

## Regional Training Seminar on assessment of GHG Inventories in Agriculture

### Montenegro

**Mr Duško Mrdak**

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This Project is funded by the European Union



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## Overview of National system

- Environmental Protection Agency of Montenegro - the institution responsible for conducting gas inventory
- Creation of gas and pollutant inventory by EPA was prescribed by national legislation and ratified international treaties – Convention on Long Range Trans-boundary Air Pollution (CLRTAP) and the United Nations Framework Convention on Climate Change (UNFCCC)
- EPA Montenegro calculates emissions and sinks in forestry using data in possession of the Forest Administration under the Ministry of Agriculture and Rural Development, and the Statistical Office of Montenegro-Monstat
- EPA Montenegro employs three people for conducting gas inventory, as part of the Department for Monitoring, Analysis and Reporting; Mr Duško Mrdak is delegated the sector of agriculture, forestry and Other Land Use (AFOLU)



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## Completeness

- The First Biennial Update Report (BUR) was drafted according to instructions from the IPCC Guidelines 2006, in cooperation with the UNDP
- The 2006 IPCC Guidelines for National GHG Inventories was used
- The report includes recalculated data for the period 1990-2011, and calculations for 2012 and 2013
- Emissions produced by the Agriculture Sector include the following GHG: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>
- Data for the Agriculture were done as part of the new AFOLU sector, and the total sink for this sector in 2013 is -1.941,37 Gg CO<sub>2</sub> eq



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## Completeness

Table 5 Total GHG Emissions Expressed as CO<sub>2</sub> eq, by Sector, for the Period 1990-2013 (Gg)

Year	Energy (Gg CO <sub>2</sub> eq)	Industrial Processes (Gg CO <sub>2</sub> eq)	Agriculture and Land Use (Gg CO <sub>2</sub> eq)	Waste (Gg CO <sub>2</sub> eq)	Total Emissions With Sinks (Gg CO <sub>2</sub> eq)	Total Emissions Without Sinks (Gg CO <sub>2</sub> eq)
1990	2,352.61	2,272.87	-987.83	19.618	3,657.27	5,238.52
1991	2,450.28	2,909.18	-691.16	34.97	4,703.27	5,985.49
1992	1,809.33	1,891.39	-1504.53	45.41	2,235.27	4,293.39
1993	1,602.90	709.60	-1,974.81	57.43	418.00	2,923.52
1994	1,428.09	94.12	-1,946.76	68.97	-364.57	2,121.89
1995	825.24	2,272.87	-1,263.66	80.39	1,914.84	3,742.74
1996	1,842.40	294.48	-1,592.61	91.69	635.96	2,788.23
1997	1,850.80	1,547.59	-1,855.69	105.17	1,647.87	4,043.37
1998	2,259.86	1,471.88	-1,882.02	116.04	1,965.76	4,380.87
1999	2,332.16	1,648.27	-1,895.22	126.57	2,211.78	4,640.09
2000	2,427.50	2,046.92	-1,921.70	136.79	2,689.51	5,156.55
2001	2,013.42	2,173.09	-1,831.38	146.02	2,501.15	4,847.49
2002	2,517.68	2,223.86	-2,171.93	154.39	2,724.00	5,415.80
2003	2,427.77	1,846.00	-1,771.35	161.92	2,664.34	4,962.67
2004	2,388.09	1,665.62	-1,367.44	168.61	2,854.88	4,726.41
2005	2,200.89	1,544.11	-1,730.85	174.48	2,188.63	4,278.82
2006	2,356.22	1,635.67	-1,044.51	179.63	3,127.01	4,519.17
2007	2,293.34	1,769.81	-2,042.20	184.25	2,205.20	4,628.58
2008	2,904.72	930.08	-1,907.74	188.21	2,115.27	4,355.32
2009	1,979.14	572.38	-2,080.66	190.26	661.12	3,009.31
2010	2,725.54	722.66	-1,725.92	193.65	1,915.93	3,904.95
2011	2,768.15	765.59	-1,583.79	197.41	2,147.36	4,017.89
2012	2,684.24	398.94	-1,754.26	200.49	1,529.41	3,571.94
2013	2,415.87	282.93	-1,941.39	199.26	956.67	3,178.28

