



Rural-Urban Outlooks: Unlocking Synergies (ROBUST)

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Snapshot: Expressions of Urban – Peri-Urban – Rural Relationships

Soil consumption, role of open spaces in peri-urban areas and ecosystem services

Province of Lucca, Italy

1. Brief Description

This research (Rovai et al. 2013) focuses on soil consumption, relevance of open spaces and the role of ecosystem services (ES)¹ assessment, building upon previous research carried out to support the planning department of the Province of Lucca (Tuscany, Italy) in developing the Territorial Coordination Plan (Rovai et al. 2013). More specifically, a multidimensional assessment of the value of ES provided by peri-urban agriculture in the agricultural plain of Lucca is developed and integrated by a cartographic representation of their spatial distribution. The visualisation of open spaces and ES aims at supporting a territorial strategy that contains land consumption and abandonment.

Open spaces around urban centres, such as Lucca city or Capannori, have been exploited for the development of new settlements, encouraged by land construction rents and the loss of agricultural production value. In recent years, thanks to a new cultural sensitivity, the use of open spaces for building purposes – in particular agricultural soils – is increasingly criticized as a waste of natural resources (when not justified by population increase or production activities). From a territorial planning perspective, it is fundamental to “valorise” (i.e. assign a value to) available open space and rural land, in order to strengthen public sensitivity on the importance of open spaces and rural territory and ensure the reproduction of resources and functions. The research identifies and assesses ES to support policies in building awareness on the environmental costs of human activities and developing tools to encourage actors involved in the production of ES themselves.

¹ “Ecosystem services consist of flow of materials, energy, and information from natural capital stocks which combine with manufactured and human capital services to produce human welfare” (Costanza, 1992). The ES can be classified into four categories of services: provisioning services; regulating services; supporting services; cultural services (MEA, 2005). The UN Millennium Ecosystem Assessment (MEA, 2005) recognizes the approach of ES as an operational tool to be introduced in the environmental and territorial policies.

2. Questions and/or Challenges

The research addresses one main question:

- > How can Ecosystem Services (ES) provided by rural areas be assessed and valorised?

The fragmentation of the ecological network and the abandonment of the cultivation due to urban sprawl is causing growing environmental and socio-cultural fragilities on the ecosystem balance in the Plain of Lucca. The research applies a model of ES assessment provided by open spaces in the Plain of Lucca, according to a spatial multi-criteria analysis, integrated with Geographical Information System mapping, which allows the understanding of the spatial / territorial distribution of ESs.

This approach overcomes the limitations of monetary and additive methods, as it prevents aggregation of values. The spatialization of ES provides an immediate and intuitive visualisation of the stronger or weaker vocation of different areas in supplying ES, priority areas and comparison of possible alternative scenarios on the basis to the instances of the different stakeholders.

A further critical question stems from the research:

- > Is valorisation of Ecosystem services a suitable approach to support territorial planning? How does it affect and support decisions by policy makers?

The endpoint of the ES assessment is to develop strategies to enhance open spaces, contain settlement dispersion, and limit agricultural land abandonment. Current planning models are still not attentive enough on the proportioning between supply and demand for ES, and still follow the logic of the functional decoupling between urban and rural areas. A logic that is leading to a progressive urbanization of large areas appointed to the provision of vital ES (e.g. energy, water and food) to the citizens.

3. Main Insights

3.1. Indications of the application of the new concept of 'New Localities'

Open and agricultural spaces situated in peri-urban areas represent a potential for more beneficial urban-rural relations and play an essential role in reconnecting cities and countryside. This requires the support of appropriate territorial governance tools: the valorisation of ES is crucial to spot light on open spaces and agricultural land. This is relevant both from the side of rural development and urban renewal. Particularly, urban renewal, in addition to morphologically and functionally regenerating the existing buildings, should also re-draw/re-think the open space (agricultural soils in peri-urban, public spaces, unbuilt space enclosed in cities) fundamental to ensure the provisioning of multiple ecosystem services (Rovai et al. 2014).

The evaluation of the ES in the Plain of Lucca was carried out to acquire knowledge on open spaces, considering both characteristics and relations with the surrounding context. This can therefore be an instrument to support the planning of open spaces trying to limit conflicts of interest on the use of soils. Further it can be used to promote forms of integration between urban and rural by allocating these spaces, for example, to typical activities of multifunctional agriculture.

