CLIMATE CHANGE ATELIER

Proposal of short-term and long-term improvements of AFOLU sector of the GHGI

Establishing Transparency Framework for the Republic of Serbia

Vrdnik (Serbia) 21/11/2019

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MAIN TOPICS

Improvements implemented

Procedure

Current situation

Improvements

Information needed for short-term improvements

Synthetic fertilizers

Histosols

Burning of agriculture residues

Liming

NFI 1989

SOC

Living biomass in crops

Soil Conservative Practices

Proposals of long-term improvements

New LULUCF map

MMS survey

Questions and answers

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IMPROVEMENTS IMPLEMENTED

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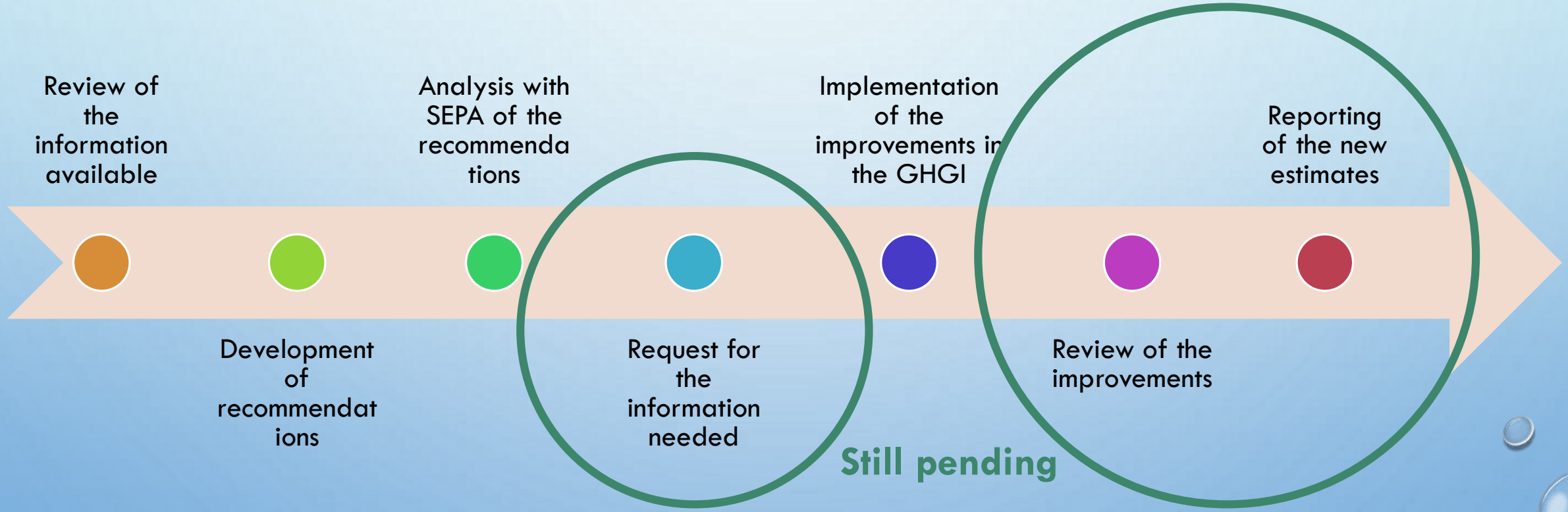
PROCEDURE FOR THE IMPROVEMENTS



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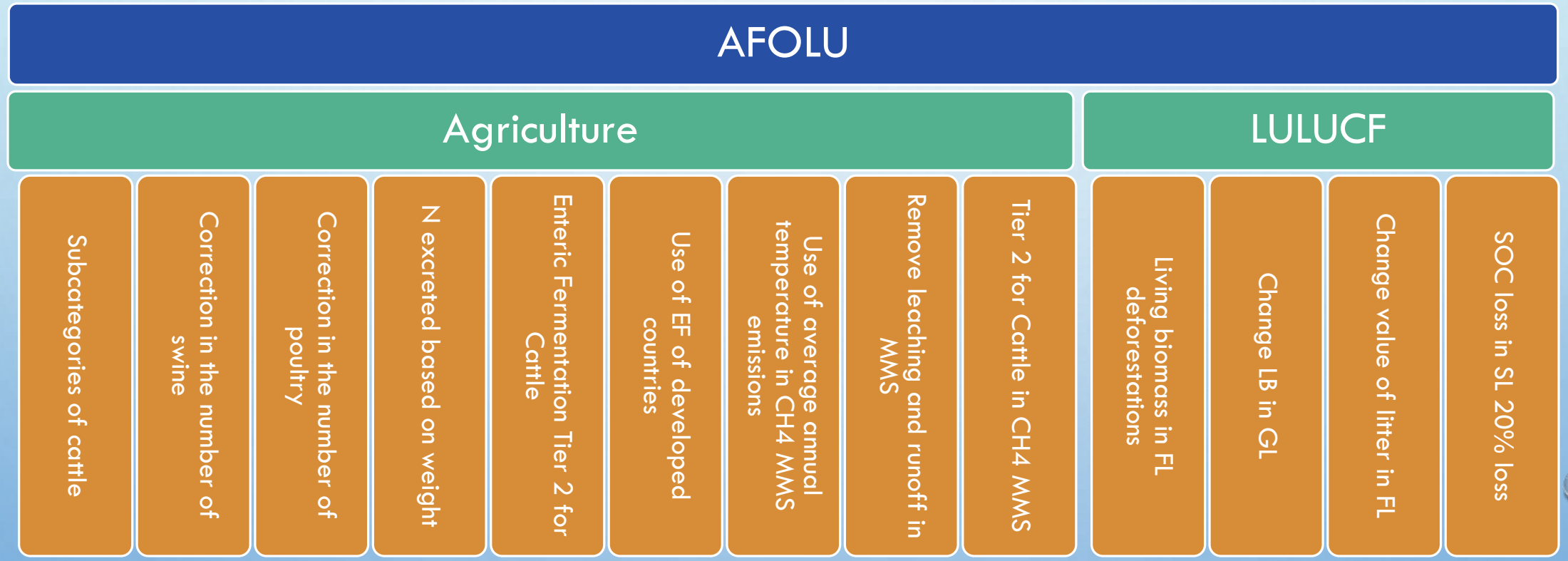
IMPROVEMENTS IMPLEMENTED DURING THE VISIT



