Farm structure survey – key data source for environmentally related farm management practices

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ABSTRACT

Assessing the integration of environmental requirements into agricultural practices is a difficult exercise, aimed at evaluation of the state of the environment, the interaction between agriculture and environmental outcomes, as well as of the influence of other factors, such as general market trends, technological development and weather events.

Measuring the impact of agriculture on environment for designing, implementation and evaluation of economic policies aimed at its mitigation is crucial. Relevant and timely information on the response of agricultural practices to data requirements for designing and monitoring the environmental policy became mandatory. To meet these high demands, international and national organizations accelerated the transition from the development of agri-environmental indicators to the actual production of such data.

Farm Structure Survey (FSS) is one of the main tools for collecting data for the calculation of agri-environmental indicators in European Union (EU)'s member countries. Starting with FSS 2010, Romania integrated in its survey program the required information for calculation part of the agri-environmental indicators according to Eurostat standards and recommendations. Having in view the deficiencies related to data collection, still a number of limitations need to be overcome for

the set of agri-environmental indicators to become fully operational. However, for analyzing the relationship between agriculture and environment and for identifying main trends in this evolving interaction, efforts are done to gather supplementary information, scattered among various institutions, to improve, develop and compile the entire set of indicators needed, according to Eurostat recommendations. Administrative data sources can fill important gaps, but efforts should be done to obtain more added value, improving such data in line with statistical requirements and georeferencing principles. From this perspective, FSS, even if confronted with increasing and more complex data demands, became a core instrument for collecting primary data on environmentally related farm management practices indicators.

The paper presents a brief overview on data needs and availability at national level for assessing the farm management practices in Romanian agriculture, aiming to appraise the set of agri-environmental indicators related to soil management practices towards environmental sustainability based on FSS data.

Keywords: agri-environmental indicators; soil management practices; soil conservation methods

1. Introduction

Agricultural production systems based on intensive farming led to increased pressure on the environment. The dynamic relationship between the processes taking place in agriculture and environmental phenomena grounds the "sustainable agriculture" concept. The series of reforms of the Common Agricultural Policy (CAP) that have taken place in the 1990s, 2000, 2003, 2008 and 2013, led to a 'greening' of the CAP (O. Oenema et al. 2011).

Implementation of agri-environmental measures started in 1980 on own initiative of several Member States of the EU. This initiative was taken by the European Community in 1985, by Article 19 of the Council Regulation (EEC) No 797/85 of 12 March 1985 on improving the efficiency of agricultural structures, but remained optional until 1992 when it was introduced as "accompanying measure" of the CAP for all EU Member States. Subsequently it became subject of a specific regulation[1], encouraging farmers to carry out environmentally beneficial activities on their land, and Member States were required to introduce agri-environment measures "throughout their territory". In 1999, the Agri-Environment Regulations were incorporated into the Regulations for Rural Development[2], as part of the CAP reform "Agenda 2000". Compliance with the rules of conditionality (cross-compliance) accompanying the single farm payment scheme (stated during CAP Reform for 2007-2013), introduces a cross-cutting approach support system for farmers, which is based on accomplishing of the strict conditions to be met for getting the aid requested from the community. All farmers receiving direct payments must comply with a "list of priorities", which refers to respecting different European standards in the following areas: (i) environmental protection; (ii) food security; (iii) animal health and welfare.

Agri-environment measures are the main tools for implementing the environmental policy for fulfilling environment objectives established through the Rural Development Programs (RDP). They are accompanying the mechanism of single farm payment scheme and are a key instrument

[1] Council Regulation (EEC) No. 2078/92 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside.
[2] Council Regulation (EEC) No 797/85 of 12 March 1985 on improving the efficiency of agricultural structures.

for achieving environmental objectives agreed in the development programs at EU level. Agri-environment measures are proposed by Member States or regions and submitted for approval to the Commission according to Regulation 1698/2005 as part of their RDPs.

For the assessment of trends over time of (i) the effects of agriculture on the environment, and (ii) the effectiveness and efficiency of agricultural and environmental policy measures, and for monitoring the implementation of agri-environment measures, a set of 28 agri-environmental indicators (AEIs) were identified in the Commission Communication COM(2006) 508 and subsequently approved by the Agricultural Council.

