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(Article begins on next page)

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# Using the ecosystem services' approach for addressing peri-urban farming in Turin Metropolitan Area

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## **Abstract**

**In the context of urban sprawl and land consumption, enhancing the awareness on the multiple values that peri-urban agriculture provides for citizens is essential. The ecosystem services approach can be applied for addressing peri-urban farming. In order to identify sustainable actions, strategies and policies for the management of Turin Metropolitan Area' agricultural production, a multidisciplinary study was carried out. The Chieri municipality (Piedmont, North-West Italy) characterised by high natural valued agricultural patterns and typical local products was chosen as case study. Since 2016, Chieri municipality was included in the Man and the Biosphere (MAB)' UNESCO area "Collina Po". The research proposed an innovative approach for enhancing peri-urban area and supporting multifunctional agricultural activity. Firstly, for identifying traditional landscape features, an historical study was performed. Ancient documents found in historical private and public archives and libraries were examined. Then, for assessing and valuing the peri-urban agroecosystem, the ecosystem services' approach was applied. For investigating the peri-urban agroecosystem, a trans-scalar approach from the farm to the landscape level was adopted. The interpretation of historical data, field observations, and farmer interviews (Research data); the analysis of statistical data and the evaluation of ecosystem services (Statistical data) were performed. Several parameters such as traditional productions, local agriculture tools and direct marketing/farmers markets were evaluated. The study showed that the multifunctional and sustainability based farms are the most resilient in the peri-urban area, able to take advantages from the city proximity.**

**Keywords:** landscape ecology, multifunctionality, MAB UNESCO, agroecosystem, landscape planning

## **INTRODUCTION**

In recent decades, an urban expansion that had a great impact on the consumption of land and agricultural resources occurred. A special relationship between the agricultural landscape and the city provides peri-urban landscapes where low-density residential settlements are intertwined with agricultural areas that have been modified and sometimes reduced by urbanization (La Rosa et al., 2014).

Agro-ecosystems provide important ecosystem services (ES) defined by the Millennium Ecosystem Assessment (2005) as the benefits that humans derive from ecosystems. These services can be summarized in four different categories: "Provisioning" such as food production, timber, fuel; "Regulating" as erosion control and pollination; "Supporting", like nutrient cycling and soil formation; "Cultural" such as recreational and educational activities. The ES approach can be applied for addressing peri-urban farming (Carvalho-Ribeiro et al., 2016). This method takes into account the fact that humans and cultural diversity are an integral part of most ecosystems, hoping that it will be an equitable

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sharing of the benefits arising from the utilization of natural resources with new urban food strategies.

For a long time, the concept of multifunctionality has emerged in response to changes in agriculture as an alternative to conventional farming with its negative environmental impacts (Sangkapitux et al., 2017). The dimensions of multifunctionality are interpreted in literature in many different ways, but always deal with environmental, social and economic aspects with the goal of achieving sustainable development (Fagioli et al., 2017). As defined by Van Huylenbroeck G. et al. (2007) the multifunctionality of agriculture includes four types of functions provided by farms: “Green functions”, which characterize landscape management and maintenance of landscape services; “Blue services” that are aimed at the management and improvement of water quality; “Yellow services” that relate to the role that agriculture has in rural cohesion and in preserving cultural and historical heritage; “White functions” produced by agriculture, such as food security and safety.

In the context, of urban sprawl and land consumption, enhancing the awareness on the multiple values that peri-urban agriculture provides for citizens is essential. The research proposed an innovative approach for supporting multifunctional agricultural activity in peri-urban areas using the ES concept. In order to characterize these areas and identify sustainable actions, strategies and policies for the management of Turin Metropolitan Area’ (Piedmont, north- west Italy) agricultural production, a study is performing. In this paper, the methodological approach and the preliminary results are reported.

## **MATERIALS AND METHODS**

### **The study area**

Since 2016, the eastern part of the Turin Metropolitan Area was recognized by UNESCO as MAB (Man and the Biosphere Programme). This site “The Collina Po Biosphere Reserve” covers the Turin stretch of the River Po with its main tributaries and the Collina Torinese hillside. The River Po is the main reservoir of biodiversity in the Turin plain, due to the numerous wetlands along its course. “The Collina Po Biosphere Reserve” includes 85 Municipalities, with about 2 millions of inhabitants.