INFORMATION NEEDED FOR SHORT-TERM IMPROVEMENTS

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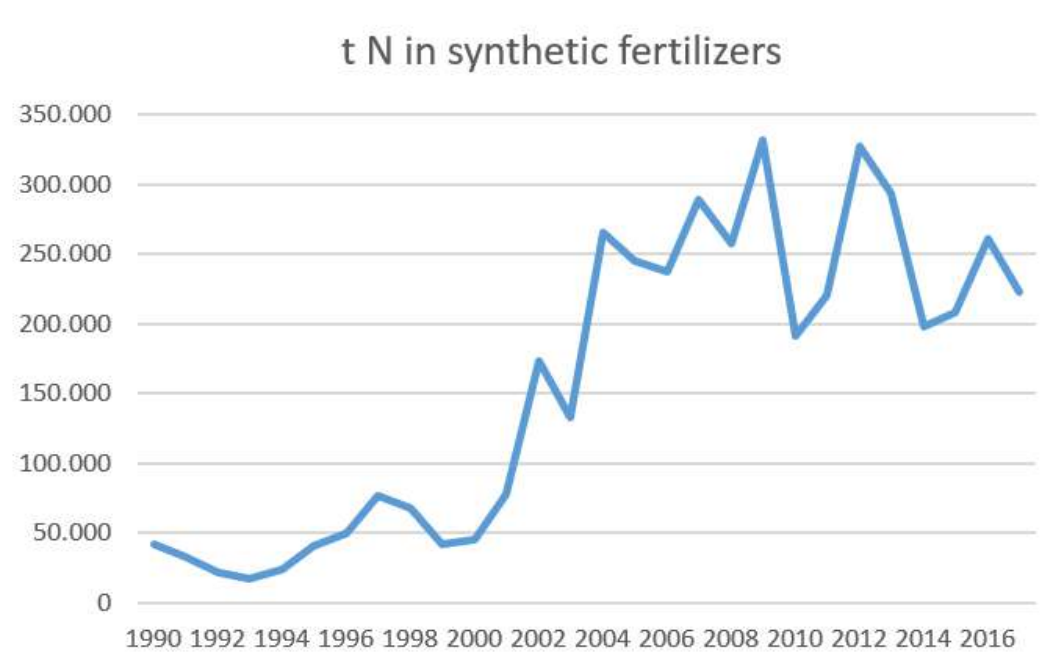
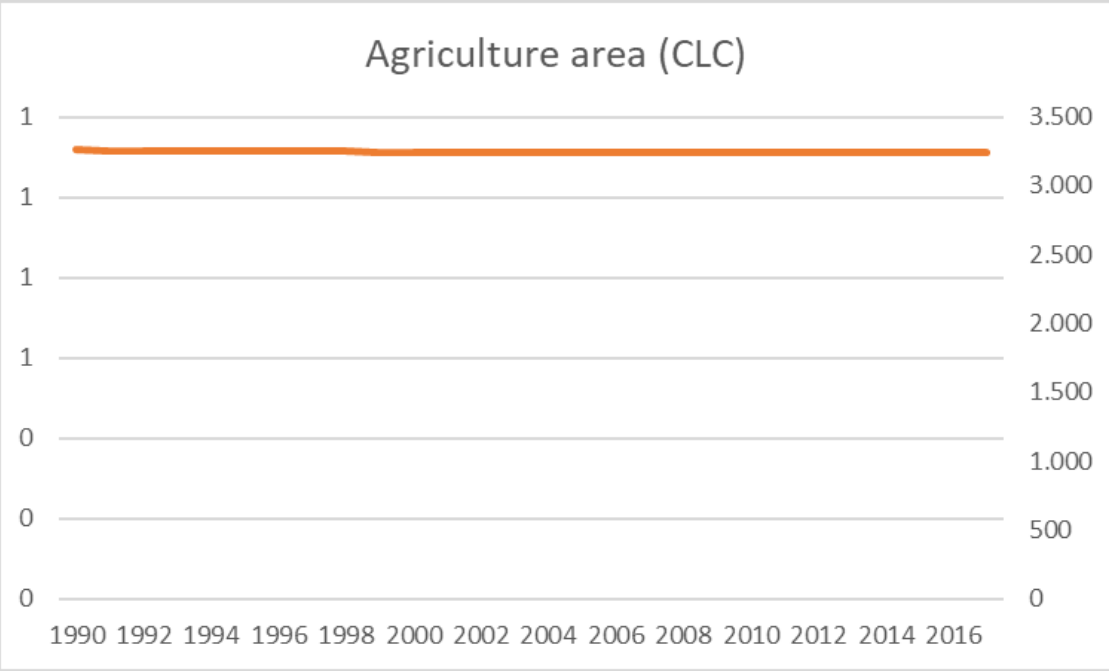
SYNTHETIC FERTILIZERS





Source: FAOSTAT
Coverage of fertilizers not complete for the first years of the timeseries