Following the analysis of data requirements for the calculation of agri-environmental indicators, Eurostat has identified a total of 97 different types of data, of which 25 are related to surface. Twenty types of data can be obtained from the Farm Structure Survey (FSS) and 12 from the Survey on Agricultural Production Methods (SAPM). In addition to FSS and SAPM there were identified 43 other different data sources.

In some EU member states the SAPM was surveyed as a sample survey, in others as a census, while the FSS was carried out as a census in all countries in 2010. The SAPM was in most countries carried out at the same time as the FSS 2010.

2. Analytical framework

Given the flexible framework offered by OECD model DSPIR (Driving forces - Pressures - States - Impacts - Responses), the 28 AEIs were identified under DPSIR analytical framework[3]. Most sets of indicators presently used by nations and international bodies are based on DPSIR-framework or a subset of it (Gabrielsen&Bosch).

Farm management practices are defined as decisions and operations practices that shape the effective management of farms, such as land preparation (soil cover and methods of preparing the soil for cultivation) and the type and capacity of manure storage farm manure and slurry. In order to assess the relations between farm management practices and environment, under the DPSIR domain "Driving Forces" sub-domain *Farm management*, there were defined three main agri-environmental indicators[4]: (i) Soil cover - AEI 11.1, (ii) Tillage practices - AEI 11.2 and (iii) Manure storage - AEI 11.3.

2.1 Soil cover – AEI 11.1

Conservation agriculture encompasses a set of complementary agricultural practices which minimize alteration of the composition and structure of the soil. Soil conservation is one of the ways to reduce land degradation due to soil erosion, pollutants, pesticides etc., contributing, at the same time, to enrich soil organic matter by soil cover in winter. Conservation agriculture tries to keep the soil covered with a cover crop or with crop residues. Soil cover can improve soil fertility and reduce erosion risk while, thereof, preventing leakage of nutrients and pesticides.

[3] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0508:FIN:EN:PDF
[4] http://ec.europa.eu/eurostat/web/agri-environmental-indicators/analytical-framework

This indicator provides information on the periods of the year when soil is covered with: (i) normal winter crops (winter crops), (ii) protecting crops / crop cover or intermediate, (iii) residues of crops or (iv) soils uncovered.

The AEI *soil cover* can be measured by the following indicators[5]:

Main indicator:

Share of the year when arable land is covered with plants or plant residues.

Supporting indicators:

• The share of arable land covered by winter crops (winter cereals and winter rape or grass)

• The share of the arable crops covered by annual green crops.

• The share of arable land covered by maize.

FSS, SAPM and Crop Statistics are the main sources of information for AEIs with reference to farm management practices classified. Data on farm management practices are not collected regularly. These data were required for the first time in the SAPM, held together with the FSS in 2010 (year of agricultural census in EU Member States).

2.2 Tillage practices - AEI 11.2

Tillage practices refer to cultivation operations carried out between harvest and the next sowing operation /cultivation. It is included only the area of the main crops. The sum of land under conventional tillage + conservation tillage + zero tillage = arable land - arable land not sown/cultivated during the reference year. Arable land which is not sown/cultivated during the reference year can be areas under glass or other protective cover, temporary grasslands, leguminous plants, industrial crops like hops or aromatic plants etc.

Tillage practices are defined as the share of arable surfaces under conventional tillage, conservation tillage (reduced cultivation) and zero tillage (direct sowing), and is measured by the following indicators[6]:

Main indicator:

The share in total area of arable land of the arable land on which there were practiced the following cultivation methods: (i) conventional plowing (ii) cultivation of conservation (iii) zero tillage and (iv) not tilled.

Supporting indicators:

Arable areas under conventional tillage, under conservation tillage and under zero tillage.

2.3 Manure storage - AEI 11.3

AEI on manure management provides information on manure storage facilities on agricultural holdings and related storage capacity, which depends on the time required for storage and the number and type of animals.

[5] http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_soil_cover
[6] http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_tillage_practices

The storage capacity for manure can be measured by the following indicators[7]:

Main indicators:

- Share of holdings with livestock which have manure storage facilities in total holdings with livestock.
- Share of holdings with different manure storage facilities.

Supporting indicators:

- Share of manure applied with different application techniques and manure incorporation time
- Share of animals in different housing systems

There are delineated the following types of storage facilities:

- Storage facility for solid manure (dung): impermeable surface with drain insulation, with or without roof;

- Storage facilities for liquid manure: watertight tank, open or covered, or lined lagoon;

- Storage facility for semi-liquid manure (suspended) slurry tanks, open or covered, or lined lagoon.

