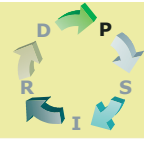


AGRICULTURE





MK - NI 025

GROSS NUTRIENT BALANCES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The balance of mineral matters enables to understand the links between nutrients used in agriculture, changes in the environment and sustainable use of soil nutrient resources. Constant surplus in mineral matters indicates potential environmental problem, while constant deficit indicates potential problem in sustainable agriculture, i.e. poses the risk of reducing the nutrients in the soil. The main determinant is the absolute value of mineral deficit/deficit related to local practice of mineral matters management in agriculture and agroecological conditions, such as soil types and weather events (rain falls, vegetation periods, etc.).

Gross nitrogen balance provides indication of the possible water contamination and identifies agricultural systems, i.e. areas loaded with excessive amounts of nitrogen.

Definition

The nutrient balance or nitrogen balance establishes the link between nutrients used in agriculture and changes in the quality of the environment, in order to achieve sustainable use of soil nutrients in terms of their input and output.

The indicator estimates the potential surplus of nitrogen on agricultural land. This is done by calculating the balance between nitrogen added to a hectare agricultural land. The indicator accounts for all inputs to and outputs from the farm. The inputs consist of the amount of nitrogen applied via mineral fertilisers and animal manure as well as nitrogen fixation by legumes, deposition from the air, and some other minor sources. Nitrogen output is contained in the harvested crops, or grass and crops eaten by livestock. Uncontrolled escape of nitrogen to the atmosphere, e.g. as N_2O from agriculture is difficult to estimate and therefore not taken into account.

Units

- The gross nitrogen balance is expressed in (kgN/year) per hectare (ha).

Policy relevance of the indicator

The gross nitrogen balance is an issue regulated by the Framework Law on Waters, which is in a phase of adoption in our country, incorporating the requirements of Nitrates Directive (91/676/EC) and Framework Water Directive (2000/60/EC). The Nitrates Directive is aimed at reducing and preventing in future the water pollution by nitrates from agricultural sources. This Directive restricts the application of manure at 170 kg N/ha/year. The goal of the Framework Water Directive is the achievement of good ecological status of surface and ground waters in





terms of quality of biological communities, hydrological characteristics and chemical characteristics.

List of relevant policy documents

The National Environmental Action Plan 2 (NEAP 2) specifies the measures for rational use of natural resources, as well as controlled use of pesticides, i.e. plant protection products, as well as the measure for establishment of soil monitoring and information system to monitor the status of pesticides consumption.

Legal grounds

The Law on Agricultural Land, in its Articles 9 and 10, specifies the measures for improved agricultural land fertility through application of agro-technical measures, hydro-amelioration, agramelioration and anti-erosion measures. Article 36 of the Law specifies that, for the purpose of agricultural land protection against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.

The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

The Law on Environment, in its Article 8, promotes the principle of sustainable development, meaning that, when undertaking or performing any activity, rationale and sustainable use of natural resources shall be taken into account, thus meeting the needs for healthy environment, as well as social and economic needs of present generations, without jeopardizing the rights of future generations to meet their own needs.

Targets

No specific targets.