Correct the timeseries.
Apply one of the methods included in the 2006 IPCC GL

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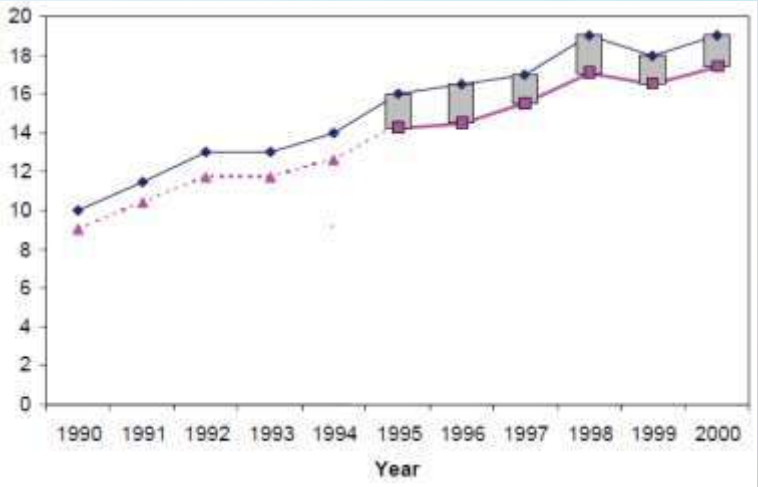
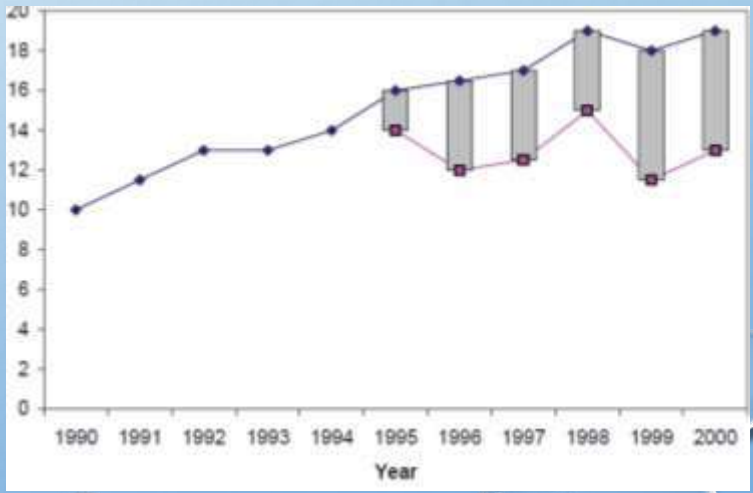
SPLICING TECHNIQUES

Approach	Applicability	Comments
Overlap	Data necessary to apply both the previously used and the new method must be available for at least one year, preferably more.	• Most reliable when the overlap between two or more sets of annual estimates can be assessed. • If the trends observed using the previously used and new methods are inconsistent, this approach is not *good practice*.
Surrogate Data	Emission factors, activity data or other estimation parameters used in the new method are strongly correlated with other well-known and more readily available indicative data.	• Multiple indicative data sets (singly or in combination) should be tested in order to determine the most strongly correlated. • Should not be done for long periods.
Interpolation	Data needed for recalculation using the new method are available for intermittent years during the time series.	• Estimates can be linearly interpolated for the periods when the new method cannot be applied. • The method is not applicable in the case of large annual fluctuations.
Trend Extrapolation	Data for the new method are not collected annually and are not available at the beginning or the end of the time series.	• Most reliable if the trend over time is constant. • Should not be used if the trend is changing (in this case, the surrogate method may be more appropriate). • Should not be done for long periods.
Other Techniques	The standard alternatives are not valid when technical conditions are changing throughout the time series (e.g., due to the introduction of mitigation technology).	• Document customised approaches thoroughly. • Compare results with standard techniques.

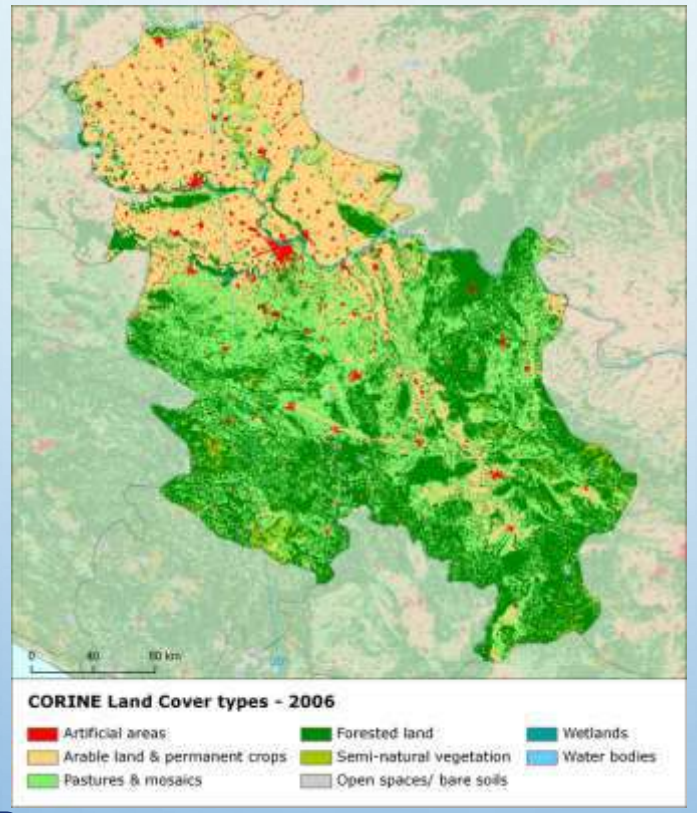




HISTOSOLS

Reference Soil Group Code		Area ha	Area %
AT	Anthrosol	11,519	0.15
AR	Arenosol	55,836	0.72
CL	Calcisol	27,284	0.35
CM	Cambisol	2,168,581	27.99
CH	Chernozem	1,369,962	17.68
FL	Fluvisol	586,221	7.58
GL	Gleysol	484,545	6.25
HS	Histosol	442	0.01
LP	Leptosol	1,231,952	15.9
LV	Luvisol	219,583	2.83
PH	Phaeozem	72,840	0.94
PL	Planosol	429,472	5.54
PZ	Podzol	34,313	0.44
RG	Regosol	168,689	2.18
SC	Solonchak	25,022	0.32
SN	Solonetz	85,858	1.11
UM	Umbrisol	131	1.69
VR	Vertisol	644,689	8.32
Total		**7,747,401**	**100**

