



Analysis and Evaluation of Agri-environmental Indicators of Republic of Macedonia

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Environmental Indicators for Agriculture

VOLUME 3
METHODS AND RESULTS

AGRICULTURE AND FOOD

- Part I: Agriculture in the broader economic, social and environmental context
- Part II: Farm management and the environment
- Part III: Use of farm inputs and natural resources
- Part IV: Environmental impacts of agriculture

OECD



Aim of the study

- Analysis of indicators with aspect to environmental impacts of agriculture in Republic of Macedonia
- Analysed agri-environmental indicators :
 - Soil quality
 - Water quality
 - Land conservation
 - Greenhouse gases
 - Biodiversity
 - Ecosystem diversity / Wildlife habitats
 - Landscape

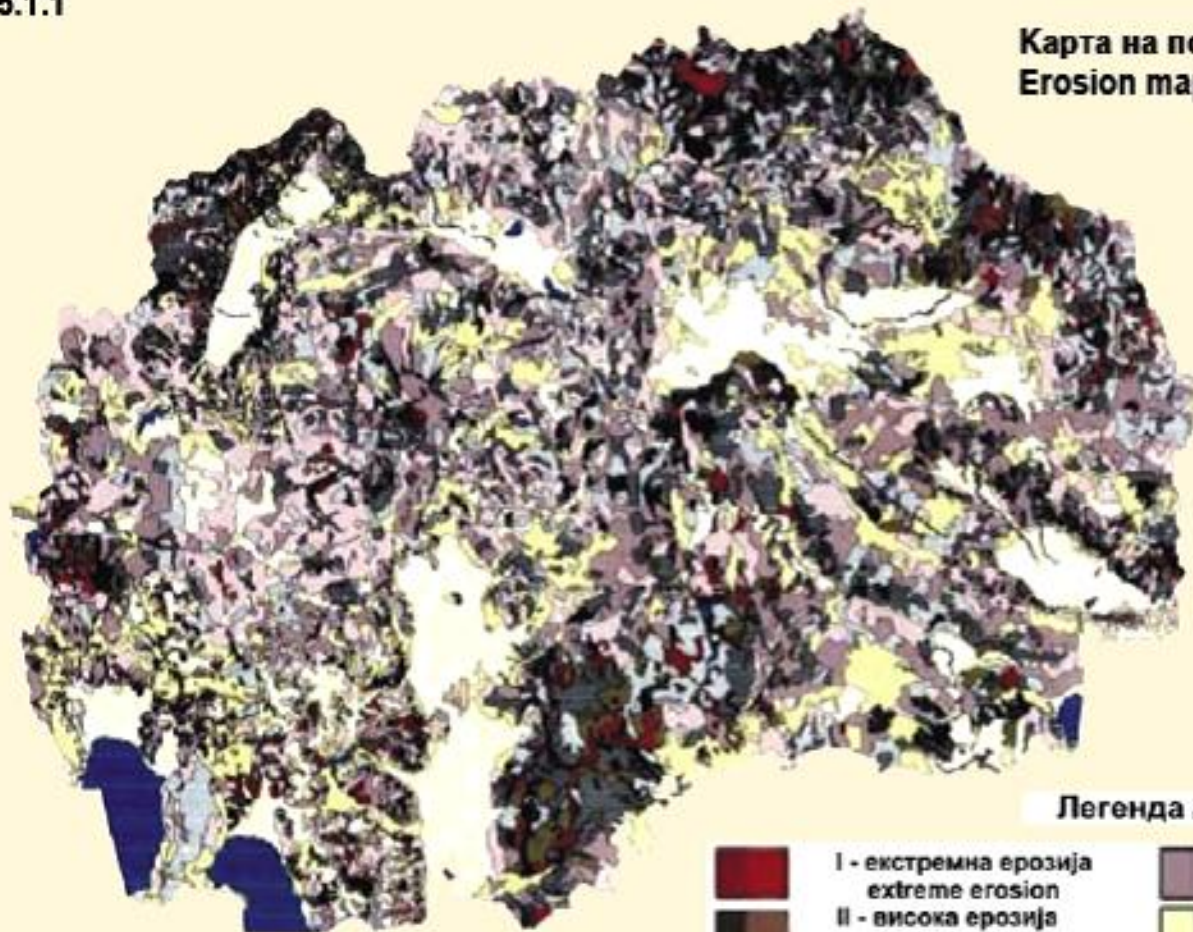


Soil quality

- **Risk of soil erosion by water**
 - Digital erosion map published in 2002
 - ~ 36.65% of the total area of the country is afflicted by the first three categories of erosion
 - 17,000,000 m³ is the average annual loss of soil every year
- **Risk of soil erosion by wind – no data available**