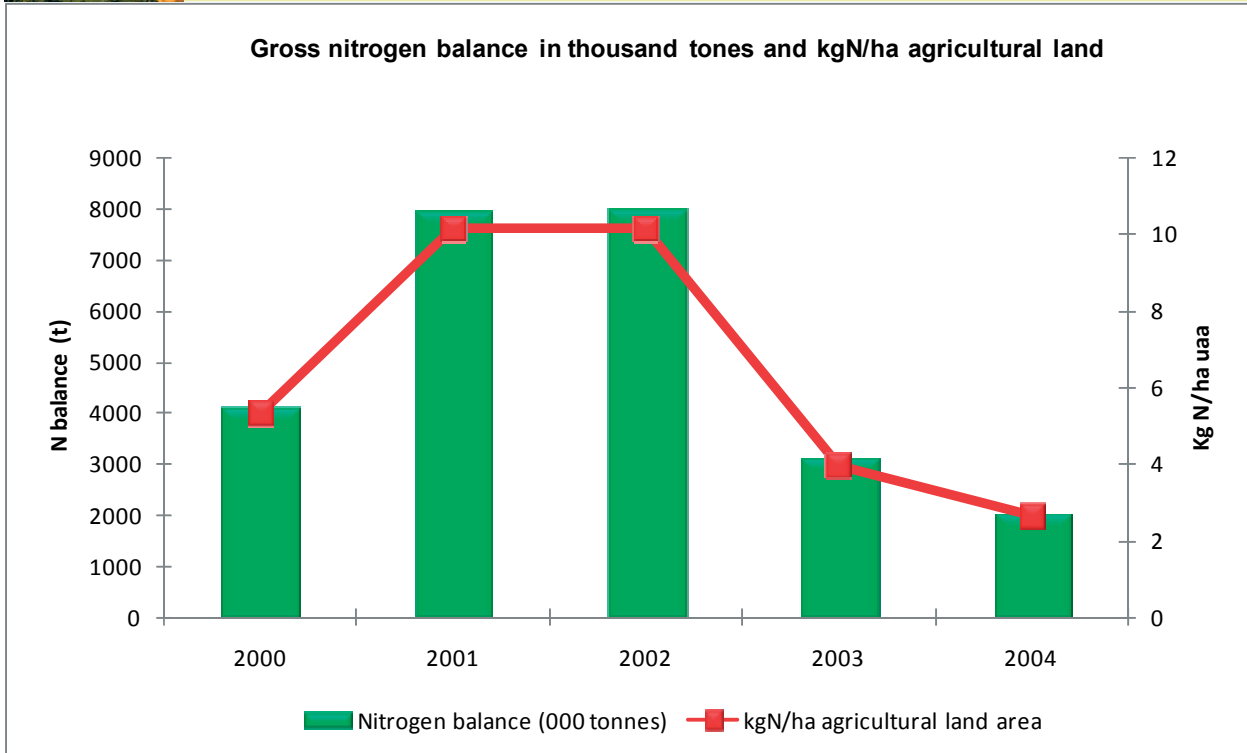
Key policy issue

Has the impact of agriculture on the environment improved?

Key message

In the period from 2000 to 2001, significant rise in gross nitrogen balance was tracked, followed by a period of stagnation, to note rapid drop in the period from 2002 to 2003 and further slight fall in the gross nitrogen balance expressed both in thousand tonnes and kilograms nitrogen per hectare agricultural land (kgN/ha). Constant surplus in nitrogen balance indicates potential environmental problems, while constant deficit indicates potential risk of reduced nutrients in the soil.





Methodology

- Methodology for the indicator calculation

Methodology for the indicator calculation has been taken from OECD/Eurostat national nutrient balances, which takes into account all input and output matters in the farm.

Input nitrogen matters consist of:

1. Total amount of applied fertilizers
 - Inorganic fertilizers
 - Organic fertilizers (manure excluded)
2. Manure
3. Nitrogen fixation by legumes
4. Deposition from the air
5. Other minor sources (semen and other reproductive material)

Output nitrogen matters include:

1. Harvested crops placed on the market, including also forage crops
2. Grass and crops eaten by livestock

Uncontrolled escape of nitrogen to the atmosphere in a form of N_2O from agriculture is difficult to estimate and therefore not taken into account.

- Source of applied methodology

OECD/Eurostat Gross Nitrogen Balances Handbook (12/2003)





Data specification

Title of the indicator	Source	Reporting obligation
Gross nutrient balance	– Statistical Yearbook 2005, State Statistical Office	
	– Calculation of the gross nitrogen balance was made by the Faculty of Agricultural Science and Food, University of “St. Cyril and Methodius”, Skopje	

Data coverage (by years):

Table 1: Gross nitrogen balance expressed in thousands tones and kgN/ha agricultural land in the period 2000 - 2004

	2000	2001	2002	2003	2004
Nitrogen balance (000 tonnes)	4117	7956	7978	3111	2053
kgN/ha agricultural land area	5,33	10,12	10,11	3,96	2,66

Table 2: Nitrogen input in agriculture, 2000 - 2004

Nitrogen input in thousands tones	2000	2001	2002	2003	2004
Via mineral fertilizers	11798	17289	18716	12999	15072
Via manure	13846	13385	13117	13097	13234
Biologically fixated nitrogen	2094	2160	1783	2232	2214
Total	27738	32834	33616	28328	30520