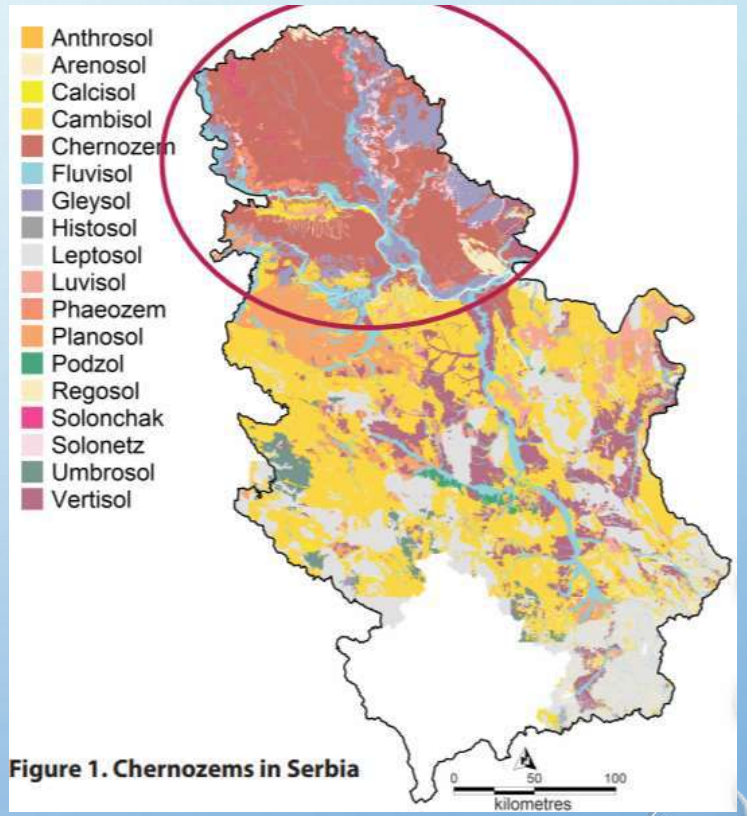
Vidoković et al. (2016)



CLC 2006

Overlap

Area of organic soils in each LU



Vidoković et al. (2016)

BURNING OF AGRICULTURAL RESIDUES

- THIS PRACTICE **EXISTS IN SERBIA**, AS THERE ARE CAMPAIGNS TO FIGHT IT.
- WE NEED INFORMATION ON REAL PRACTICES NOT IN LEGAL PRACTICES.

Information needed	Percentage of residues burned in the fields	By crop
Sources of information	Ad-hoc studies for the anti-fires campaign	Expert judgement

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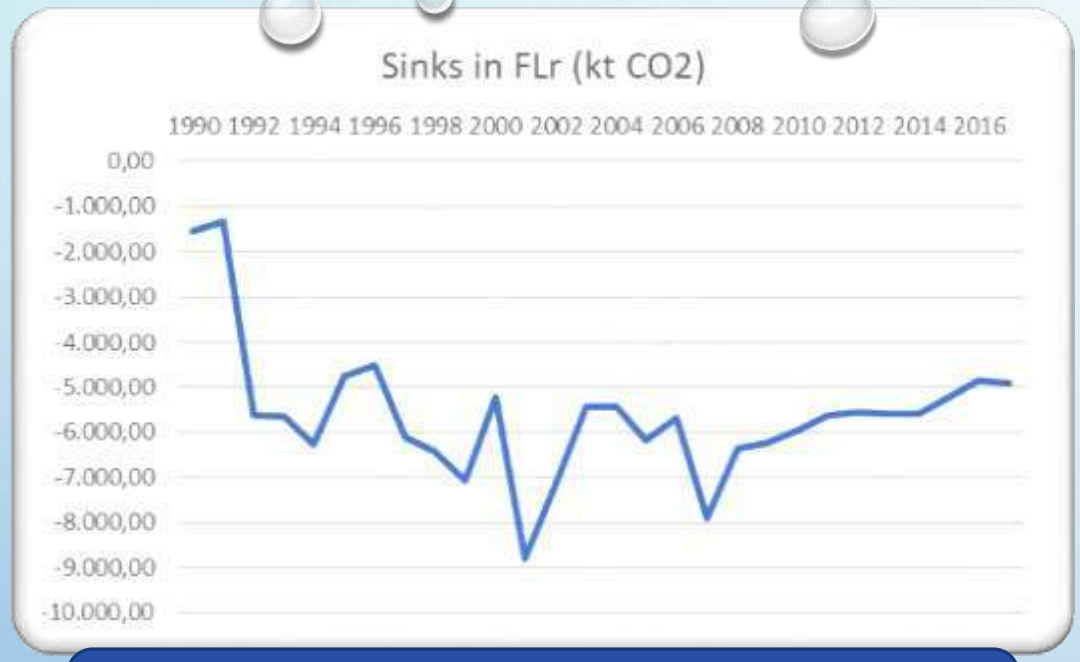
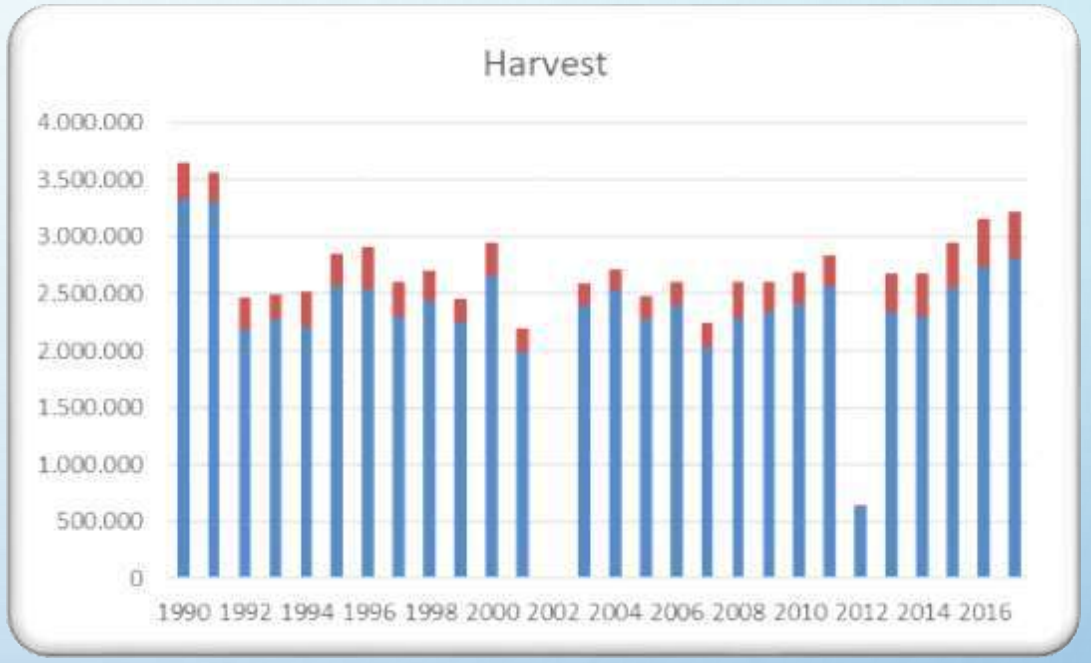
LIMING