Карта на почвената ерозија Erosion map

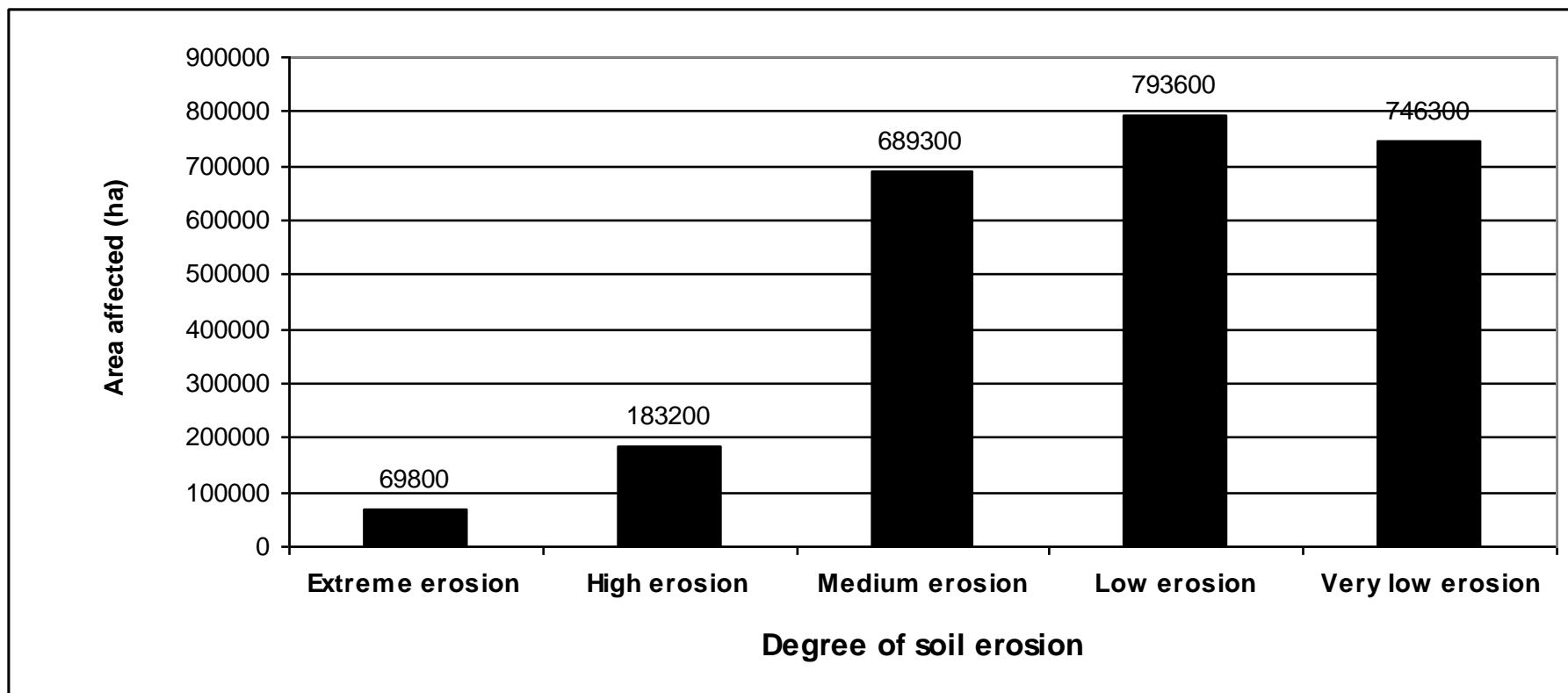
M=1:200 000



Легенда / Legend

	I - екстремна ерозија extreme erosion		IV - слаба ерозија low erosion
	II - висока ерозија high erosion		V - многу слаба ерозија very low erosion
	III - средна ерозија medium erosion		зони на седиментација zones of sedimentation

Source: Ministry of Environment and Physical Planning



Area affected by different degree of soil erosion in Republic of Macedonia



Water quality

- Evaluated by:
 - **water quality risk indicator**
 - **water quality state indicator**
- Most of the data available is referring to the urban water quality and waste water quality.
- There is no monitoring system on water quality in vulnerable agricultural areas.



