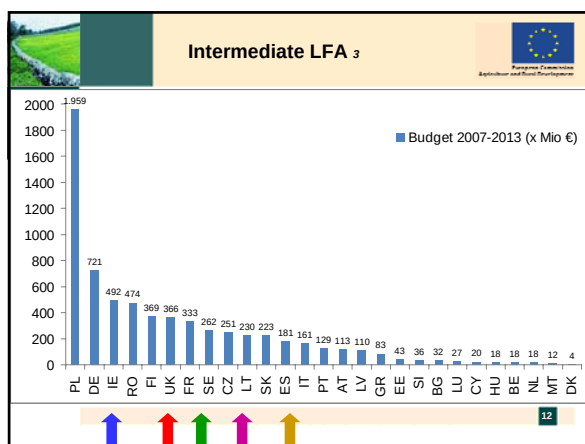
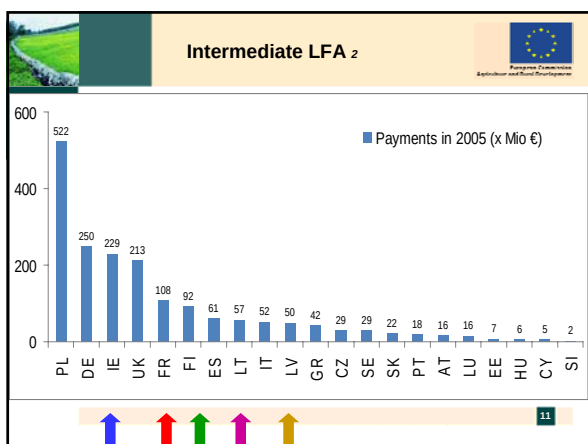
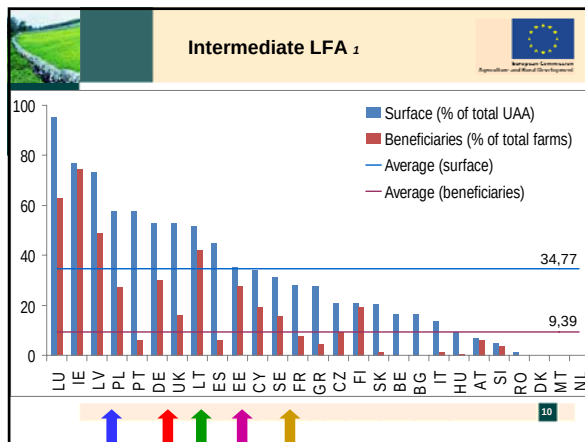
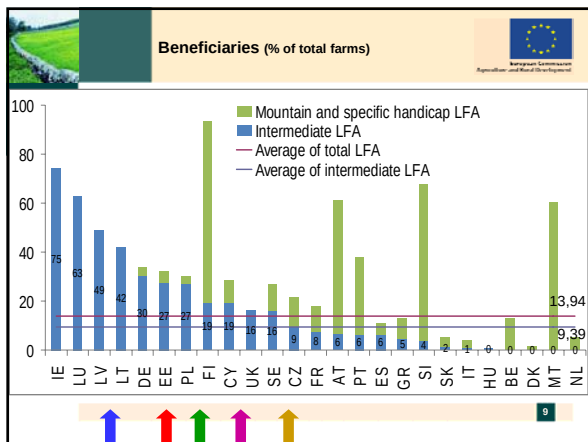
- Sustains farmers' income
- In general lower in LFAs
- GAEC: more onerous in areas with NH

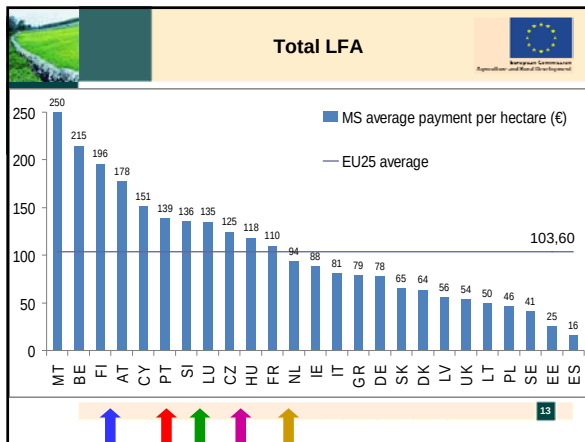
- Compensates for the natural disadvantage
- Threat of land abandonment
- Environmental benefit from continuing farming
- No specific environmental outcome

Covers additional costs/income foregone for specific environmental commitments

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Why are we looking into LFAs?