- LIMING IS USED TO **REDUCE SOIL ACIDITY** AND IMPROVE PLANT GROWTH IN MANAGED SYSTEMS, PARTICULARLY AGRICULTURAL LANDS AND MANAGED FORESTS.
- ADDING CARBONATES TO SOILS IN THE FORM OF LIME (E.G., CALCIC LIMESTONE (CACO3), OR DOLOMITE (CAMG(CO3)2) LEADS TO CO2 EMISSIONS AS THE CARBONATE LIMES DISSOLVE AND RELEASE BICARBONATE (2HCO3-), WHICH EVOLVES INTO CO2 AND WATER (H2O).
- AS FAR AS WE KNOW, THIS IS **A COMMON PRACTICE IN SERBIA**

Information needed	Amount (t) of limestone and dolomite applied to the soils	All types of soils
Sources of information	Agricultural statistics	National producers + import and export





Big jump in the first years due to the effect of harvest in gains-losses method

HARVEST IN 1990-1991

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NATIONAL FOREST INVENTORY 1989

- HOW CAN WE ACCESS TO THE INFORMATION IN THE YUGOSLAVIAN NFI OF 1989?
- IS THE INFORMATION DIVIDED BY REPUBLIC?
- IS THE INFORMATION COMPARABLE WITH 2009 NFI?
- IF SO, SERBIA CAN CHANGE THE METHODOLOGY TO CARBON STOCK CHANGE AND AVOID THE JUMPS DUE TO THE HARVEST STATISTICS.

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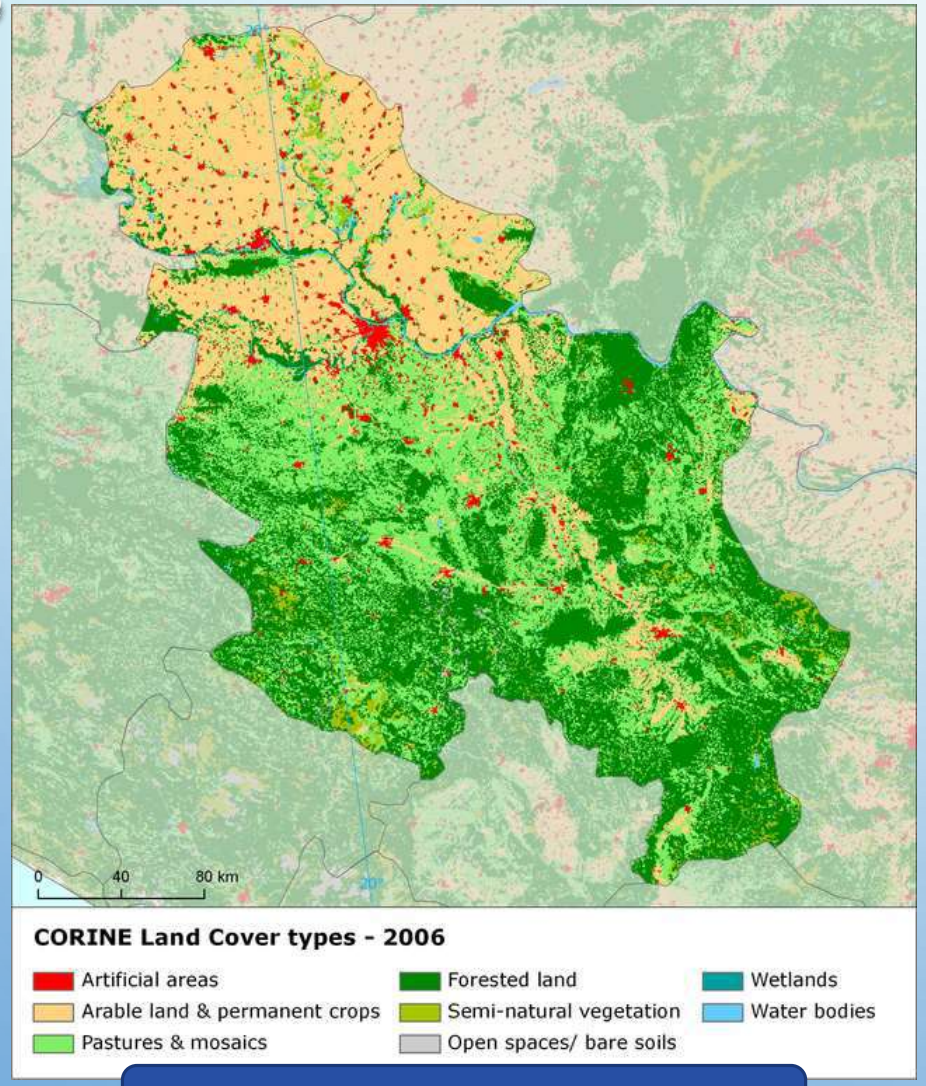
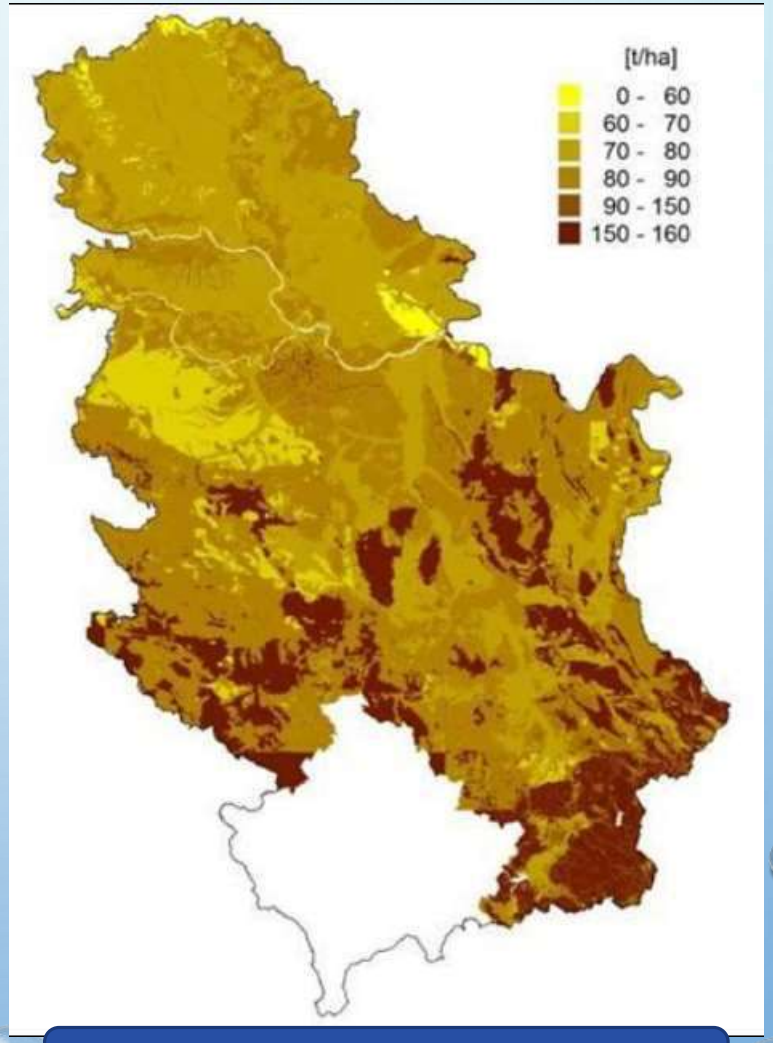
SOIL ORGANIC CARBON (SOC)