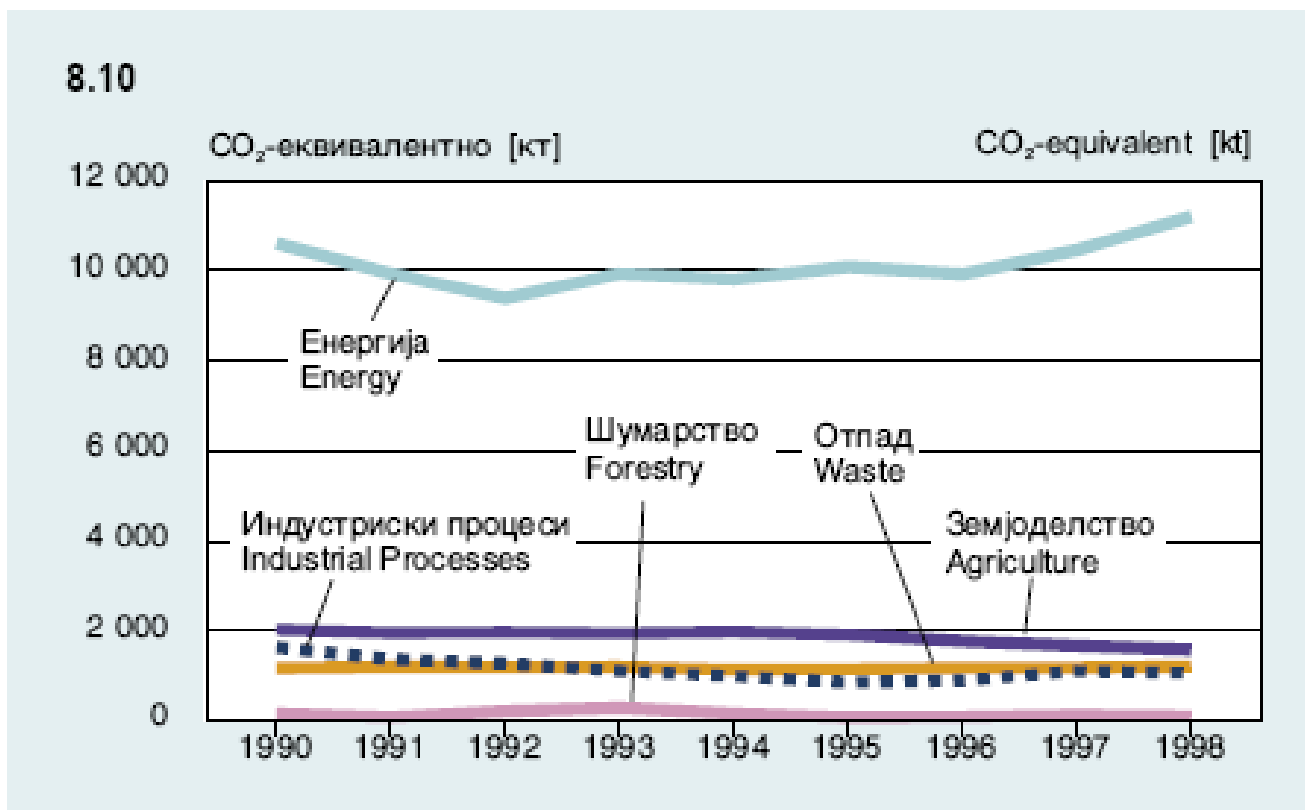
Land conservation

- The status of land conservation is analysed with the indicators
 - **water retaining capacity**
 - **off-farm sediment flow**
- 72,000 ha land is protected from flooding by protection dams;
- 7.5 millions m^3 soil are transported out of the country by the river flows;
- 3 millions m^3 are deposited in the natural and artificial water basins.



