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An assessment of policies affecting Sustainable Soil Management in Europe and selected member states

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ABSTRACT

This paper analyses soils-related policies in Europe and in selected member states and regions. Our approach breaks down policy packages at European, national and regional levels into strategic objectives, operational objectives, policy measures and expected impacts, and assesses the relationships between these elements and soil stakes. Four major policy packages, both at EU and national level (CAP-I, RDP, Environment, national initiatives) were analysed. A numerical scale was developed to quantify the level of "embeddedness" of soil stakes in these policy packages. We found that countries better embed soil stakes into their policies when they also put more efforts on environmental innovation. In turn, countries with a high embeddedness level, with high trust in European institutions and that make more efforts towards renewable energy, tend to propose a wider variety of management practices to farmers for dealing with soil stakes.

1. Introduction

Agricultural soils in Europe are facing many threats, such as wind and water erosion, decline of organic matter content, local and diffuse contamination, sealing, compaction, decline in biodiversity, salinization, floods and landslides (Jones *et al.*, 2012). These threats have gradually developed from an increasing pressure on natural resources (including soil), that are due to agricultural and industrial activities, urbanization and possibly climate change. To the best of our knowledge, there is no precise assessment on how the existing policies have affected, and will further impact, the pressure on agricultural soils in Europe. Such assessment would require knowledge on (i) how policy frameworks are implemented in the respective Member States (MS), (ii) how farmers' soil management responds to policy measures, and (iii) what impact these responses have on the state of soils in short and longer term. This paper aims to fil the existing gap in point (i) and documents how soils are currently integrated into policies, using results from a survey conducted by the EU funded research project Catch-C[1].

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[1] http://www.catch-c.eu/.

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The extreme differentiation of policy implementation among MS and regions adds to the assessment difficulties. Consequently, soil quality has been taken for granted in most policy assessments performed so far. Among notable exceptions, Louwagie *et al.* (2011) assessed the capacity of (then) existing and "future" EU policies to address soil degradation. They concluded that, so far, not all relevant policy measures are implemented throughout the EU-27. Kutter *et al.* (2011) provided an extensive overview on how soil-relevant policies are being implemented, including the agricultural practices involved, in several EU regions, based on an on-line stakeholders survey. According to their results, soil quality is often mentioned among the main targets of the policies they have analysed, but the potential of these policies to address all soil degradation processes at EU level is hampered by the lack of adequate monitoring. However, despite its size, their extensive database was not – in their view – suitable to analyse policies in individual MSs. More recently, Glæsner *et al.* (2014) performed a cross-policy analysis to identify gaps and overlaps in the existing (up to 2013) EU legislation concerning soil protection. They show that, for several major soil threats, MSs failed to include sufficient mitigation measures in their current national legislations.

Even if limited in number, the existing analyses of policy instruments in Europe (the most recent is Frelih-Larsen *et al.*, 2016) all conclude that soil functions are often only implicitly addressed in EU regulation or national initiative, and that the overall benefit for soil protection depends strongly on how issues are integrated in the various policy instruments and on how they are coordinated. It is precisely this aspect – how exactly are soils issues integrated in policies – that we set out to assess in this study: we have built our approach on the works by Louwagie *et al.* (2011) and Kutter et al. (2011). In expanding their approach, we actualised the set of policy packages by including the last CAP reform. Next, we performed a cross-cutting analysis of policy measures and the soil management practices (MPs) they foster or discourage in relation to the different soil stakes, and we did so for regional, national and European levels. We introduce the new concept of 'embeddedness of soil stakes' in the policy frameworks, and we explain different levels of embeddedness found in the respective MSs by a set of indicators that reflect both the assets and the institutional constraints that characterise each MS.

The remainder of this paper is organised as follows. Section 2 depicts the method we applied to link soil stakes, policy packages, types of instruments, and involved management practices. Section 3 discusses the outcomes of our assessments. In Section 4, we use these outcomes to propose new pathways towards more sustainable soil management.