Table 3: Nitrogen output from agriculture, 2000 - 2004

Nitrogen output in thousands tones	2000	2001	2002	2003	2004
Contribution by market non-forage and forage crops	8571	7381	7894	7124	9916
Contribution by non-market forage crops and pastures (harvested- grazed)	15050	17498	17745	18103	18551
Total	23621	24878	25638	25217	28467

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 025	Gross nutrient balance	CSI 025	Gross nutrient balance	P	A	agriculture water	3 - annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2000 - 2004

Frequency of data collection: annually





Uncertainty

■ Methodological uncertainty

Data used in the calculation of this indicator has been partially based on estimates by experts, using harmonized methodology which might not always reflect specific circumstances in our country, Certain coefficients used in calculations differ significantly from country to country. Data on nitrogen input is considered more adequate and more comprehensive than on the output. Uncertainty is present with regard to harvested forage crops, as well as grass crops eaten by livestock.

Based on the above, data on gross nitrogen balance in our country should be taken with certain extent of precaution.

■ Uncertainty of data sets

Data on the amounts of applied manure are accompanied by certain extent of uncertainty, and statistical data on semen and other reproductive material, as well as data on grass crops eaten by livestock, i.e. those that are not placed on the market, should be taken by certain extent of uncertainty, too.

Future activities

■ Short-term activities

- Establishment of Work Group with a task to define, elaborate and develop the indicator in full..

a. Description of the activity

- Definition, elaboration and full development of the indicator..

b. Required resources

- Experts in the area of environment, agriculture and other relevant fields.

c. Status

- In progress

Deadline: June 2008

■ Long-term activities

Long-term activities are to be defined by the Work Group.





MK - NI 026

AREAS UNDER ORGANIC FARMING

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The need to select this indicator is related to the specific nature of organic farming which is distinct from other manners of farming in the application of certain standards, production rules, certification procedures, specific labeling, as well as products placement on specific market. Farming is considered organic if it complies with the Law on Organic Farming and regulations that are in a process of adoption. The provisions of this Law have been harmonized with international and European ones, especially with EU Regulation No.2092/91, because of the future development of trade exchange of organic products with European countries. Organic farming has been developed in order to be sustainable from environmental point of view, while observing clearly verified rules.

Definition

Organic agriculture is a production system reducing or eliminating the use of GMOs and input of synthetic chemicals such as synthetic chemical fertilizers, pesticides, hormones and growth regulators in agriculture. Instead, the use of good practices in the agro-ecosystem management for crop and livestock production is promoted. Organic farming differs from conventional in the application of production rules, labelling schemes and certificates.

The indicator is calculated as share (percentage) of area under organic farming (sum of existing areas under organic farming and areas in a process of conversion for organic farming) in the total area or total cultivable land area.

Units

The indicator is presented as sum of area under organic farming and area being converted for organic farming, measured in ha. Share of organic farming is given as a percentage of total utilized agricultural area.

Policy relevance of the indicator

Legal grounds

The framework for the organic farming is established by the Law on Organic Farming and regulations which are in a process of adoption. The provisions of this Law have been harmonized with international and European ones, especially with EU Regulation No.2092/91, which is of particular importance in the context of future development of trade exchange in organic products with European countries. Officially, the organic (ecological or biological) farming started in 2005 under the Programme for encouraging and development of organic agricultural production for 2005.





Targets

No specific targets have been set.

Key policy issue

Which are the key trends in agricultural production systems from environmental point of view?

Key message

In 2005, the share of the area under organic farming in the Republic of Macedonia amounted 0.049% and 0.060% area under conversion in the total cultivable land. Out of the total agricultural land area, 0.127% of the area was used for organic farming, including also forest areas, pastures and uncultivated land and 0.027% area under conversion.

	total in ha	as % of total utilized agricultural area
Total utilized agricultural area	545.514,00	100%
Utilized organic area	266,00	0,049%
Area in a process of conversion	326,54	0,060%
	total in ha	as % of total utilized agricultural area
Agricultural area	1.229.150,00	100%
Utilized agricultural area + Forest organic area, pastures, uncultivated land	1.566,00	0,127%
Area in a process of conversion	326,54	0,027%

Methodology

- Methodology for the indicator calculation

The indicator is presented as sum of area under organic farming and area being converted for organic farming, divided by the total cultivable land area or total agricultural area. This value is multiplied by 100 in order to present the value in percentage.

- Source of applied methodology

The method of the European Environmental Agency.