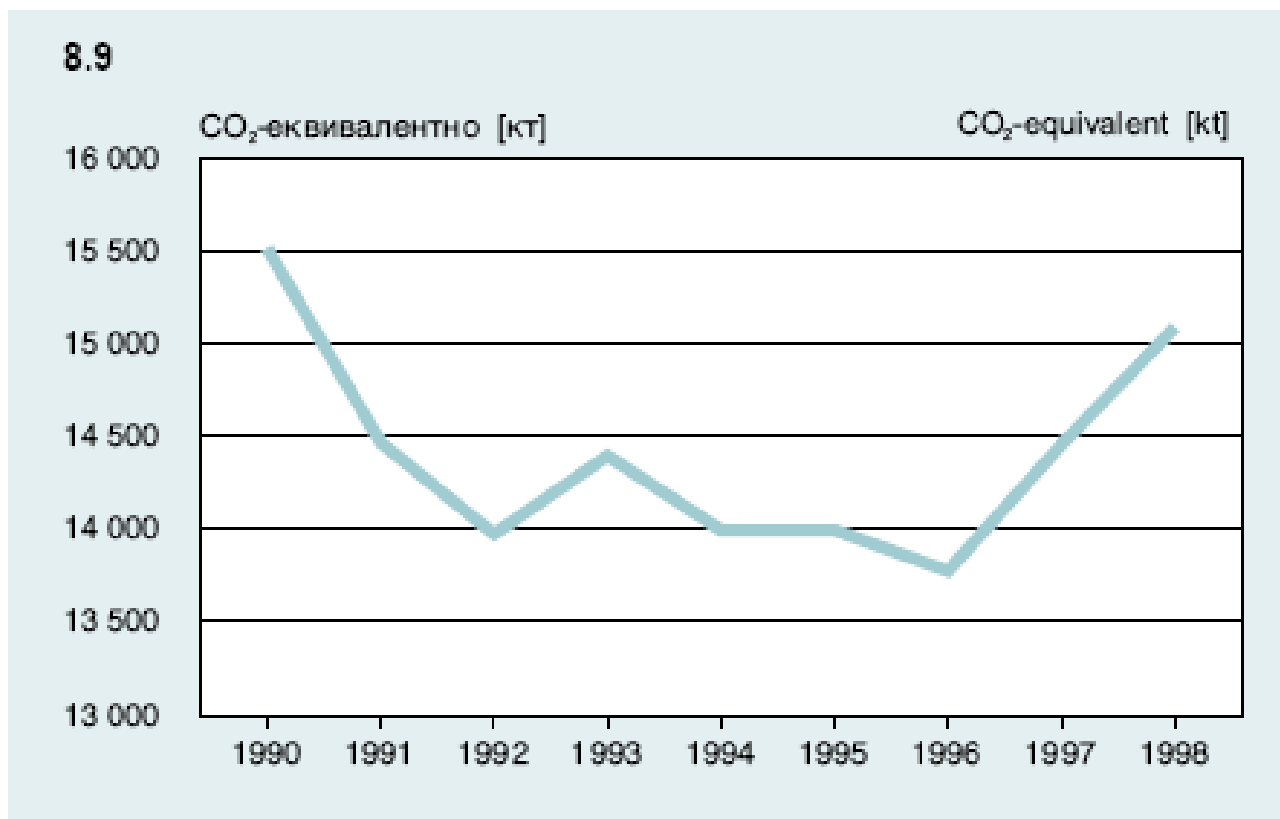
Greenhouse gases

- Agriculture is second sector in the share of total emissions, right after the energy sector
- The agriculture greenhouse gas emission registers a decline of 22% from 1990 to 1998



Source: Ministry of Environment and Physical Planning

Emission of gasses by sector in Republic of Macedonia (1990 – 1998)



Source: Ministry of Environment and Physical Planning

Total emission of gasses in Republic of Macedonia (1990 – 1998)



Genetic biodiversity

- 129 recognised domestic varieties
- 2,205 imported varieties used domestically
- Native breeds of livestock:
 - Local breed of cattle: Busha;
 - Pramenka (sheep) with three strains: Karakachanska, Ovchepolska and Sharpalaninska;
 - domestic (Balkan) goat;
 - local primitive pig;
 - sheepdog (Sharpalaninec).



Source: Country report on the state of the animal genetic resources in Republic of Macedonia



Species diversity

- Close wild relatives to the cereal and industrial crops
 - *Avena* spp.
 - *Hordeum* spp.
 - *Triticum* spp.
 - *Cannabis sativa*
 - *Papaver* spp.
- Wild relatives in fruit production are used most often, for food and rootstocks.
- Fodder crops were created by selection and cultivation of wild species.



Species diversity

- There is no national germplasm bank
- Three institutional gene banks:
 - Gene bank of Faculty of Agriculture at the Goce Delcev University - Stip,
 - Gene bank of the Agricultural Institute in Skopje,
 - Gene bank of the Institute of Rice in Kocani