CLC 2006

Overlap

Average SOC for each LU



Vidojević et al. (2017)

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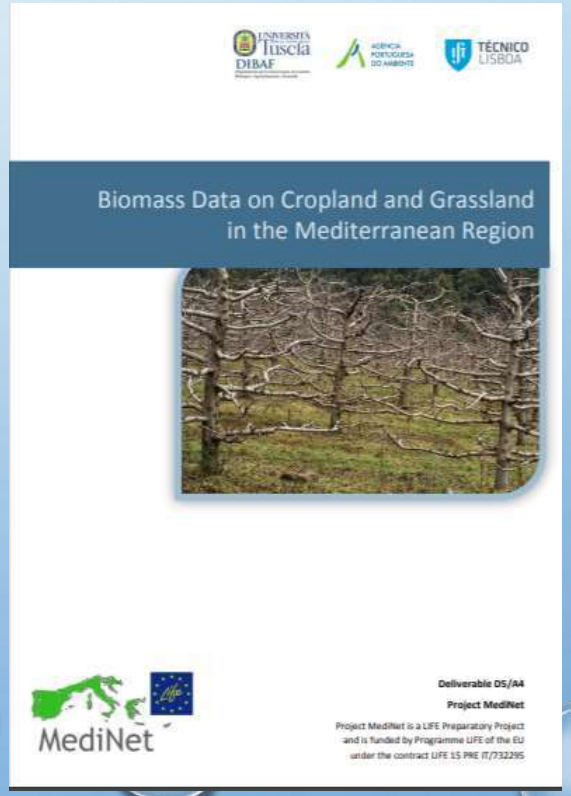
LIVING BIOMASS IN CROPS

- Perennial/tree crops store carbon as the trees in the forest. Changes in the area of perennial crops lead to emissions or removals
- Information:
  - on area available for 2017
  - on number of trees available for the whole timeseries

- Find sources for living biomass by tree or number of trees by hectare.
- Some detailed sources for the Mediterranean area

12.11. ВОЋНА СТАБЛА И ПРОИЗВОДЊА ВОЋА, 2005-2009. **FRUIT TREES AND PRODUCTION OF FRUIT, 2005-2009**

	Република Србија / *Republic of Serbia*												
	укупно / *Total*				централна Србија / *Central Serbia*				Војводина / *Vojvodina*				Косово и Метохија *Kosovo and Metohia*
	стабла, хиљ. *Trees, thous.*		производња, хиљ. t *Production, thous. t*	принос по стаблу, kg *Yield per tree, kg*	стабла, хиљ. *Trees, thous.*		производња, хиљ. t *Production, thous. t*	принос по стаблу, kg *Yield per tree, kg*	стабла, хиљ. *Trees, thous.*		производња, хиљ. t *Production, thous. t*	принос по стаблу, kg *Yield per tree, kg*	
	свега *All*	способна за род *Trees of productive age*			свега *All*	способна за род *Trees of productive age*			свега *All*	способна за род *Trees of productive age*			
Јабуке / *Apples*													
2005	16580	14805	198	13,4	11016	10024	109	10,9	5564	4781	89	18,6	...
2006	16521	14658	240	16,4	11226	9980	147	14,7	5295	4678	93	19,9	...
2007	17185	15037	245	16,3	11721	10311	162	15,7	5463	4726	83	17,7	...
2008	16998	15224	236	15,5	11237	10204	153	15,0	5761	5020	83	16,5	...
2009	17688	15600	282	18,1	11643	10213	177	17,4	6054	5387	105	19,4	...
Крушке / *Pears*													
2005	5506	4958	47	9,4	4138	3743	37	9,8	1368	1215	10	8,3	...
2006	5361	4788	58	12,1	4098	3669	46	12,5	1263	1119	12	10,7	...
2007	5175	4723	61	12,8	4057	3682	50	13,6	1118	1041	11	10,2	...
2008	4968	4403	62	14,1	3960	3550	51	14,4	1008	853	11	12,6	...
2009	5033	4471	68	15,2	3882	3510	55	15,8	1150	961	12	12,9	...