Data specification

Title of the indicator	Source	Reporting obligation
Areas under organic farming	<ul style="list-style-type: none"> – State Statistical Office – Ministry of Agriculture, Forestry and Water Economy, Division of Organic farming. 	

Data coverage (by years):

Table 1: Total utilized agricultural area and total agricultural area in 2005

Utilized agricultural area in ha	Total agricultural area in ha
545 514	1 229 150

Table 2: Areas under organic farming in 2005

Production areas under organic farming in ha	Forest land areas, pastures, uncultivated organic land in ha	Area under conversion in ha
266	1 300	326,54

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 026	Area under organic farming	CSI 026 IRENA 07	Area under organic farming	R	A	agriculture biological diversity	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2005

Frequency of data collection: annually

Uncertainty

- Methodological uncertainty

Impossibility to observe the trend due to the lack of data for several years.

Future activities

- Short-term activities
 - Establishment of Work Group with a task to define, elaborate and develop the indicator in full..
 - a. **Description of the activity**
 - Definition, elaboration and full development of the indicator..





b. Required resources

- Experts in the area of environment, agriculture and other relevant fields.

c. Status

- In progress

Deadline: June 2008

■ Long-term activities

- Long-term activities are to be defined by the Work Group.





MK - NI 08

MINERAL FERTILIZER CONSUMPTION

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of mineral fertilizers.

Definition

Mineral fertilizers are substances containing chemical elements required for plants growth, especially nitrogen, phosphorus and potassium.

This indicator shows the consumption of mineral fertilizers in the Republic of Macedonia, by presenting total amounts in tonnes consumed substances, and their application per hectare cultivated land area.

Units

- Total amounts in tonnes consumed mineral fertilizers, and their application per hectare cultivated land area (kg/ha).

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of mineral fertilizers. The same document also specifies the measure for establishment of monitoring and information system for soil, to monitor the mineral fertilizers consumption.

Legal grounds

The Law on Agricultural Land in its Articles 9 and 10 specifies the measures for improved agricultural land fertility through undertaking of agrotechnical measures, one of them being fertilizers application. Article 31 concerning agricultural land protection against pollution and contamination specifies that the protection of agricultural land against pollution and contamination is performed by prohibition, restriction and prevention of direct input of harmful matters in soil, input of harmful matters through water and air and undertaking of other measures for its productivity maintenance and improvement. Article 36 of the Law specifies that, for the purpose of agricultural land protection against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.





The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

Targets

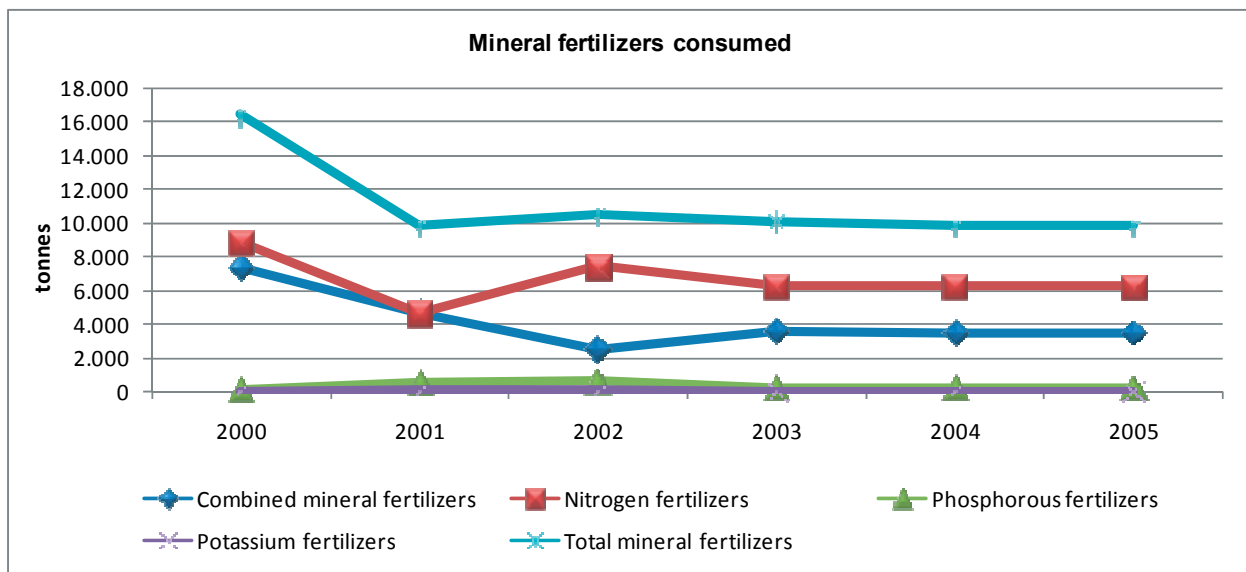
No specific targets.