**Gen bank facilities at Faculty of Agriculture, Goce Delcev University – Stip,
Republic of Macedonia**

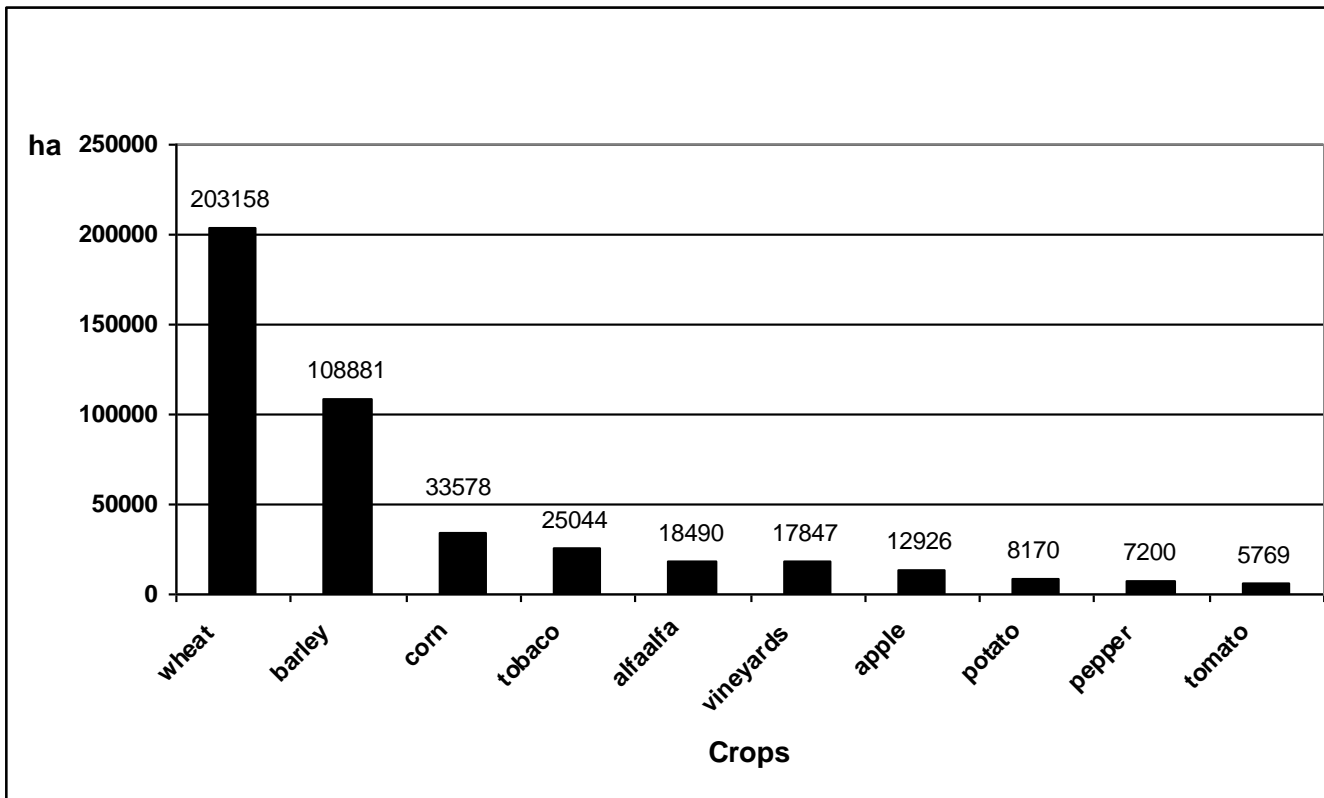


Species diversity

- There is no specific data available for **non-native species** as indicator for species diversity.