- Weaknesses in the area designation
 - Socio-economic criteria inconsistent with new intervention logic
 - Wide discrepancies among MS
 - transparency?
 - equal treatment?
 - targeting of aid?
- Weaknesses in targeting of aid
 - Most disadvantaged farmers often not recipients of highest support.
 - In some MS, due to low payments and eligibility rules, minimal contribution to maintaining agriculture.

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European Court of Auditors

- ✓ Lack of evaluation → IEEP Report 2006
- ✓ Avoid overcompensation → cost incurred-income foregone 2005
- ✓ Harmonise good agricultural practices → GAEC apply 2005
- **A complete in depth review of existing classification → current exercise**

From 2006: Development of appropriate indicators → JRC panel: 8 biophysical criteria
From 2007: Collaboration with Member States → > 130+ Commission-MS meetings
April - June 2009: Commission Communication and Council Conclusions
June 2009 - January 2010: Member States are testing the 8 biophysical criteria

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Suggested method of delimitation

8 Common Biophysical Criteria

- Provide a clear and robust common framework, based on sound scientific knowledge
- Transparent and comparable application is possible, provided that definition and threshold are identical at EU level
- Cover different situations in Europe (North/South, Atlantic, Mediterranean, etc...)
- High simplification potential: 1 single criterion triggers delimitation (against more than 100 criteria nowadays)
- Already extensively discussed with MS (confirmed that criteria are relevant)

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Common biophysical criteria (JRC)		
Climate	Temperature	Low length of growing period
	Heat stress	Periods of continuous days with high temperature
Integrated soil-climate	Soil-water balance	Soil moisture availability limiting during crop growth
	Drainage	Poorly drained soils
Soil	Texture	Coarse texture soils, heavy clay soils, vertic features
	Stoniness	Volume of stones in topsoil
	Rooting depth	Depth limitations caused by hard rocks or hard pans
	Chemical properties	Acidity, salinity, sodicity or soil
Terrain	Slope	% slopes limiting agricultural activity

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Targeting of the aid: fine-tuning the area delimitation

- Aim: to exclude from the LFA map those areas where the handicap has been overcome and where there is no risk of land abandonment.
- Only the areas classified on the basis of 5 out of 8 biophysical criteria should undergo a further control based on production related criteria
- Flexibility for MS

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Timetable

- By end of January 2010 : MS send simulations (maps) to DG AGRI
- 2010 Commission proposal
- 2014: new programming period
- ? Phasing out arrangements?

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Scope of the current exercise

- NOT a new proposal, development of an existing policy tool
- Focus on area designation and targeting of aid
- Mountain areas and areas with specific handicaps NOT covered.
- The objective is NOT to reduce or to enlarge LFAs.

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Chateauneuf du Pape. Poor soil. No handicap.



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Climate constraints + Soil/climate constraints

- Low Temperature: Low temperatures limit crop growth and development through the impact on photosynthesis and leaf appearance, resulting in too short growing period not allowing the crop to reach maturity.
- Heat stress: High temperature, particularly during critical plant development stages drastically reduce yields or can even compromise survival.
- Soil water balance: Moisture availability is essential for photosynthesis and to complete growth cycle. Lack of moisture has adverse effects on plant growth and yields.