Key policy issue

Has the impact of agriculture on the environment improved?

Key message

Mineral fertilizer consumption in agriculture noted a falling trend in the period from 2000 to 2005. Consumption of nitrogen mineral fertilizers dropped by 29.8%. Consumption of potassium fertilizers dropped by 92.3%. Consumption of combined mineral fertilizers dropped by 53%, while the total consumption of mineral fertilizers dropped by 39.7%. Consumption of phosphorus fertilizers only increased by 31%.



Assessment

It is difficult to connect the reduction in mineral fertilizers consumption directly with the impact on the quality of the environment. The ultimate effect on the quality of environment depends to a great extent on other factors, such as use of organic fertilizer, yield from crops, soil types, management of agricultural farms, etc.

Methodology

- Methodology for the indicator calculation

Consumption of individual groups of mineral fertilizers as combined mineral fertilizers, nitrogen fertilizers, phosphorous fertilizers, potassium fertilizers, as well as total mineral fertilizers per





hectare utilized agricultural area is obtained by dividing the total quantity of consumed group of mineral fertilizers in kg by the total utilized agricultural area presented in ha.

Data specification

Title of the indicator	Source	Reporting obligation
Mineral fertilizer consumption	– Statistical Yearbook, 2006, State Statistical Office	

Data coverage (by years):

Table 1: Mineral fertilizers consumption, 2000 - 2005 (in tonnes)

Year	Combined mineral fertilizers	Nitrogen fertilizers	Phosphorous fertilizers	Potassium fertilizers	Total mineral fertilizers
2000	7409	8833	161	13	16416
2001	4732	4625	515	81	9953
2002	2536	7386	618	53	10593
2003	3588	6250	234	2	10074
2004	3498	6217	213	3	9931
2005	3488	6200	211	1	9900

Table 2: Total utilized agricultural area in thousand hectares (ha), 2000 - 2005

	2000	2001	2002	2003	2004	2005
Total utilized agricultural area in thousand ha	598	612	577	569	560	546

Table 3: Mineral fertilizers consumed per utilized agricultural area (kg/ha)

	2000	2001	2002	2003	2004	2005
Mineral fertilizers consumed per utilized agricultural area (kg/ha)	27,45	16,26	18,35	17,7	17,73	18,13

General meta data

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 08	Mineral fertilizer consumption	IRENA 08	Mineral fertilizer consumption	D		Agriculture	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2000-2005

Frequency of data collection: annually





Uncertainty

- **Uncertainty of data**

Data on the quantity of consumed mineral fertilizers contains certain extent of uncertainty, especially when originating from private sector. Some of the values have been obtained by estimation.

Future activities

- **Short-term activities**

- Establishment of Work Group with a task to define, elaborate and develop the indicator in full.

- a. Description of the activity**

- Definition, elaboration and full development of the indicator.

- b. Required resources**

- Experts in the area of environment, agriculture and other relevant fields.

- c. Status**

- In progress.

- Deadline: June 2008**

- **Long-term activities**

- Long-term activities are to be defined by the Work Group





MK - NI 09

CONSUMPTION OF PESTICIDES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

In order to preserve and revive the existing biological diversity in a state of natural balance and prevent harmful activities in agriculture that may result in disruption in nature, it is necessary to monitor the application of plants protection products.

Definition

Plants protection products or pesticides are chemical substances which restrain diseases and pests in plants. This indicator shows the quantities of pesticides used for plants protection, such as fungicides, herbicides, insecticides and category of total including, apart from the mentioned ones, other plant protection products.

Units

- Total quantities of used substances in tones, share of different groups of pesticides, as well as their application per hectare utilized agricultural area (kg/ha).

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of pesticides, i.e. plant protection products. The same document also specifies the measure for establishment of monitoring and information system for soil, to monitor the pesticides consumption.