- Mostly of the non-native species threatening agri-ecosystems refer to weeds, pests and diseases that infest agricultural ecosystems.

Wildlife habitats

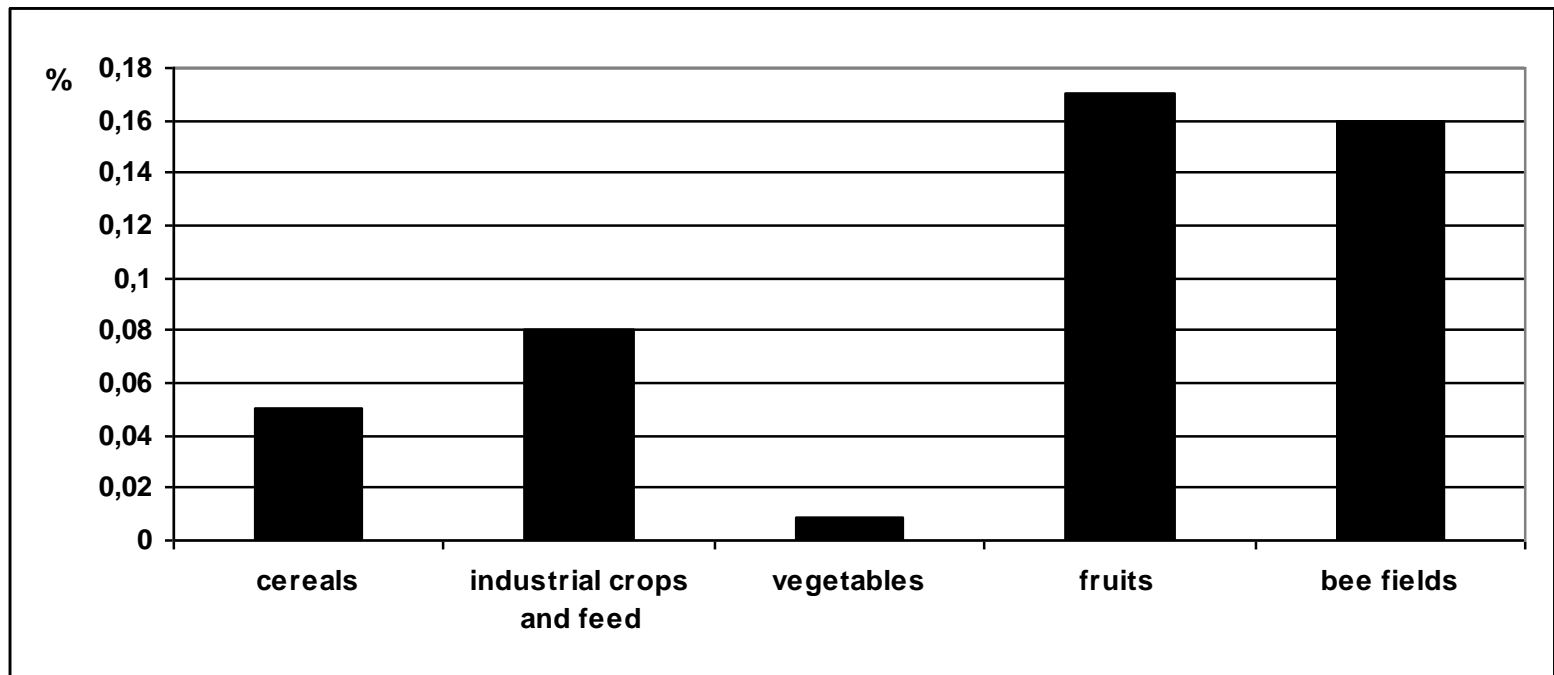
- **Intensively-farmed agricultural habitats**
 - Share of each crop in the total agricultural area