This indicator is primarily of relevance for emission of ammonia (NH3) and nutrient leaching losses from animal manures. The main indicator is related to storage facilities and supporting indicators to spreading of manure or slurry and to housing facilities

3. AEI on farm management practices in Romania

Agri-environmental indicators related to farm management practices were calculated based on the results of FSS and SAPM carried out in Romania in 2010 (full scope survey).

3.1 Soil cover – AEI 11.1

Over 96% of the total number of farms in Romania (3.9 million farms) operated agricultural areas in 2010, of which 71.5% operated arable land (2.8 million farms). About 79% of the farms that operated arable land (2.2 million farms) have applied one or more methods of soil conservation: 34 % applied winter crops, 4% applied protective cultures, 15% applied crop residues and 82% have applied bare soil method. Total arable land under soil conservation methods was 6.5 million hectares, representing 73.8% of total arable land of the country (8.3 million ha). 53% of total arable land under soil conservation methods was operated by holdings sized more than 100 ha, 14% by holdings sized between 2-5 ha, 9% by holdings sized 1-2 ha, 7% by holdings up to 1 ha, while the rest of 17% by holdings sized in classes between 5-100 ha. The structure of the total arable land under conservation methods, according to the methods of conservation applied was: 47.2% under bare soil, 44.9% under winter crops, 6.6% under residues crops and 1.4% under intermediate crops. The application of soil conservation methods differ depending on size classes of arable land area The areas under winter crops increase with the increase of the size classes of the holdings, while the

[7] http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_manure_storage

areas under bare soil, covering more than 70% in holdings sized less than 0.5 ha, decrease to 40-50% in holdings bigger than 10 ha. Intermediate crops amounts up to at most 3% in all size classes, while soils covered with plant residues amount 9-12% in holdings sized up to 10 ha, 6-8% in holdings sized between 10-100 ha and 4% in holdings larger than 100 ha (Figure 1).

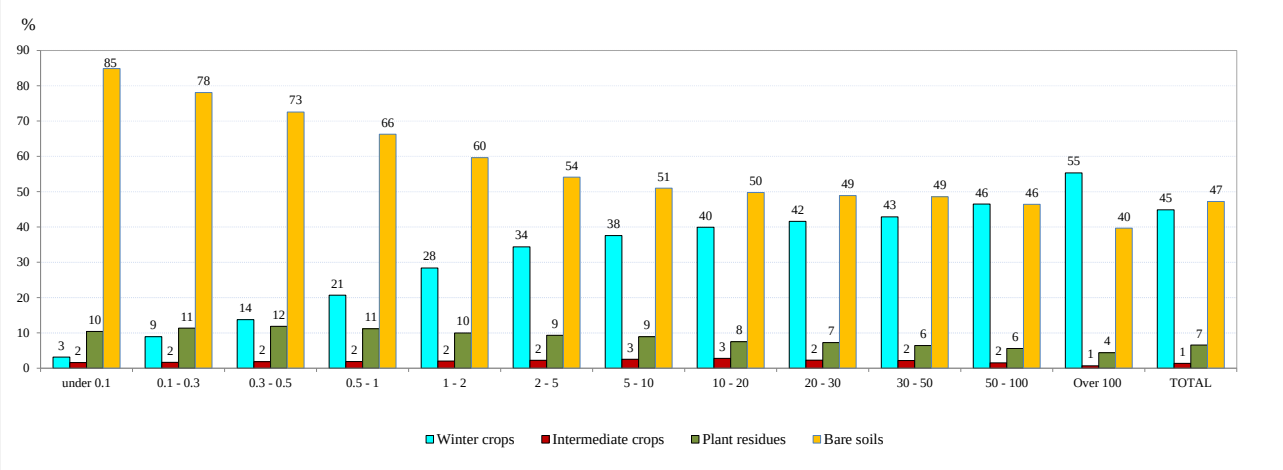

Figure 1: *Structure of arable land area on which were applied soil conservation methods, after the method of soil conservation applied, by size classes of arable land area*

3.2 Tillage practices - AEI 11.2

About 94% of the total number of farms with arable land (2.8 million farms) have practiced one or more tillage methods: 89% have practiced conventional tillage on 6.9 million hectares (83% of the total arable land), 2% farms have practiced conservation tillage on 193 thousand hectares (2% of the total arable land) and 13% farms practiced zero tillage on 584 thou hectares (7% of the total arable land). About 8% of the total area of arable land area (652 thou ha) was not tilled (without cultivation) (Figure 2).