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Soil constraints

- Drainage (poor): Presence of excess water in root zone leads to lack of oxygen hampers normal root metabolism, disturbs bio-chemical processes
- Texture and stoniness:
 - Texture influences water availability and rooting conditions
 - Stoniness influences rooting conditions (obstacle to roots) and mechanisation
- Rooting depth: Too shallow soils prevent rooting system to develop and limit water and nutrient storage in soil
- Chemical properties: high salt content in soil reduces water available to plant (can also kill plant at high concentration)

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Terrain

- Slope: Steep land prevents the use of machinery (therefore farming opportunities) or induces high cost equipment

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Geographic distribution of the criteria

- **Criteria applying mostly to northern conditions (cold)**
Low Temperature, poor drainage
- **Criteria applying mostly to north-western conditions (wet)**
Poor drainage, Low temperature, organic soil
- **Criteria applying mostly in central Europe**
Texture (coarse texture, stoniness), Chemical properties
- **Criteria applying mostly to southern conditions (dry)**
Soil water balance, Heat stress, Texture (stoniness), Rooting depth

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JRC Technical Notes

Guidelines for Application of Common Criteria to Identify Agricultural Areas with Natural Handicaps

K. Böttcher, A. Eliasson, R. Jones, C. Le Bas, F. Nachtergaele, A. Pistocchi, F. Ramos, D. Rossiter, J.-M. Terres, J. Van Grshoven and H. van Velthuisen

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Boundary Conditions

The common bio-physical criteria are based on the definition provided by Article 50, 3. (a) of Council regulation 1698/2005 for areas affected by natural handicaps, other than mountain areas and than those with specific handicaps. These areas are defined as: *"affected by significant natural handicaps, notably a low soil productivity or poor climate conditions"*

Objectives and recommendations given :

- Scientifically **clear and understandable methodology**: The application of the criteria should be **transparent, straightforward and scientifically clear** to enable translation into policy framework.
- Key **soil, climate and terrain characteristics** in EU-27: The criteria should be **based on the most pertinent characteristics of land according to its suitability for generic agriculture activity** and should be applicable within EU-27 Member States.
- Natural conditions: The classification of areas **should relate to areas that have natural handicaps to agriculture** and not to how the land is used, i.e. it does not identify conditions to reach optimal production for each type of crop.
- Classification of land: The **classification relates only to areas having natural handicaps** and not to the payment mechanisms such as eligibility rules, and level of payments.
- Agricultural areas: the **criteria should focus on agricultural areas which include permanent grasslands, permanent crops and arable land**. Forest is not included.
- No crop specificity**: The method should not be crop dependent. Suitability was considered for a European **conventional capital-intensive, mechanised, family unit of adapted grain crops or adapted grasses for hay or silage**.
- Not to change during the programme period: The criteria should not change during the period of the programme. Concerning climate, **it should not be based on a particular year, but rather by considering probabilities**.

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CLIMATE CRITERIA

CRITERION	DEFINITION	THRESHOLD
CLIMATE		
Low Temperature	Length of Growing Period (number of days) defined by number of days with daily average temperature > 5°C (LGP ₅) OR	≤ 180 days OR
	Thermal-time sun (degree-days) for Growing Period defined by accumulated daily average temperature > 5°C.	≤ 1500 degree-days
Heat Stress	Number and length of continuous periods (number of days) within the growing period for which daily maximum temperature (T _{max}) exceeds the threshold.	One or more periods of at least 10 consecutive days with daily T _{max} > 35°C

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Criterion 1: Low Temperature

Threshold
 Temperature thresholds and thermal requirements for plant development vary among crop species and cultivars. For European conditions, thermal-time sum (TS) requirements can be used as a reference to delimit thresholds for the development of agricultural crops.
 In general, adequate thermal-time requirement for most agricultural crops is above a TS5 of 1500oCd (degree day), above a base temperature (Tb) of 5oC.
 Therefore
 -Severely limiting low temperature is said to occur if **TS5 is lower than or equal to 1500oCd OR if LGP t5 is lower than or equal to 180 days.**