The case study was Chieri Municipality (45° 00' 37" North, 7° 49' 16" East) included in the MAB’ site and representative of the MAB UNESCO landscape. High natural valued agriculture, typical local products, and beautiful landscapes characterize Chieri Municipality. It covers about 54200 ha with flat areas and hills ranging in altitude from 243 to 406 m above sea level and 36680 inhabitants.

### **Methodological framework**

For investigating the peri-urban agroecosystem, a trans-scalar approach from the farm to the landscape level was adopted. The interpretation of historical data, field observations, and farmer interviews (Research data); the analysis of statistical data and the evaluation of ecosystem services (Statistical data) were performed.

Firstly, with the aim to identify historical permanences of rural landscape, a historical research was developed. In this step, ancient documents (iconographies, cartographies, maps and bibliographical descriptions) found in historical public archives and libraries were collected and analysed. Secondly, analysis of Chieri Municipality’s statistical data (Agricultural Statistical Census, ISTAT 2010) were performed. In this context, the characterization of agricultural sector, the ecosystem services’ evaluation provided by the farms and their multifunctionality were deeply analysed. According to Casini, Contini and Romano (2012) regarding multifunctional concept, different parameters should be evaluated and directly translated into rural development models. Figure 1 reported the

scheme of the multifunctional concept applied to analyse the peri-urban farming system of Chieri.



Figure 1. Scheme of multifunctional concept.

Furthermore, field observations and farmer interviews were carried out. Fifteen local farmers as representative of different farm types based on enterprise mix were interviewed. Regarding farmer interviews, data are under evaluation and not showed in this paper.

## RESULTS AND DISCUSSION

### 1. Research data

The analysis of historical documents and cartography (XVII<sup>th</sup> – XX<sup>th</sup> centuries) confirmed the importance of agricultural activity in Chieri Municipality. The identification of historical permanences were also identified by the authors, through the surveys and the comparison of ancient documents with present cartography and bibliography. Moreover, historical literature, cartographies, figured land registers and cadastral maps collected in this research (Table 1) allowed us to understand the historical permanences and landscape structure, with particular attention to land uses, cultivation types and traditional elements. Vineyards, grassland pasture and crops were the main historical cultivations and were maintained for centuries.

Table 1. The list of archives consulted, original name, year, the type of documentation, and the information acquired.

Archive name and localization	Original name	Year	Type of documentation	Information acquired
Archive of Turin, Sezioni Riunite (TURIN)	Tipo dimostrativo Bealera, Parti, Fossi e Strade	1773	Map	Irrigation system and settlements character
	Tipo dimostrativo del corso delle Bealere del Si. Principe di Carignano	-	Map	Land use types, and farm buildings
Archive of Turin, Sezione Corte (TURIN)	Tipo della Vigna della proprietà dei Padri Barnabiti	1787	Map	Landscape structure and settlements character (vineyards)
	Notizie topografiche e statistiche sugli Stati Sardi.	1847	Literature	Cultivations practiced, production, agricultural features and techniques
Archive of the Royal Agricultural Academy (TURIN)	Dizionario geografico storico-statistico-commerciale degli Stati S.M. il re di Sardegna	1847	Literature	Land uses, techniques, productions and traditional cultivations
Archive of Chieri	Mappa Strada vecchia di Pasano	1766	Cartography	Land use types, and farm buildings
	Cabreo del Monastero delle Orfane	1750'	Maps	Land use types and landscape structure
	Collezione cartoline storiche e fotografie	1899-1920	Photo Postcards	Landscape structure

## 2. Statistical data

In 2010 Chieri had a Total Agricultural Area (TAA) of 5264 ha and an Utilized Agricultural Area (UAA) of 5018 ha. Considering UAA, the amount of the main crop productions in Chieri was analysed: Cereals 54%; Permanent grassland 39%; Vegetables, flowers and nurseries 2%; Arboriculture and woods 4%; and Fruit crops 1%.