Areas under most important crops grown in 2004 in Republic of Macedonia

Wildlife habitats

- **Intensively-farmed agricultural habitats**
 - Share of organic agriculture in the total agricultural area



The share of organic sectors in the total agriculture land in Republic of Macedonia (2006)



Wildlife habitats

- **Semi-natural agricultural habitats** – there is no data available.
- **Uncultivated natural habitats**
 - the loss of natural habitats is most evident within **aquatic habitats**
 - no data available about lost of **natural forests** due to conversion into agricultural land







Wildlife habitats

- **Habitat modification through transformation**
 - as a result of artificial reservoir construction
 - the conversion of natural habitats into agricultural uses does not represent a serious threat to biodiversity



Landscape

- **Structure of landscapes**
 - Environmental features and land use patterns – declination since **1990 (633,000 ha)** to **2004 (560,000 ha)** due to abandoning of agricultural land and migration of population from rural to urban environment
 - In 2004 the agricultural land was **0.0625 ha per capita**.
- There is no specific data available on **man-made objects (cultural features) on agricultural land** resulting from human activity.



Landscape

- **Landscape management**
 - **1994:**
 - 178,000 private farms
 - 2.5 - 2.8 ha average size and fragmented field size of 0.3-0.5 ha
 - ~ 40% of the private farms are within private households with size below 2 ha fragmented to small fields.
- **Landscape costs and benefits – no data/information available for this issue indicator.**



CONCLUSION

- Measurable indicators for all issues of environmental impact of agriculture are **not available and/or partially available, descriptive and not updated.**
- Estimation and evaluation of environmental impact of agriculture in Republic of Macedonia is difficult to be performed.



CONCLUSION

- An urgent need of **good statistical tools and official reports** of the Ministry of Environment and Physical Planning and Ministry of Agriculture, Forestry and Water Management on indicators.
- An urgent need of **on-farm scientific research and scientific publications** in different environmental sectors in Republic of Macedonia.
- Well developed agri-environmental indicators will provide information on the current state and changes in the environmental impact of agriculture and they can be used for **policy monitoring, evaluation and forecasting purposes.**