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SOIL CONSERVATIVE PRACTICES

INFORMATION AVAILABLE FOR 2012 IN THE AGRICULTURAL CENSUS

	Period	2012
	Interval	Total
	Data type	Area, ha
Variable		
Normal winter crop		668160.54
Soil conservation - total		2311183.27
Cover crop		14784.98
Plant residues		79777.16
Bare soil		1548460.59

	Period	2012	
	Interval	Total	
	Data type	Area, ha	Number of holdings
Variable			
Conventional tillage		2043609.40	503164
Tillage methods - total		2311183.27	517969
Conservation tillage		244035.55	53142
Zero tillage		23538.32	14313

Practices are disaggregated but affect the same area

Need detailed information on all the practices applied to each area

It is key to have a detailed description of what involves each soil conservative practice

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SOIL CONSERVATIVE PRACTICES

Factor value type	Level	Temper-ature regime	Moist-ure regime[1]	IPCC defaults	Error[2,3]	Description
Land use (F_{LU})	Long-term culti-vated	Tem-perate/ Boreal	Dry	0.80	± 9%	Represents area that has been continuously managed for >20 yrs, to predominantly annual crops. Input and tillage factors are also applied to estimate carbon stock changes. Land-use factor was estimated relative to use of full tillage and nominal ('medium") carbon input levels.
			Moist	0.69	± 12%	
		Tropical	Dry	0.58	± 61%	
			Moist/ Wet	0.48	± 46%	
		Tropical montane[4]	n/a	0.64	± 50%	
Land use (F_{LU})	Paddy rice	All	Dry and Moist/ Wet	1.10	± 50%	Long-term (> 20 year) annual cropping of wetlands (paddy rice). Can include double-cropping with non-flooded crops. For paddy rice, tillage and input factors are not used.
Land use (F_{LU})	Peren-nial/ Tree Crop	All	Dry and Moist/ Wet	1.00	± 50%	Long-term perennial tree crops such as fruit and nut trees, coffee and cacao.
Land use (F_{LU})	Set aside (< 20 yrs)	Tempe-rate/ Boreal and Tropical	Dry	0.93	± 11%	Represents temporary set aside of annually cropland (e.g., conservation reserves) or other idle cropland that has been revegetated with perennial grasses.
			Moist/ Wet	0.82	± 17%	
		Tropical montane[4]	n/a	0.88	± 50%	

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SOIL CONSERVATIVE PRACTICES

Tillage (F_{MG})	Full	All	Dry and Moist/ Wet	1.00	NA	Substantial soil disturbance with full inversion and/or frequent (within year) tillage operations. At planting time, little (e.g., <30%) of the surface is covered by residues.
Tillage (F_{MG})	Re-duced	Tem-perate/ Boreal	Dry	1.02	± 6%	Primary and/or secondary tillage but with reduced soil disturbance (usually shallow and without full soil inversion). Normally leaves surface with >30% coverage by residues at planting.
			Moist	1.08	± 5%	
		Tropical	Dry	1.09	± 9%	
			Moist/ Wet	1.15	± 8%	
		Tropical montane[4]	n/a	1.09	± 50%	
Tillage (F_{MG})	No-till	Temperat e/ Boreal	Dry	1.10	± 5%	Direct seeding without primary tillage, with only minimal soil disturbance in the seeding zone. Herbicides are typically used for weed control.
			Moist	1.15	± 4%	
		Tropical	Dry	1.17	± 8%	
			Moist/ Wet	1.22	± 7%	
		Tropical montane[4]	n/a	1.16	± 50%	

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SOIL CONSERVATIVE PRACTICES

Factor value type	Level	Temper-ature regime	Moist-ure regime[1]	IPCC defaults	Error[2,3]	Description
Input (F_I)	Low	Tem-perate/ Boreal	Dry	0.95	± 13%	Low residue return occurs when there is due to removal of residues (via collection or burning), frequent bare-fallowing, production of crops yielding low residues (e.g., vegetables, tobacco, cotton), no mineral fertilization or N-fixing crops.
			Moist	0.92	± 14%	
		Tropical	Dry	0.95	± 13%	
			Moist/ Wet	0.92	± 14%	
		Tropical montane[4]	n/a	0.94	± 50%	
Input (F_I)	Med-ium	All	Dry and Moist/ Wet	1.00	NA	Representative for annual cropping with cereals where all crop residues are returned to the field. If residues are removed then supplemental organic matter (e.g., manure) is added. Also requires mineral fertilization or N-fixing crop in rotation.
Input (F_I)	High with-out manure	Tem-perate/ Boreal and Tropical	Dry	1.04	± 13%	Represents significantly greater crop residue inputs over medium C input cropping systems due to additional practices, such as production of high residue yielding crops, use of green manures, cover crops, improved vegetated fallows, irrigation, frequent use of perennial grasses in annual crop rotations, but without manure applied (see row below).
			Moist/ Wet	1.11	± 10%	
		Tropical montane[4]	n/a	1.08	± 50%	
Input (F_I)	High – with manure	Tem-perate/ Boreal and Tropical	Dry	1.37	± 12%	Represents significantly higher C input over medium C input cropping systems due to an additional practice of regular addition of animal manure.
			Moist/ Wet	1.44	± 13%	
		Tropical montane[4]	n/a	1.41	± 50%	