In the specific context of Lucca, the main limiting factor to fostering beneficial relations is cultural. Among citizens and public decision-makers there is a widespread belief that agriculture in peri-urban contexts cannot or should not be developed because it is not economically viable, and it creates pollution and discomfort. Therefore, the aim is to understand the economic, social and environmental benefits of closer interaction between urban and rural areas in a territory characterized by a strong settlement dispersion. Another limitation regards the rigidity of the land market which makes it difficult to establish new farms.

Regarding the “new localities” concept, and what information should be collected and mapped, this has not been addressed directly. Including peri-urban agricultural spaces as an integral part of the structure of the contemporary city aims to create a closer relationship between rural and urban. What has always been considered separate (urban and rural) can be transformed into a unique and continuous system: the image of "new localities" should not be limited to green infrastructures and ecological corridors, but to a continuous substratum of agricultural spaces that supports the city, makes it sustainable, and feeds it.

Ultimately, the vision of new rural and urban localities should be realized in a set of multifunctional agricultural spaces for social interaction and free time, connected to the city, and integrated with the existing infrastructures and networks. For this reason, the ES study is a prerequisite for creating this new vision of the Plain of Lucca. The management of multifunctional agricultural areas would help achieve important sustainability objectives if oriented towards eco-compatible and quality production.

In addition, tourism is increasing and hosted in the peri-urban areas (bed and breakfast, holiday homes and agritourism). Tourists often find it difficult to access the authentic values of a territory that bases its reputation on gastronomy, local products, and the landscape: working on peri-urban open spaces, both in terms of agricultural activities and recreation opportunities, means increasing the quality of life of citizens, but also offering income and work opportunities.

3.2. Insights related to the broad area of 'Smart Development'

The improved equilibrium between human pressure and the use of resources forms the basis for sustainable development of cities and territories, in order to ensure that needs are balanced based on the natural capital endowment (Arrow et al. 1995).

The opportunity to use urban and multifunctional agriculture as a tool to revitalize and regenerate urban spaces seems appropriate in today's socio-economic context. In these

terms, agriculture can represent a real key to renewal of the city, being able to combine in synergy both the production of quality local food and production/reproduction of neo-rurality, land management and landscaping.

Peri-urban areas are critical areas in which to experiment with models of regeneration, also through multifunctional agriculture, which should help counter soil consumption and support the supply of ecosystem services that increase quality of life: improvement of ecological connectivity and biodiversity; protection of hydrogeological structure; preservation of the identity characteristics of landscape; etc.

In relation to Smart Development, this could be developed through the recovery of the relationship between city and countryside. Today, most peri-urban agricultural areas are not adequately used to their potential (e.g., meadows and fallow areas were previously fruit orchards and productive gardens). Therefore, we need to work towards a more intelligent use of resources (e.g. land and water availability) and try to develop adequate entrepreneurial skills on multifunctional forms of agriculture.

The role of social innovation is fundamental for creating this new vision and therefore, in addition to technological tools such as GIS, it is necessary to realize (and appropriately communicate) specific pilot projects to valorise the relationship between urban spaces and rural areas. This implies developing skills to better manage multifunctional spaces (e.g., farms that can offer spaces for social gardens, environmental education, laboratories, meeting places, agri-kindergartens, educational farm, etc.). Skills should not be limited to technical and regulatory aspects, but rather on networking, communication and marketing. In this sense, a close relationship with universities and local technical institutes is essential.

The role of new technologies (ICT) will be fundamental to better match the supply and demand of new goods and services that could be developed. Available inspiring examples of smart development and of rural-urban synergies can be found in Italy in the Milan South Agricultural Park (<http://parcosud.cittametropolitana.mi.it/>), which has been developed for some years and illustrates all types of possible connections that can be developed. It could be taken as a model to be adapted to the context in Lucca.

4. Data Sources and Indicators

The research has identified data for three categories of ES. Food production services were assessed in relation to the type of agriculture, typicality of products, and value of crops. Ecological services were mapped in terms of ecological connectivity, CO2 sequestration capacity and capacity to recharge the water reserves. Regarding the indicators useful for the measurement of recreational / cultural services, the authors experimented with original criteria, as the persistence with respect to the historical settlement system; the topological relationship with the settlement system, and the proximity to areas of high population density.