Assessment
 To assess low temperature as a land characteristic, the concepts of thermal-time sums (TSb, degree days, oCd) or length of temperature growing period (LGPt, days) can be used.
 The length of the temperature growing period (LGPt5), i.e. the number of days with daily average temperatures (Tavg) above 5oC, is calculated for each year. The LGPt5 characterizes the days in which temperatures are conducive to crop growth.
 Thermal-time sums above a base temperature (Tb) of 5oC (days within LGPt5), are calculated for each year by accumulating the difference between daily Tavg and Tb.
 Calculated values of LGPt5 and TS5 are compared with reference thresholds for severe limiting conditions.
 Finally, the number of years with limiting conditions is counted. **If limiting conditions occur in more than 20% of the years of the whole time series, the land is classified as constrained.**




Criterion 2: Heat Stress

Threshold
 Thresholds for **heat stress** have been identified for important crops including wheat, rice, brassicas, tomato, barley and soybean. However, they are **different among crops** and also vary within species, i.e. tolerant and sensitive cultivars were identified for several crops. In general, start of yield loss is observed at temperatures above 30oC while the magnitude of damage increases with the period of exposure. **Yield loss is usually severe above 35oC** increasing at higher temperatures until complete damage is observed at above 40-45oC, near lethal temperatures.
 Therefore: Severely limiting heat stress is said to occur when "one or more periods of at least 10 consecutive days with daily maximum temperatures above 35oC" are observed within a year.

Assessment
 To assess heat stress, **maximum temperature as a land characteristic (Tmax, oC) can be used.** The consecutive days with daily maximum temperature above 35 degrees should be accounted for in each year. Finally, the number of years with limiting condition (one or more periods of at least 10 consecutive days with daily maximum temperatures above 35oC) is counted. If limiting conditions occur in more than 20% of the years of the whole time series, the land is classified as constrained.




SOIL AND DRAINAGE CRITERIA

CRITERION	DEFINITION	THRESHOLD
SOIL		
Drainage	Areas which are water logged for significant duration of the year (lack of gaseous oxygen in soil for root growth or land not accessible for tillage)	Poorly drained soil
Texture and Stoniness	Relative abundance of clay, silt, sand, organic matter (weight %) and coarse material (volumetric %) fractions in topsoil material.	> 15% of topsoil volume is coarse material OR Unsorted, coarse or medium sand, loamy coarse sand OR Heavy clay (>60% clay) OR organic OR
		Vertisol, clay, silty clay or sandy clay with vertic properties
		Rock outcrop, boulder within 15 cm of the surface OR
Rooting depth	Depth (cm) from soil surface to coherent hard rock or hard pan	< 30 cm
Chemical properties	Presence of salts, exchangeable sodium and gypsum (toxicity) in the topsoil.	Salinity: > 4 deca-Siemens per metre (dS/m) OR Sodicity: > 6 Exchangeable Sodium Percentage (ESP) OR Gypsum: > 15%




Criterion 3: Drainage

Threshold
 The thresholds identify land areas that are **waterlogged for significant periods during the normal growing season and thus affect normal farming operations or crop yields.** The threshold is designed to identify soils on which farming operations for adapted crops are possible, but with severe yield reductions due to late planting or poor tillage, crop damage by transient anoxic conditions or plant pathogens resulting from poor drainage.

Assessment
 ...**soil drainage is limiting when the soil is classified as wet within 80 cm for over 6 months OR wet within 40cm for over 11 months.**

Criterion 3: Drainage (cont..d)

Definition of drainage classes from Soil Survey Division Staff (1993):

Poorly drained. Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plough-depth. Free water at shallow depth is usually present. This water table is commonly the result of low or very low saturated hydraulic conductivity of nearly continuous rainfall, or of a combination of these.

Very poorly drained. Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.

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Criterion 3: Drainage (cont..d)

We recommend that Member States **identify the most suitable drainage/wetness representation in the national dataset that corresponds to the drainage criteria.** As an **alternative**, water-logging can also be assessed through a **soil water balance calculation**, with the use of soil hydraulic properties and weather data. However, this requires more parameters and more complex processes to be accounted for by the model, which may result in a more difficult implementation (see box).