Legal grounds

The Law on Agricultural Land in its Articles 9 and 10 specifies the measures for improved agricultural land fertility through undertaking of agro-technical measures, hydro-amelioration, agramelioration and anti-erosion measures. One of the agrotechnical measures is control of weeds, diseases and pests. Article 31 concerning agricultural land protection against pollution and contamination specifies that the protection of agricultural land against pollution and contamination is performed by prohibition, restriction and prevention of direct input of harmful matters in soil, input of harmful matters through water and air and undertaking of other measures for its productivity maintenance and improvement. Article 36 of the Law specifies that, for the purpose of agricultural land protection against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.





The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

The Law on Plants Protection, in its Article 1, regulates the protection of plants against diseases, pests and weeds, as well as use of plant protection products. Article 38 specifies that producers of plant protection products are obliged to keep records of quantities of products produced and released for trade, while legal persons importing such products from foreign producers are obliged to keep records of quantities of products imported and released for trade in the Republic of Macedonia.

Targets

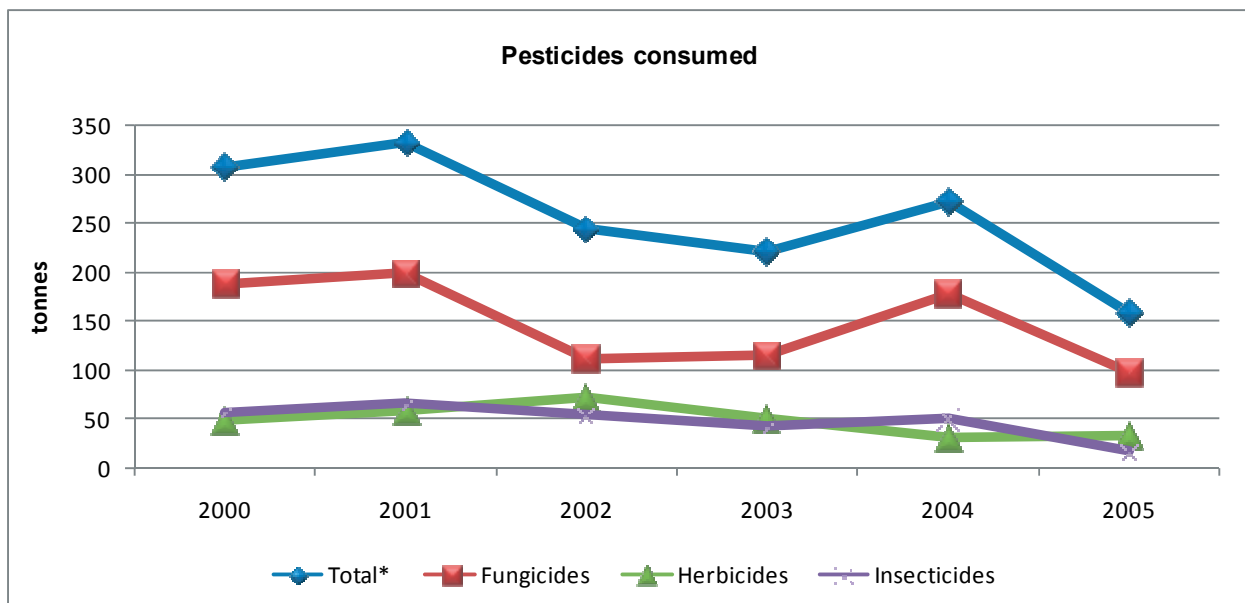
No specific targets.

