



## Mapping local spatial knowledge in the assessment of agricultural systems: A case study on the provision of agricultural services



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Interest in spatial evaluation to develop comprehensive strategies to plan and manage agricultural systems and to assess the impact of agricultural policies has been growing among policy-makers and scientists. Innovative methods of acquiring and processing spatial data and information related to agricultural topics have therefore been gaining attention. In this context, place-based and experiential knowledge of local actors has been recognized as an important source of data, especially for decision-making and planning. Several methods have been proposed in the literature for retrieving and analyzing this knowledge. Our aim was to analyze the capability of one of these methods (the mapping of local spatial knowledge) to identify the organizational gaps in the provision of agricultural services in rural areas. The method consisted of an interview supported with a fixed-scale map; the goal of the interview was to retrieve both spatial data and descriptive information (local spatial knowledge mapping) for GIS processing. Map-based interviews were conducted with 26 representative collective structures of the Grosseto (central Italy) agro-food system. Five agricultural systems (field crops, live-stock, viticulture, olive-growing, and fruit-growing/horticulture) and five services (stocking/selling of farm products, technical advising, sale of farm inputs, promotion and contract services) were identified by local spatial knowledge. The main organizational and spatial gaps were assessed in each agricultural system for the following: (a) the number, typology and combinations of supplied services and (b) the overlap of operational areas of the agro-food system structures with the areas reported as being suitable for the five agricultural systems. This analysis allowed us to identify the benefits and drawbacks related to the spatial configurations that determine the provision of agricultural services for local farming activities.

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### Introduction

Discussions of agricultural policies have recently highlighted spatially explicit and place-based approaches as useful methods for strengthening local rural development (Diakosavvas, 2006; OECD, 2006, 2009). Studies related to this topic begin by developing comprehensive strategies for the planning and management of farming and agricultural systems, then assess the impact of policy

on agricultural practices (Ewert et al., 2009; Piorr et al., 2009; Poudel, 2010; Teillard et al., 2012; Van Ittersum et al., 2008; Van de Steeg, Verburg, Baltenweck, & Staal, 2010).

In the context of the framework defined by McCall and Dunn (2012), the development of methods that could elicit, represent and process local spatial knowledge on farming and agricultural systems is needed. The identification of suitable spatial scales for a reliable assessment is crucial (Ewert et al., 2011; Van Delden, Van Vliet, Rutledge, & Kirkby, 2011; Verburg et al., 2008), as the gathering and integration of available spatial data sources is strongly related to choice of scale (Janssen, Andersen, Athanasiadis, & Van Ittersum, 2009). This task may be cumbersome when using datasets and maps produced by administrative or public bodies; indeed, these public datasets are often not complete, as they may be only partially digitized, fragmented, out-of-date, or limited to specific

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administrative boundaries (e.g., census data) (Yeager & Steiger, 2013).

Agricultural systems are characterized by agro-environmental and socio-economic features that vary considerably in terms of spatial distribution. The place-based assessment of agricultural systems is therefore limited by the weak spatial integration of available data (Leenhardt, Angevin, Biarnès, Colbach, & Mignolet, 2010; van Berkel & Verburg, 2011). A clear example of a problem in the integration of spatial data includes the difficulty of mapping agricultural multifunctionality (Wilson, 2009), agricultural intensity (Teillard et al., 2012) or the location of farmer types (Valbuena, Verburg, & Bregt, 2008). The knowledge of local actors can compensate for the lack of consistent spatial data sources in agricultural systems, as highlighted by various case studies involving farmers, local experts and rural communities (Ball, 2002; Cerdán, Rebolledo, Soto, Rapidel, & Sinclair, 2012; Clavel, Soudais, Baudet, & Leenhardt, 2011; Galli, Bonari, Marraccini, & Debolini, 2010; Mignolet, Schott, & Benoît, 2004; Planchat-Héry, 2011).

Place-based assessments and experiential knowledge of local stakeholders provides planners and decision-makers with geo-data that might otherwise remain undetected by assessments based only on conventional geographical data (Brown, 2012; Hall, Moore, Knight, & Hankey, 2009; Kahila and Kyttä, 2009). Such geo-information could furnish a spatial understanding of the facts, dynamics, connections, and interdependencies of the individuals (Pfeffer, Baud, Denis, & Sydenstricker-Neto, 2010; Yeager & Steiger, 2013). In fact, the spatial representation provided by local actors includes both the acquisition of descriptive data and their spatial significance, which helps to identify *where* and *how* certain information is relevant.