Assessment of drainage status using soil moisture balance calculation

The criteria on drainage describes how soil drainage is generally determined i.e. through monitoring wells and/or soil classification systems where the soil moisture regime often is included for each soil individual of its soil name. Moreover, certain soils properties are also directly related to poor drainage. These are the more common approaches for assessing soil moisture excess related to drainage. However, drainage conditions can also be derived from time series of soil moisture balance as number of days within the length of growing period ($T_{avg} > 5^{\circ}\text{C}$) when the soil is saturated up to a given depth. This requires the characterisation of the hydrologic boundary conditions (depth of the phreatic water table must be known at each day) and the inclusion of capillary rise. Hydraulic properties and weather data have been used for soil wetness assessment in a number of studies (see for example Fischer et al. 2002, Schulte et al. 2005 for Ireland).

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Criterion 4: Soil Texture and Stoniness

Threshold

Soil texture is said to be severely limiting if any of the following conditions are present:

- (i) **more than 15 % volume of coarse fragments** (> 2 mm) of any kind in topsoil; or
- (ii) average **texture class** (fine earth e.g. < 2 mm) of rooting zone is
 - (a) **unsorted, coarse or medium sand, loamy coarse sand**; or
 - (b) **heavy clay** (> 60% clay); or
- (iii) **organic soil** as defined with organic matter (>30%) of more than 40 cm either extending down from the surface or taken cumulatively within the upper 80 cm of the soil or
- (iv) texture class of **clay, silty clay, or sandy clay with vertic properties** as defined by the WRB; or
- (v) any proportion of **rock outcrops, boulders within 15 cm** of the surface.

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Criterion 4: Soil Texture and Stoniness (cont..d)

Assessment

Coarse fragments (> 2 mm) are described by their abundance (volume %), size, shape, state of weathering, and nature. Fine earth (<2 mm) is defined by the relative proportion (by weight) of **sand, silt and clay** as determined in the laboratory. The upper limits used here correspond to the **FAO norms** and are **2000, 63 and 2 micrometres** respectively. National systems may use different limits but it is possible to harmonise data using transfer functions.

Texture classes are defined according to FAO texture triangle (see Figure 1). Note that the diagnostic criterion for texture limitations (ii) includes only sub-divisions of the sandy textural classes, namely unsorted, coarse or medium sand and coarse loamy sand (Figure 1). **Therefore care has to be taken when applying the criterion to already classified datasets on soil texture as they mostly do not separate between sub-classes of the sandy textural classes.**

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Criterion 4: Soil Texture and Stoniness (cont..d)

Vertic properties as defined by the WRB have either:

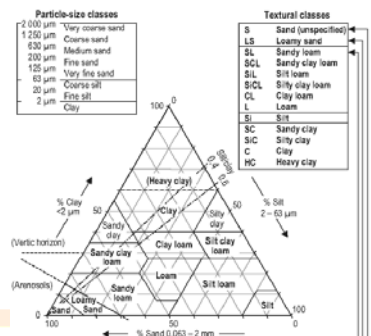
- (i) $\geq 30\%$ clay throughout a thickness of at least 15 cm and one or both of the following characteristics:
 - (a) slickensides or wedge-shaped aggregates; or
 - (b) cracks ≥ 1 cm wide that open and close periodically; or
- (ii) a coefficient of linear expansion (COLE) of 0.06 or more averaged over depth of 100cm from the soil surface.

The soil reference group **Histosols** of WRB can in general be used as a proxy for the mapping of **organic soils**, although some differences in the definition exist. According to the definition used for delimiting LFA, all Histosols with 20% organic carbon content or more would qualify. But note that Histosols need a 40 cm thick layer of organic material within 1m, whereas in the definition given in point iii) it is required within 80 cm. Therefore a few soils with buried organic matter might not qualify according to the definition above but would be defined as Histosols.