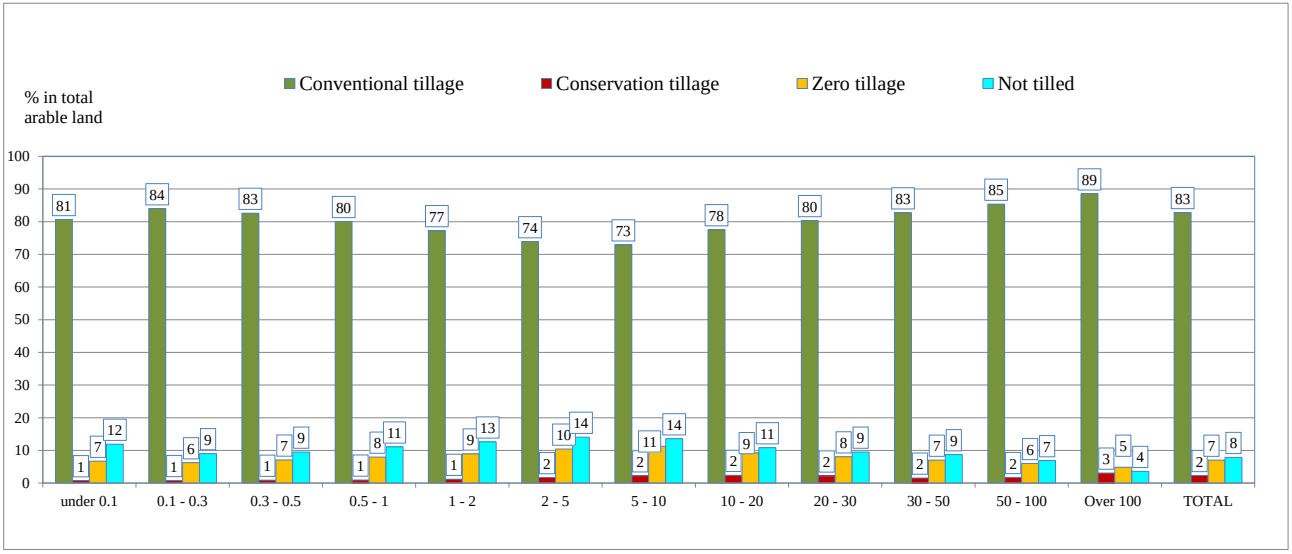

Figure 2: *Structure of arable land area on which were applied tillage practices, after the tillage method applied, by size classes of arable land area*

Over 80% of farms under each size class of arable land practiced conventional tillage, covering a total area of 6.9 million ha (83% of total arable land). Conventional tillage was practiced

on 89% of total arable land operated by holdings larger than 100 ha, and on 73-85% on arable land operated under each size class of arable land area.

3.3 Manure storage - AEI 11.3

Romania is among the countries with a low potential for manure storage compared to other EU Member States. Thus, out of the total holdings with livestock (2.8 million holdings), only 15% have solid manure storage facilities. Out of the total holdings with storage facilities for solid manure, only 3% have storage facilities covered. Out of the total holdings with storage facilities for liquid manure, about 28% have storage facilities covered. Out of the total holdings with storage facilities for semi-liquid manure in basins, about 15% have storage facilities covered, while from total holdings with storage facilities for semi-liquid manure in reservoir 7% have storage facilities covered (Figure 3).