## Completeness

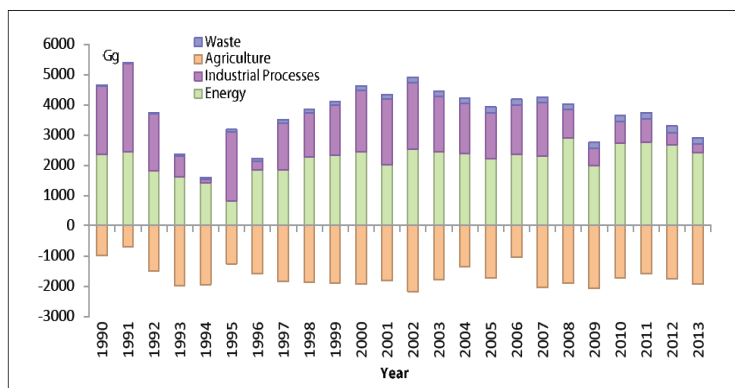


Figure 8 GHG Emissions Presented as CO<sub>2</sub> eq, by Sector, 1990-2013 (Gg)

## Data sources and identified gaps

- MONSTAT data was used to assess GHG emissions from the agriculture sector
- Data from the statistical yearbook (MONSTAT), records from the Forestry Administration of Montenegro and data from the National Forest Inventory of Montenegro (2010) were used to estimate sinks



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### **Data sources and identified gaps**

- According to MONSTAT data, the surface area of agricultural land in Montenegro was 517.136 ha in 1990, while in the surface area of used agricultural land was 223 131 ha in 2013

### **Data sources and identified gaps**

- The National Forest Inventory of Montenegro is the first professional record that provides data on forestry in Montenegro, in accordance with the standards of countries that have a long tradition in forestry management. The key quantitative findings of the NFI are that forests cover 59.9% of the total land area, that forest land covers 9.8% of total land area, and that forests and forest land together cover 69.7% of the total land area of Montenegro

## Data sources and identified gaps

- Data on the number of livestock, sheep, goats, horses, pigs and cattle were obtained from the inventory of agriculture from Monstat. Using this data, CH<sub>4</sub> emissions from enteric fermentation and manure management
- Data on forest area burnt during the year was obtained from the Forest Administration
- For the purpose of BUR, data on fires for the period 1990-2013 was included
- The burning of biomass from arable land for the same period was included in the calculation
- For estimating direct N<sub>2</sub>O emissions, data on imports of nitrogen fertilizers were used, obtained from Monstat



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**Table 32 Sources and Sinks of GHG Emissions, Expressed as CO<sub>2</sub> eq From the Agriculture and Land Use Subsectors, 1990-2013 (Gg)**