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Criterion 4: Soil Texture and Stoniness (cont..d)

Relation of constituents of fine earth by size, defining textural classes and sand subclasses



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Criterion 4: Soil Texture and Stoniness (cont..d)

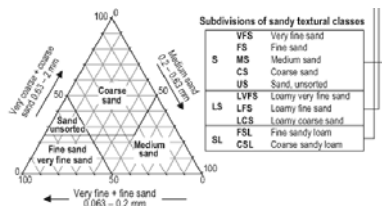


Figure 1. Relation of constituents of fine earth by size, defining textural classes and sand subclasses (FAO, 2006).

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Criterion 5: Rooting Depth

Threshold

Severely limiting physical rooting depth: < 30 cm

Assessment

During routine field survey, rooting depth is typically assessed by **augering**. The observed depths are then interpolated with reference to the landscape structure to produce rooting depth estimates for land areas or map units.

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Criterion 6.1: Chemical Properties – Salinity

Threshold
Salinity tolerance is influenced by plant physiology, soil and environmental factors and their interrelationships. Although crop response to soil salinity is crop specific, overall there are good arguments to accept that:
Levels **over 4 dS/m** severely affect many plants.

Assessment
Soil salinity is determined by measuring the **electrical conductivity of a solution extracted from a water-saturated soil paste**.
Soil names in the WRB that can be used for indicating severe salinity constraints of natural saline soils are Solonchaks and *salic* and *petrosalic* soils.

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Criterion 6.2: Chemical Properties - Sodicity

Threshold
The effect of Exchangeable Sodium Percentage (ESP) on the yield, chemical composition, protein and oil content and uptake of nutrients is severe when soil sodicity is at **ESP > 6**

Assessment
Sodicity is determined by measuring the **exchangeable sodium** proportion of the cation exchange capacity or by comparing the soluble Calcium and Magnesium in a soil solution (**SAR** – Sodium Adsorption Ratio). According to WRB classification soils having a high content of exchangeable Na are Solonetz, *natric* soils, or *sodic* soils, which can be used for indicating a severe sodicity constraints.

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Criterion 6.3: Chemical Properties - Soil Gypsum Content

Threshold
Apart from special crops (certain fruit trees), gypsiferous soils present a severe limitation to crop production once the **gypsum percentage exceeds 15%**.

Assessment
Gypsum is determined by the **differential water loss method** which estimates the gypsum percentage from the loss of water in the soil sample **between 70 and 90°C**. It can also be estimated with **gravimetric determinations of precipitated BaSO₄**.
In the WRB classification, presence of gypsum with an amount above 15% appears in Gypsisols, *gypsic* soils, *petrogypsic* soils, which can be used for classifying area constrained.

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SOIL AND CLIMATE CRITERION

CRITERION	DEFINITION	THRESHOLD
SOIL AND CLIMATE		
Soil Moisture Balance	Number of days within growing period as defined by daily average temperature > 5°C (LGP ₅), for which the amount of precipitation and water available in the soil profile exceeds half of potential evapotranspiration	≤ 90 days

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Criterion 7: Soil Moisture Balance

Threshold

Short growing period provides unfavourable conditions for agriculture. On the basis of minimum crop cycle duration, the following critical limit has been established:
Severe threshold: ≤ 90 days within the growing period as defined by temperature above 5°C , for which the amount of precipitation and available water in the soil profile exceeds half of potential evapotranspiration. These days are called "non-dry days".

Assessment

For the calculation of the soil water balance the concept proposed by Thornthwaite (1948) and Thornthwaite and Mather (1955) is followed here, see box on calculation of soil moisture balance. For the calculation of reference evapotranspiration, the Penman-Monteith equation is recommended.

The water budget components are calculated by comparing values for precipitation and potential evapotranspiration and monitoring water stored in the soil. Potential evaporation represents the maximum "water need" of vegetation. To meet this requirement, vegetation uses water available via precipitation or water stored in the soil. When there is sufficient water, actual evapotranspiration (AET) will be equal to potential evapotranspiration (PET). In the opposite case, water stored in the soil profile will be extracted by the root system.