A wide array of participatory GISs based on the spatial knowledge of local actors and communities has effectively led to the acquisition of more informative base maps (Hall et al., 2009; Le

Guyader, 2012, p. 309) and promoted the empowerment of local communities in the planning process (Dunn, 2007; Gonzalez, 2002; Saqalli, Caron, Defourny, & Issaka, 2009; Van Herzele, 2004). Methods for the extraction and use of local geospatial knowledge have been proposed to tackle issues related to environmental (e.g., Failing, Gregory, & Harstone, 2007; Raymond et al., 2010) or urban systems (e.g., Coburn, 2003; Kahila & Kyttä, 2009). However, fewer applications are available for the primary production sector (e.g., fisheries management, Bradshaw, Wood, & Williamson, 2001; Close & Hall, 2006) or the integration of agricultural points of view in local planning (Benoît, 2006).

Our aim was to further enhance existing methods for mapping local spatial knowledge (LSK) and to integrate these methods into the assessment of agricultural systems. This work is completely in line with the comments of Yeager & Steiger (2013) on applied geography and the need to marry qualitative and quantitative approaches to improve the knowledge of the organization of agricultural systems. In this work we highlighted the role of local knowledge in assessing the spatial organization of agricultural services at a provincial scale.

### Study area

The province of Grosseto in the South of Tuscany (central Italy) was chosen as the study site (level 3 in the European nomenclature of territorial units for statistics – Eurostat, 2012). Grosseto is located between 10–11° East longitude and 42–43° North latitude and extends over approximately 4504 km<sup>2</sup>. From an administrative viewpoint, it is divided into twenty-eight municipalities, the boundaries of which are shown in Fig. 1.

The altitude of Grosseto ranges from 0 to 1400 m above sea level. The region experiences a high spatial and seasonal variability in rainfall, ranging from 600 mm/year on the coast to 1100 mm/year in

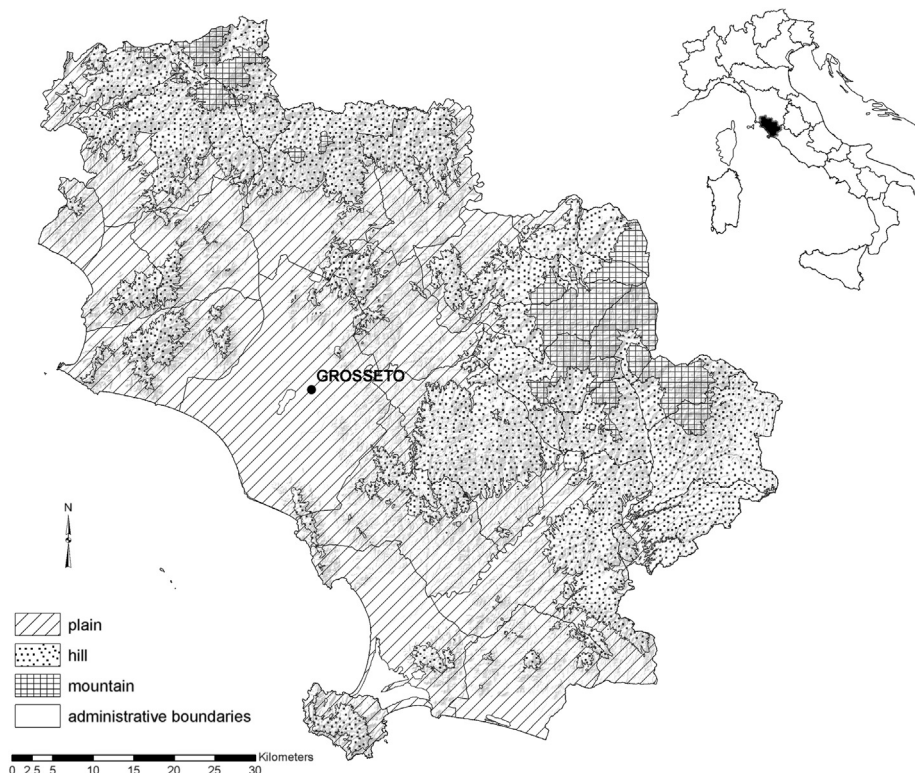


Fig. 1. Study area.

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