Table 1 Data / Indicators

Data / Indicator	Source
<i>Name of data source / indicator</i>	<i>Citation, website link, organization</i>
Food production	
(i) type of agricultural management	<p>Authors' elaboration of OPENDATA Tuscany.</p> <p>Objective: to define areas with professional agriculture and hobby agriculture.</p> <p>Methodology: Overlay on the Land Cadastre of the ARTEA (Tuscany) cadastral parcel dataset that received CAP payments. Particles ARTEA = professional agriculture; other particles 0 Hobby agriculture;</p>
(ii) Typicality of production	<p>Authors' elaboration of OPENDATA Tuscany.</p> <p>Objective: to define areas with professional agriculture and hobby agriculture.</p> <p>Methodology: shp file of the areas with PDO and PGI production and overlay on land cadastre;</p>
(iii) Value of crops	<p>Authors' elaboration of OPENDATA Toscana – soil destination in 2010 and land cadastre</p> <p>Methodology: Overlay of the soil destination on the Land Cadastre; Identification of the value of the crop (profitability) through a comparison in pairs between the different uses of the soil (from the maximum value of the orthofloro-nursery to the minimum value of the pastures and semi-natural areas).</p>
Ecological services	
i) Ecological connectivity	<p>Authors' elaboration from ECOLOGICAL NETWORK MAP of the Province of Lucca</p> <p>Methodology: assignment to the different elements of the ecological network of a value linked to the functional role of the soils (the maximum value at the nodes and the minimum value at the secondary connections) through the comparison in pairs;</p>
(ii) the ability to sequester CO2	<p>Authors' elaboration of OPENDATA Toscana - USE OF SOIL 2010</p> <p>Methodology: use of a scale of values based on land use (from the maximum value of orchards, to the minimum value of complex particle systems);</p>
(iii) the recharge capacity of the groundwater layer	<p>Authors' elaboration of OPENDATA Toscana - PERMEABILITY OF SOILS based on geopedological nature.</p> <p>Methodology: use of a comparison in pairs giving greater value to the most permeable soils and lower value to those less permeable to rains;</p>
RECREATIONAL / CULTURAL SERVICES	

(i) persistence with respect to the historical settlement system;	Authors' elaborations for the drafting of the Territorial Plan of the Province of Lucca. Methodology: attribution of value to open spaces based on the proximity to historical-architectural settlement fabric;
(ii) the topological relationship with the settlement system;	Authors' elaborations for the drafting of the Territorial Plan of the Province of Lucca. Methodology: classification of the typology of open spaces according to the surrounding urban context (eg intercluse areas, open areas, gates, etc.) and attributing greater value to the open spaces with respect to those located in more peripheral contexts;
(iii) proximity to areas of high population density.	Authors' elaborations for the drafting of the Territorial Plan of the Province of Lucca Methodology: spatialization of Population Census data for census sections to determine the population density and, consequently, assign higher values to open spaces placed at higher densities;

5. Critical Appraisal of Data Use

As we can see from the data table, this work analyses only a few of the numerous ES defined by the Millennium Ecosystem Assessment and by CICES² – the Common International Classification of Ecosystem Services (CICES, 2013) – developed to support environmental accounting (EEA, 2015). This is because the evaluation work was aimed at an experimental hypothesis of evaluation of ES at the local level considering the particular specificities of the territory itself.

The proposed method of evaluation of the ESs is an instrument available to policy makers to help them think of a new configuration of standards (urban planning), no longer to simply generate quantitative data and only to expropriate areas, but to dynamically reflect the needs of citizens. In fact, the method used deliberately avoided aggregating the values of the ES analysed in order to obtain an immediate and intuitive vision of the areas with greater or lesser vocation for the provision of the services examined, and the areas that require priority protection, redevelopment, etc. The method also allows us to directly compare possible scenarios according to the different positions of the stakeholders.

Ultimately, it constitutes an introductory (implementable) information basis for the preparation of spatial planning tools which, by adopting the spatial analysis of the potential supply of ES, can guarantee a correct and balanced development of the territory.

² CICES takes the Millennium Ecosystem Assessment classification of ecosystem services as a starting point but modifies the approach to reflect more recent research and does not include supporting services to reduce the risk of double-counting of benefits.

6. References

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