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PROPOSAL OF LONG-TERM IMPROVEMENTS

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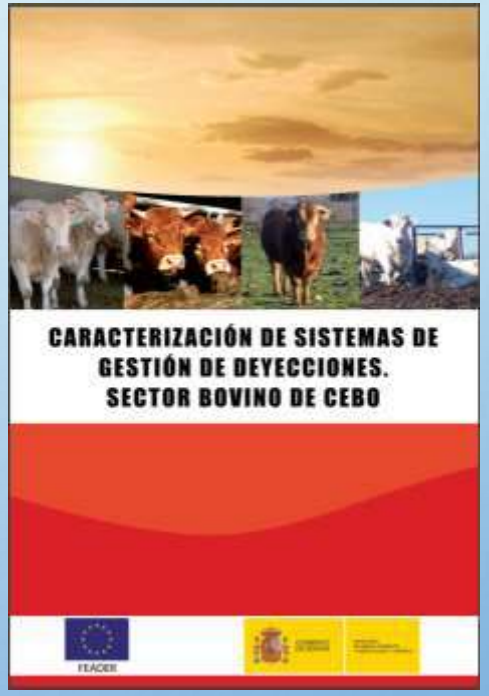
SURVEY ON MANURE MANAGEMENT SYSTEMS

- Manure management systems (MMS) are key for the estimation of CH4 and N2O emissions in farms
- MMS are really **country-specific** and change between animals and, sometimes, even region
- **EFs** of the different MMS can be **20 times smaller or even zero**
- MMS and their percentage in 1990 is probably different to the current use. Therefore, it is not enough with knowing the current situation
- **Simple option**: Survey amongst the livestock departments in the universities to obtain expert judgement
- **Proper option**: based on a well designed survey in the farms for the current situation and expert judgement in the past
- It is key to take into account in the survey the different EFs
- Information has to cover **all animals**, but be more focussed in cattle and swine



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NEW LULUCF MAP

- CURRENTLY USING THE SUMMARY TABLES OF **CORINE LAND COVER**
  - STRENGTHS OF CLC: CONSISTENT BETWEEN VERSIONS AND WITH SEVERAL AVAILABLE MAPS
  - WEAKNESSES OF CLC: HUGE MINIMUM POLYGON (25 HA) THAT CREATES PROBLEMS IN IDENTIFYING CHANGES.
- IPCC ALLOWS THE USE OF ANY OF THE 3 APPROACHES
- HOWEVER, THE **NEW EU LULUCF REGULATION** CLEARLY STATES THE NEED OF USING APPROACH 3 (SPATIALLY EXPLICIT MAPS)
  - ACCORDING TO IPCC BOTH WALL-TO-WALL MAPS AND SAMPLING PLOTS MAPS ARE OK. HOWEVER, THERE ARE SOME CONTROVERSY (RIGHT NOW) ABOUT WHAT IT IS IN LINE WITH THE EU LULUF REGULATION
- **CREATING NEW MAPS IS NOT CHEAP AND TAKES TIME**, SO IT IS KEY TO DO IT PERFECTLY THE FIRST TIME
- **RECOMMENDATION**: WAIT UNTIL IT IS CLEAR IF USING SAMPLING PLOTS IS OK AND THEN LAUNCH A PROJECT TO (FIRST) DESIGN AND (LATER) IMPLEMENT THE NEW LULUCF MAP OF SERBIA.

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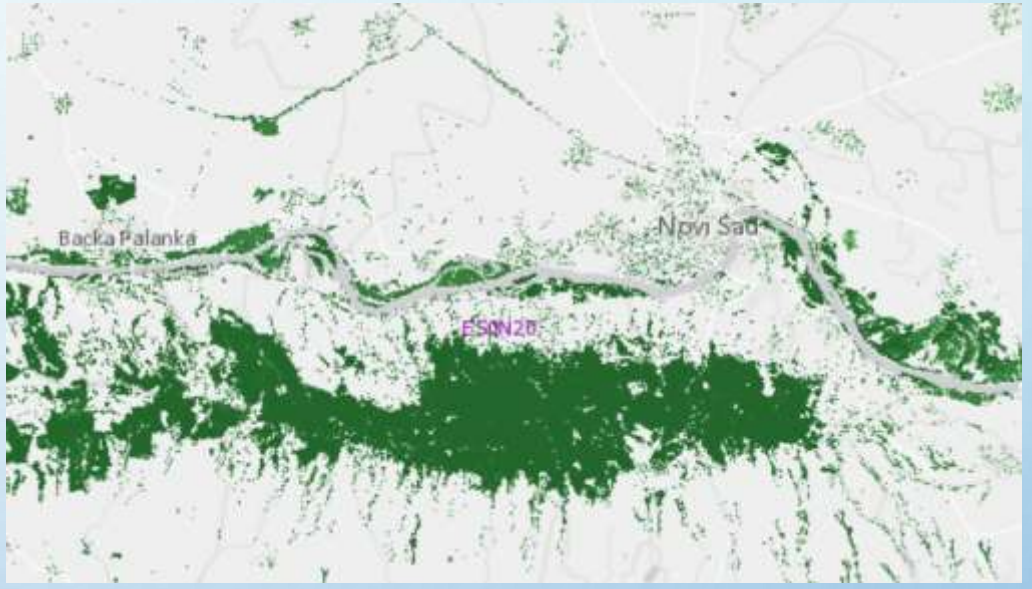
PANEUROPEAN PROJECTS

JRC Forest Cover Map 1990-2000-2006 (FOREST project – FISE)
Forest Type – Status Maps (Copernicus High Resolution Layers)
Hansen Global Forest Change v1.6 (2000-2018)
Grasslands – Status Maps (Copernicus High Resolution Layers)
Corine Land Cover Plus, CLC+
European Forest Fire Information System – EFFIS
MODIS Global Burned Area Product



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QUESTIONS AND ANSWERS

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THANK FOR YOUR ATTENTION!!!