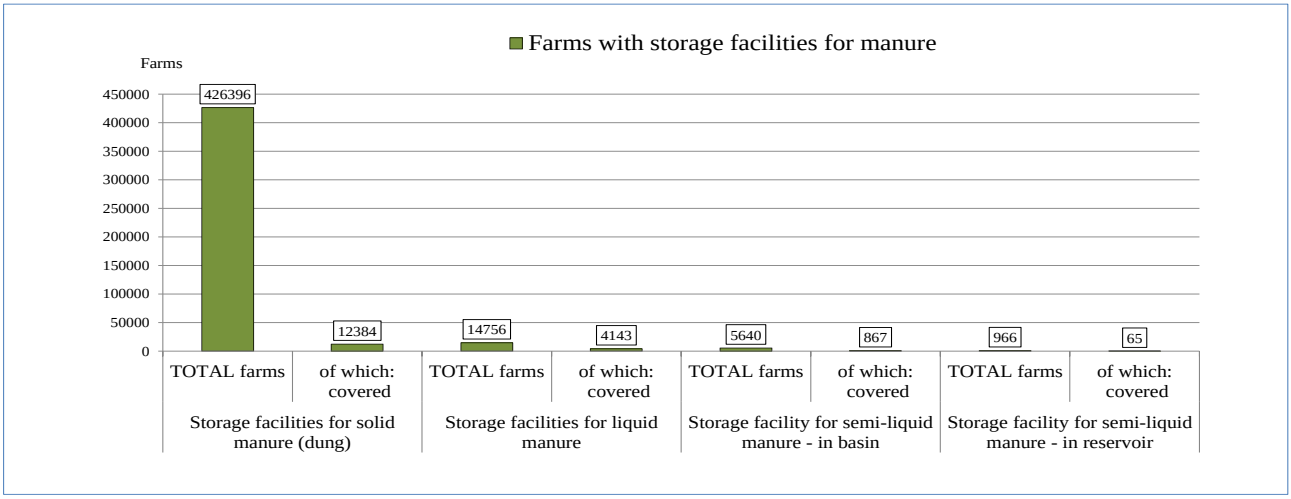

Figure 3: *Agricultural holdings with manure storage facilities, by type of manure storage*

Understanding farm management system is essential in order to implement the concepts of sustainable resource management. A relevant indicator giving a good insight in understanding the managerial approach at farm level is the *Share (number) of farm managers having practical experience, basic training, and full agricultural training* (one of the supporting indicators used for measuring AEI 3[8] related to the domain Responses in the DPSIR model). For Romania, this AEI indicates that from the total 3.9 million Romanian farmers[9] 0.4% completed full agricultural training, 2.1% had basic training in agriculture and 97.5% had only practical experience, ranking Romania on the last place among EU-28 in relation to the shares of farm managers with only practical experience.

4. Conclusions and recommendations

Winter covered soils are most effective against surface runoff and soil erosion, as well as nitrogen leaching during winter. This is why the extent to which winter crops protect against leaching and

[8] Farmers' training level and use of environmental farm advisory services
[9] Full scope Farm Structure Survey 2010

runoff is correlated with the presence of winter crops. AEI 11.1 can be further improved by including information about topography (Vinther Finn P. at al, 2011). A territorial approach rather than a national approach is essential to capture the diversity in farming systems and the environment.

Reduced tillage may in the short term lead to increased use of herbicides in order to compensate for the reduced mechanical weed control, but also can contribute to carbon sequestration in soil and thereby may alter the emissions of greenhouse gases, especially CO2 and N2O. The differentiation between reduced and conventional tillage is rather difficult, and clear definitions of reduced, minimal and conventional tillage would be needed. Reduced/minimal tillage may relate to both reduced frequency of tillage and to reduced soil depth of tillage (Vinther Finn P. at al, 2011).

SAPM, main data source for the AEI related to farm management practices, was carried out so far only in 2010. Collecting the data required for calculating these indicators by a statistically representative survey once every 2-3 years, together with FSS, would be useful for analysis the trend of these indicators, having in view that cropping systems and manure storage systems do not change significantly from year to year. This necessitates greater policy relevance and increased quality and timeliness of basic data sets, as well as a closer link between environmental data and existing economic and social information systems. It also necessitates more work to complement the indicators with information reflecting sub-national differences (Linster M. at al., 2001).

The set of AEIs have much in common with policy requirements, and even those that are not required directly for policy are useful for monitoring the outcomes of policy implementation. AEIs provide much of the needed coordination for data collection at an EU level to meet the needs of the key agri-environmental policies. Nevertheless, the results of monitoring and evaluation of sustainable development concepts based on AEIs must take into account that making decisions about the use of natural resources at their disposal, belongs directly to agricultural producers. Therefore, the successful implementation of any of the conclusions drawn from monitoring the indicators for the sustainable management of soil resources will depend on their acceptance by farmers.

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