Farms (n. 276) were classified by type of production. In Table 2, the average of the Total Agricultural Area (TAA) and Utilized Agricultural Area (UAA), the owners' gender and age were reported for each type. Farms specialized in herbivorous (B) are those with the highest UAA (46 ha), orchards and vineyards farms (E) are the smallest (5 ha). Varied cultivated crops and farm' types contribute to characterize the Chieri Municipality's landscape. Observing the owners' mean age, it is possible to note that it is under 60 years old. It is possible to assume that the rural identity of the area will be stable for at least next 15 years. In addition, women represent 1/3 of the total number of owners farmers.

The multifunctional parameters, discussed in Figure 1, have been analyzed and are linked to the provision of ecosystem services. The number of satisfied parameters was calculated for each type of farm. The results are highlighted in Table 3.

Farms specialized in horticulture (F) satisfied more parameters than the others, especially compared to farms specialized in granivorous (G) or in mixed livestock (H). Considering the frequency perspective (ratio between the total of multifunctional parameters satisfied and the total number of farms of each farm type, %) the 77% of farms specialized in horticulture (F) satisfied multifunctional parameters and they are probably the most active in opening up websites and selling online products. Mixed farms (D and H)

express multifunctional attitude up to 39% and 33% respectively. While farms specialized in cereals (A) and granivorous (G) less contribute to multifunctionality. These parameters will be used in the continuation of work, which involves gathering information directly from a sample of farmers.

Table 2. Classification of Chieri farms by type of production (2010). Mean values of Total Agricultural Area (TAA), Utilized Agricultural Area (UAA), the owner farmers gender and mean age are reported.

Farm Type	Code	n°	TAA (ha)	UAA (ha)	Owner farmers		
					Males	Females	Age
Specialized in cereals	A	130	12,37	11,86	88	42	54
Specialized in herbivorous (cattles, sheeps and goats)	B	49	46,51	45,77	41	8	58
Mixed farms with crops and livestock	C	28	20,39	19,53	21	7	52
Mixed farms (cereals, vegetables and permanent crops)	D	23	9,97	8,10	17	6	60
Specialized in vineyards and orchards	E	19	5,50	5,50	13	6	63
Specialized in horticulture (vegetables and flowers)	F	13	6,06	4,67	8	5	55
Specialized in granivorous (pigs and poultry)	G	11	32,41	29,65	11	0	48
Specialized in mixed livestock	H	3	20,15	19,04	3	0	58
TOTAL		276	-	-	202	74	-

Table 3. Multifunctional parameters satisfied by each type of farm (A,B,C,D,E,F,G,H codes refer to Table 2).

Multifunctional parameters	A	B	C	D	E	F	G	H
Website	-	-	-	3	-	3	-	-
Online selling	-	-	-	-	-	2	-	-
Agritourism	-	-	-	2	1	-	-	-
Didactic farms	-	-	-	2	1	-	-	-
Work on behalf of third parties - non-agricultural activities	1	2	1	1	-	-	-	-
Maintenance parks and gardens	6	2	1	-	-	5	-	-
Renewable energy production facilities	-	1	2	1	1	-	1	1
Transformation of products	1	3	1	-	1	-	-	-
FREQUENCIES (%)	6	16	18	39	21	77	9	33

## CONCLUSIONS

The following preliminary conclusions can be drawn from the study:

- Multifunctionality pathways provides a useful instrument of development and a challenge for the agricultural sector (Wilson 2008). Our results can be of interest both for methodological purposes and for the planning and management, keeping on hand the intrinsic, tangible and intangible benefits of these peri-urban rural landscapes. After identifying types of multifunctional agriculture, Casini et al. (2012) outlined the need to develop models that integrate traditional and historical farming processes with non-market goods and services' evaluation.
- Using the ecosystem services' approach allows to express on a territorial scale what each farm expresses in terms of multifunctionality. This result is in providing ES that directly or indirectly affect our quality of life.
- There exist ecosystem disservices and trade-offs produced by intensive agriculture which must be taken into account.

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