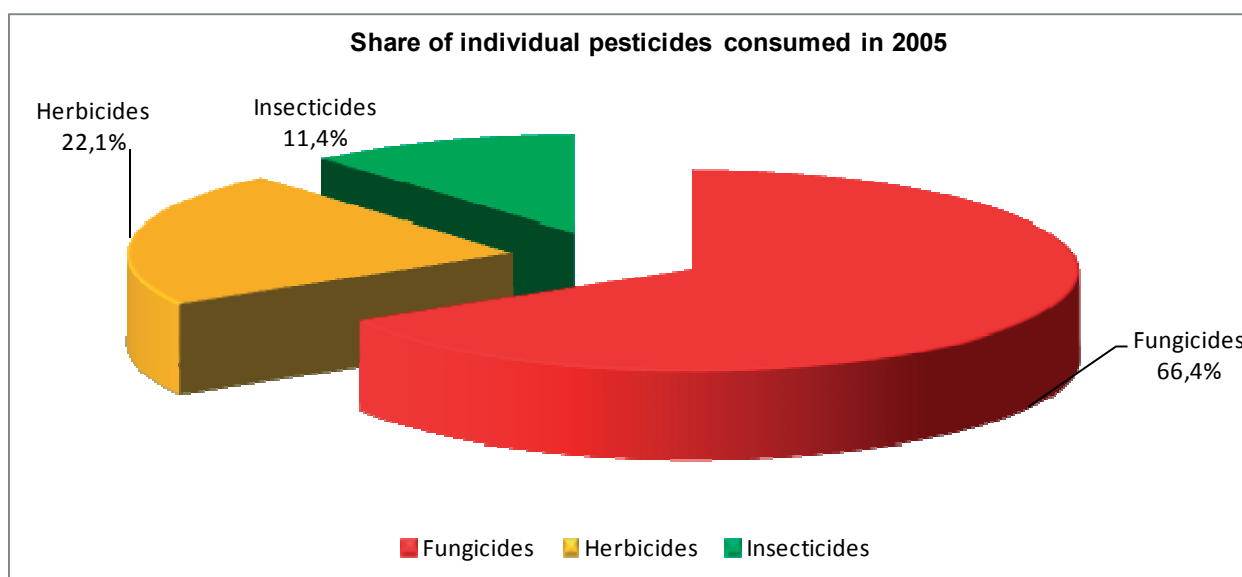
Key policy issue

Has the impact of agriculture on the environment improved?

Key message

Application of pesticides in agriculture, including all plant protection products, like fungicides, herbicides, insecticides and total quantity shows a trend of slight reduction in quantity consumed in the Republic of Macedonia in the period between 2000 and 2005, with an exception of 2001 when increase in quantities consumed was recorded. In terms of share of pesticides in 2005, the highest quantity consumed was of fungicides by 67%, followed by insecticides with 11% and herbicides with 22%.





Methodology

- Methodology for the indicator calculation

The share of different pesticide groups as fungicides, herbicides and insecticides is obtained when the quantity of each group is divided by the total quantity of consumed pesticides, and then the value obtained is multiplied by 100. The application of individual group per hectare utilized agricultural area is obtained when the total quantity of consumed pesticides expressed in kg is divided by the total utilized agricultural area in the Republic of Macedonia expressed in ha.

Data specification

Title of the indicator	Source	Reporting obligation
Consumption of pesticides	– Statistical Yearbook, 2006, State Statistical Office	

Data coverage (by years):

Table 1: Total utilized agricultural area in thousand hectares (ha), 2000 - 2005

	2000	2001	2002	2003	2004	2005
Total utilized agricultural area in thousand ha	598	612	577	569	560	546





Table 2: Consumed pesticides, 2000 - 2005

Year	Total* (tonnes)	Fungicides (tonnes)	Herbicides (tonnes)	Insecticides (tonnes)
2000	308	189	50	57
2001	333	200	59	66
2002	245	113	73	54
2003	222	116	52	42
2004	273	179	32	51
2005	159	99	33	17

*The category "total", apart from recorded fungicides, herbicides and insecticides, covers other pesticides as well

Table 3: Total pesticides consumed per total utilized agricultural area (kg/ha)

	2000	2001	2002	2003	2004	2005
Total pesticides consumed per total utilized agricultural area (kg/ha)	0,51	0,54	0,42	0,39	0,48	0,29

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators	Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 09	Consumption of pesticides	IRENA 09	Consumption of pesticides	D	agriculture	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2000 - 2005

Frequency of data collection: annually

Uncertainty

- Uncertainty of basic data

Data on the quantity of consumed pesticides contains certain extent of uncertainty, especially when originating from private sector. Some of the values have been obtained by estimation.

Future activities

- Short-term activities
 - Establishment of Work Group with a task to define, elaborate and develop the indicator in full
 - a. **Description of the activity**
 - Definition, elaboration and full development of the indicator..
 - b. **Required resources**
 - Experts in the area of environment, agriculture and other relevant fields.





c. Status

- In progress

Deadline: June 2008

- **Long-term activities**

- Long-term activities are to be defined by the Work Group.