Year	1990	1991	1992	1993	1994	1995	1996	1997
3 - Agriculture, Forestry and Other Land Use	-987.83	-691.16	-1,504.53	-1,974.81	-1,946.76	-1,263.66	-1,592.61	-1,855.69
3.A - Livestock	505.72	504.35	473.66	455.91	464.67	478.97	477.59	466.03
3.A.1 - Enteric Fermentation	400.79	399.71	375.19	361.08	368.00	379.57	378.42	368.06
3.A.2 - Manure Management	104.93	104.63	98.47	94.83	96.67	99.40	99.17	97.97
3.B - Land	-1,581.25	-1,282.22	-2,058.12	-2,505.51	-2,486.45	-1,827.91	-2,152.27	-2,395.49
3.B.1 - Forest Land	-1,471.46	-1,172.42	-1,946.32	-2,395.41	-2,376.35	-1,717.44	-2,041.98	-2,283.60
3.B.2 - Cropland	-109.79	-109.80	-109.79	-110.10	-110.10	-110.46	-110.29	-111.90
3.C - Aggregate Sources and Non-CO <sub>2</sub> Emissions Sources on Land	87.70	86.71	79.93	74.79	75.02	85.27	82.07	73.78
3.C.1 - Emissions From Biomass Burning	3.28	1.89	4.58	4.28	2.48	4.29	4.67	1.66
3.C.4 - Direct N <sub>2</sub> O Emissions From Managed Soils	43.89	44.21	38.32	35.45	36.66	42.45	39.82	35.84
3.C.5 - Indirect N <sub>2</sub> O Emissions From Managed Soils	22.52	22.62	20.12	18.87	19.36	21.52	20.60	18.87
3.C.6 - Indirect N <sub>2</sub> O Emissions From Manure Management	18.01	17.99	16.91	16.20	16.52	17.01	16.99	17.41
Year	1998	1999	2000	2001	2002	2003	2004	2005
3 - Agriculture, Forestry and Other Land Use	-1,882.02	-1,895.22	-1,921.70	-1,831.38	-2,171.93	-1,771.35	-1,367.44	-1,730.85
3.A - Livestock	460.02	462.89	451.15	442.25	452.26	446.31	432.20	308.53
3.A.1 - Enteric Fermentation	364.29	366.51	357.58	350.35	358.20	352.80	341.43	244.55
3.A.2 - Manure Management	95.72	96.38	93.58	91.91	94.06	93.50	90.78	63.99
3.B - Land	-2,415.11	-2,428.31	-2,467.04	-2,346.33	-2,691.81	-2,298.33	-1,871.54	-2,090.20
3.B.1 - Forest Land	-2,303.07	-2,315.58	-2,354.24	-2,243.21	-2,588.62	-2,194.81	-1,766.69	-1,973.26
3.B.2 - Cropland	-112.04	-112.73	-112.80	-103.12	-103.19	-103.52	-104.85	-116.94
3.C - Aggregate Sources and Non-CO <sub>2</sub> Emissions Sources on Land	73.08	70.21	94.19	72.70	67.61	80.67	71.89	50.81
3.C.1 - Emissions From Biomass Burning	5.07	0.78	22.20	1.72	1.46	11.88	4.25	0.52
3.C.4 - Direct N <sub>2</sub> O Emissions From Managed Soils	32.97	34.20	36.29	35.95	33.10	34.87	34.04	26.18
3.C.5 - Indirect N <sub>2</sub> O Emissions From Managed Soils	17.53	17.71	18.29	17.79	16.96	17.52	17.11	13.12
3.C.6 - Indirect N <sub>2</sub> O Emissions From Manure Management	17.50	17.53	17.41	17.24	16.09	16.40	16.49	10.99
Year	2006	2007	2008	2009	2010	2011	2012	2013

## Non-estimates (NE)

- Categories for which no calculation was done were all those concerning conversion of land, except forest land and arable land
- The Ministry of Agriculture and Rural Development, with the responsibility for the land use, does not possess data on surface area, consequently no data on its other use
- No calculation was done for the use of lime in agriculture, as well as urea application, also due to lack of input data for these activities
- There is no rice cultivation in Montenegro



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## Key categories

- The categories calculated are the forest area in hectares, from which we obtain the total CO<sub>2</sub> sink in forests of Montenegro
- The release of methane (CH<sub>4</sub>), when forests burn (forest fires), and fire-affected areas in hectares are counted
- Enteric Fermentation in livestock and manure management



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## **QA/QC Plan and Verification**

- The Plan for Quality Assurance and Control, when developing greenhouse gas inventories, is prescribed by the Rulebook on the List of Gases and Method of Developing Greenhouse Gas Inventories and Exchange of Information (Official Gazette of Montenegro 25/10). This Rulebook sets out the way that procedures should be followed to ensure data quality control, as well as providing methods for archiving inventories, complementary materials and documentation

## **QA/QC Plan and Verification**

- In line with the recommendations from the IPCC2, the inventory was verified through a series of simple checks to ensure the completeness and accuracy of data; this included checking arithmetic mistakes, comparing national statistics with international statistics and checking estimated carbon dioxide emissions from the energy sector by comparing the results obtained through the Sectoral and Reference approach

## Critical issues

- ◉ Lack of data
- ◉ The quality of existing data (the estimates were made for the surfaces)
- ◉ A relatively high percentage of uncertainty for the activities done
- ◉ Use of default emission factors and the absence of national ones
- ◉ QA/QC Plan and Verification was not carried out (QA/QC) outside of the Environmental Protection Agency by anyone else. It is planned for the 2017



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## Progress made

- ◉ The First National Forest Inventory of Montenegro, done by the Forest Administration under the Ministry of Agriculture and Rural Development
- ◉ The First Biennial Update Report (BUR) was drafted according to instructions from the 2006 IPCC Guidelines, in cooperation with the UNDP
- ◉ Project for the 3rd National Communication for Climate Change is being drafted, with certain data and categories further improved, and thus the Montenegro Report more complete and more complex



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**Thank you for your attention!**



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