The efficiency of this extraction depends on the pressure that roots are required to apply. Here, it is assumed that the efficiency of the extraction is 100 percent when soil water is greater or equal to the Soil Water Available to Plants (SWAP) and declines thereafter in a linear manner. If the requirement of PET is not met, there is a deficit, which is defined as the difference between PET and AET. When P exceeds PET, the extra water contributes to increased storage or surplus. After soil moisture storage reaches SWAP any surplus water is counted as excess (runoff).

If soil water retention properties have not been measured (from undisturbed cores) for an area of interest, they may be estimated from pedotransfer functions relating water retention⁴⁶ at field capacity and wilting point to other soil properties like particle-size distribution, organic carbon and bulk density.

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TERRAIN CRITERION

CRITERION	DEFINITION	THRESHOLD
TERRAIN		
Slope	Change of elevation with respect to planimetric distance (%)	$> 15\%$

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Criterion 8: Slope

Threshold

Slopes above 15 % pose severe problems for mechanized cultivation and specific equipment is required.

Assessment

From neighbouring altitude data, slope can be determined by algorithms. The resulting "local" slopes must be averaged over a larger area to be applicable as an indicator of land suitability.

When using a digital elevation model, the maximum rate of change between each cell and its neighbours is calculated, for example the steepest downhill decent for the cell (maximum change in elevation over the distance between the cell and its eight neighbours).

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FINE TUNING

It is therefore necessary, for the cases where the natural handicaps can be overcome, to finetune the area delimitation by applying the biophysical criteria in combination with appropriate production-related indicators.

The handicaps resulting from poor drainage, soil texture, stoniness, rooting depth and chemical properties, as well as soil-moisture balance are those most commonly offset by farmers thanks to investments, farming techniques and appropriate crop choices. The simulations made on the basis of these criteria should therefore systematically exclude:

- (a) **artificially drained areas** when applying the poor drainage criterion;
- (b) **areas with high proportion of irrigated land** when applying the soil-moisture balance criterion;
- (c) **areas for which soil problems** (soil texture, stoniness, rooting depth and chemical properties) **are clearly overcome** and where relevant **production related indicators** (average cereal yield or livestock density or standard gross margin per hectare) **are comparable to the national average** (excluding, where appropriate, mountain areas).

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Application

- LAU2 level
- Significant handicap = 66% of UAA
- Not all applicable in all MS
(ex: Heat Stress in Nordic countries)
- One criteria constrained qualifies
- Climate data used in a probabilistic way
- No combination, addition or weighting of criteria
Not to be confused with the areal assessment (66% threshold)
- Targeting agricultural areas
Excluding non-agricultural land-use from the analysis
- Soil Association maps
All soil types to be considered, not the dominant one only

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Technical guidelines

<http://agrienv.jrc.ec.europa.eu/activities/lfa.htm>

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Why the need for Fine Tuning?

- Article 50(3a) of Council Regulation (EC) No 1698/2005
'areas affected by significant natural handicaps, notably a low soil productivity or poor climate conditions and where maintaining extensive farming is important for the management of the land'.
- Some natural handicaps can be overcome by technical progress and management intervention

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Example: overcoming the handicap in dry areas



Example: Drainage to overcome the handicap in wet areas



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Example: Stoniness and output value above average



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from http://kerpark.blogier.hu/340227/a_bene_pinceszeti_szolo-duto

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Example: High stocking density



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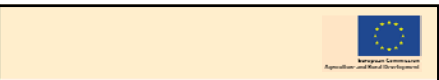
Criteria for application of finetuning



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- 1.LGP, Heat Stress and Slope: **No need for Fine Tuning**
- 2.Soil Moisture Balance: **Fine tune using % of area that is covered by irrigation**
- 3.Drainage: **Take account of the artificial drainage which can in effect move soils from one class to another**
- 4.Texture and Stoniness, Rooting depth and Soil Chemical properties: **Fine tune using production related indicators.**

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THANK YOU FOR THE
ATTENTION

AND

MR L VISEK FOR GIVING ACCESS TO HIS PREVIOUS PRESENTATION