2. Methods and definitions

2.1. Soil stakes

There are many stakes related to soil management, from soil biodiversity to global climate change, and those stakes are affected by farmers and a large range of other actors, including civil society, land planners and policy makers at various levels. Soils supply private (farmer income) and public (ecosystem services, ES) goods and services, and the two are often hard to separate. A certain management practice can improve soil quality to the benefit of both types of purposes, or may foster one purpose but jeopardize others. Examples of these trade-offs are numerous, especially regarding the long-term impacts of practices. For instance, the use of farmyard manure in the continental climate zone does improve soil biological and physical quality and contributes to soil carbon stocks (Bhogal *et al.*, 2011), but reduces nitrogen (N) use efficiency and crop yield, as compared to mineral fertilisers at the same N input rate[2]. Similarly, reduced tillage for soil conservation reduces fuel use but boosts herbicide use in many MSs, jeopardizing biodiversity (Moreby and Southway, 1999; Marshall, 2001).

Soil quality, as the foundation of agricultural production, is generally considered as a private good that is capitalized into rental (Kilian et al., 2008) or sale prices (Feichtinger and Salhofer, 2013). The public goods and services from soils have local as well as more global dimensions. The prevention of landslides, siltation and flooding, or the preservation of soil biodiversity may have a local character. Services with wider outreach are the sequestration or retention of carbon in soils, the regulation of water systems and water quality, and the sustenance of biodiversity at large.

In this paper, we consider all ES affected by soil management as part of soil stakes. We refer to 'soil stakes' as public and/or private interests affected by the management of agricultural soils. These include in the first place the protection and improvement of the soil itself, notably the integrity and quality of soils for use in agriculture and in the provision of other ES. These "soil quality stakes" relate to the status of the soil itself. Among these, we distinguish the retention of topsoil by protection against erosion by water (1) and wind (2), the protection of soil structure against compaction (3), and the conservation and enhancement of soil organic carbon (SOC) (4) and soil biodiversity (5). Besides their obvious importance to farming, these stakes also relate to the above public goods and services. Beyond the soil quality stakes, we distinguish a second set of stakes that include the provision of landscape-based ES such as water quality (6), air quality (7), and (above-ground) biodiversity (8). These are evidently public stakes, have far wider than just local outreach, and are largely determined by soil management practices, irrespective of their impact on soil quality. For example, excessive fertiliser or herbicide use pollutes water bodies, and monoculture cropping diminishes the potential to sustain biodiversity, even if they would leave the soil unaltered. We refer to these stakes as "other environmental stakes affected by soil management" (hereafter in short "other stakes"). We did not cover the threats of soil acidification (mentioned by only few MSs), or industrial contamination (no direct link with agriculture).

2.2. Policies affecting soil management

The appropriate level of policy design for the protection of soils, as that for other environmental goods, is fiercely debated in the literature. Millimet (2013) provides a recent review of the advantages and drawbacks of centralised versus decentralised levels of policy design for environmental protection in general, which applies also to soil protection. Beyond achieving a sufficient level of protection, criteria for or against centralisation are the existence of spillovers[3], the heterogeneity between regions[4], and the ability of local governments to respond better or not – than the central government – to community preferences.

According to the Subsidiarity Principle[5], the EU countries and regions have the freedom to implement policies to protect soils according to the needs and specific geo-climatic and farming conditions in their territories. This has resulted in an incredibly complex set of strategies overall Europe for soil protection. Kutter et al. (2011) counted 410 different soil conservation measures in the European Member States in 2008. A few years later, Frelih-Larsen et al. (2016) have identified 35 EU level policies and 671 instruments across the

[2] Many other examples can be found here: http://knowsoil.catch-c.eu/KnowSoil/?dojo.locale=en#.

[3] Spillovers occur when the level of environmental (soil) protection chosen by a region affects the benefits of other regions. The most common examples are transboundary water protection, climate change mitigation or research effort benefitting more regions than those where research is done, but spillovers can also derive from changes in competitive assets when some regions choose low protection levels to attract polluting enterprises or to decrease production costs.

[4] When the regions are highly heterogeneous, a centralised uniform policy is inefficient.

[5] The Subsidiarity Principle dictates that EU action is only allowed in situations where policy objectives cannot be sufficiently achieved through MS actions (Revesz, 1997).

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