

Special session - Planning and designing green infrastructures.

Farming in a city without farmlands.

Cadastral mapping of agriculture in Turin and early assessment of multifunctionality viability.

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Abstract:

In Turin, agriculture still does not officially exist in the zoning of the masterplan. Recently, the City opened to the opportunity to include agricultural areas in the plan, a subject still under discussion. Peri-urban agriculture is a controversial topic. Not only it is impactful on the landscape and on the ecosystem, but it also is scarcely profitable due to price volatility. However, peri-urban farming is often not negligible in dimensions. In the City of Turin, the productive farming soil amounts to at least 650 ha and it is even more extensive (10,000 ha) by looking at the cities of the first belt. The study shows that the agricultural sector of the City is currently struggling, and the very role of agriculture, in peri-urban areas, may be under discussion. Can agriculture, in Turin, become environmentally sustainable, integrate multifunctionality, recover its social value and dialogue again with the historical cultural heritage of the green belt? Before answering these questions, it was necessary to have a starting point. This paper will present the state of affairs of agricultural cadastral parcels and farmers in Turin.

Keywords: peri-urban agriculture; multifunctionality; mapping; productive green infrastructure

Introduction

This study was born within the proGReg Project -Productive green infrastructure for post-industrial urban regeneration-, an EU Horizon project about Nature-Based Solutions (NBS) for Green Infrastructures. The local partners of the project are the City of Turin, the Metropolitan City of Turin, the Regione Piemonte, the DIST (*Dipartimento Interateneo di Scienze, progetto e politiche per il Territorio*), the DAD (*Dipartimento di Architettura e Design*) department, several cultural and trade associations; the international partners participating are Dortmund, Zagreb, Ningbo (China) as leading cities; Cluj, Zenick, Piraeus as follower cities; Aachen University, ICLEI as organizers and CNR (*Centro Nazionale di Ricerche*) as a partner for research and monitoring in Italy. The first phase of the work from the DIST, comprised within the proGReg work package n.2.1 -spatial analysis in front-runner and follower cities- (Elisei, Leopa, 2018) focused on agriculture and farming in the City of Turin. The ratio behind this choice must be searched in the inherent nature of agriculture, which creates, on all effects, a diffuse productive green infrastructure on the territory. It is also necessary to assess how peri-urban agriculture can also fulfill the adjective *green* in *Green Infrastructures*, which is related to sustainability and support towards the ecosystems; a feature that conventional agriculture somehow lacks without applying proper farming methodologies (Power, 2010).



The study consisted in a direct survey of agricultural businesses. The broad objective of the work was to evaluate the opportunity to integrate multifunctionality in agriculture. Multifunctionality, in fact, can facilitate the conversion toward a more sustainable agriculture, and contribute to the requalification of the peri-urban territories. The *Comune di Torino* recently started an overall revision process of the main planning tool (Comune di Torino, 2017, 2018), also with the opportunity to add agricultural zoning, which was historically missing. The origin of the absence goes back to the original Masterplan of the City -PRG-, which purposely omitted this use of the land, distributing formerly agricultural areas in zones of further expansion of the City or, more recently, integrating them under the definition of *parks* and *green areas* (Area Urbanistica, 2018). Agriculture, with the urban expansion and the increase of the industrial production, was expected to become a marginal sector for the economy of the City. The recent opening of the administration toward this subject must be traced back to 2015 when the first 301 variants was originally proposed (Comune di Torino, 2015). Agriculture was further investigated in 2018, when the City undertook a path of deep revision of the main planning tool to integrate sustainability processes.

To understand the phenomena on a territorial standpoint, the priority was to build a database to distinguish between areas that are just maintained by farmers and surfaces where the agricultural production happens. This has been the main scope of the study since there was almost no direct nor complete source of data to obtain this information. It was also an important moment to study the current state of peri-urban agriculture in Turin from the point of view of the farmers and their farms, which represents a source of strategical information to develop future strategies and new policies. Before being able to successfully integrate multifunctionality and new concepts for green agriculture and ecosystem services, it is important to assess the readiness of the farmers.

The methods used

The work was carried out with qualitative and quantitative approaches, in four phases. A quantitative approach was used to collect and process the necessary data to analyze the farm enterprises activity on the territory of the City and to compose a GIS map. A qualitative approach, consisting of semi-structured interviews, was used to gather information about the condition of the farms from the farm holders (Russo, Tomaselli, Pappalardo, 2014).

The first phase entailed a review of the former works done on this subject on previous years in the City of Turin by the DIST. The data collected was in form of questionnaires, but it also provided a former mapping of the locations of the farm fields. The second phase involved interviews of the owners and collection of information on the farm about the quantities of production and the presence of threats to the farming activity. The third phase consisted in the scouting of the regional database and the use of cadastral maps to represent agriculture in Turin, with the support of local farming-trade unions and farmers, to identify more in detail which soils are kept by the farmers on the City and build a preliminary GIS dataset. The last phase was to identify, between the formerly collected data, which cadastral parcels are currently and actively used for agriculture, which are simply maintained by farmers but are not directly involved in production because are abandoned, have undergone urbanization processes or are occupied by parks or forests.

Quantitative analysis:

Agriculture is not directly planned in the uses currently regulated by the PRG *-Piano Regolatore Generale-*, and therefore little information is available about it in the City. In order to capture the spatial extension of agriculture in Turin, it was necessary to operate indirectly, using ownership, funding and cadastral data. To study the characteristics of the farms that are active on the territory the *Regione Piemonte* provided access to their *Unified Agricultural Registry* and data warehouse *Sistemapiemonte*.

The service is publicly available for use on the official site of the Region and can be queried about multiple issues regarding the agricultural sector (presence of livestock breeding, prevailing crops, Utilized Agricultural Area), with the capability to restrict the investigation down to the municipal level. For this work, however, the interest was on the cadastral data used by this system and, since it held sensitive information on the companies, the owners and on production, it was subject to a request for special access. In order to be as comprehensive as possible, the data extraction was extended to all the cadastral parcels owned by each company that declared at least one parcel on the territory of Turin. This was done to investigate the business dimension not only within the survey area, but also its extension into other municipalities.

The results, elaborated with the GIS, allowed to spatialize the data to better understand the agricultural phenomenon. The Regional dataset, although exhaustive in the quantity of information contained, is built on a yearly basis with the interactions that farm owners have had with the administration while applying for tax deductions and funding requests related to the Common Agricultural Policy. This means that the parcels declared by the farmers do not coincide with agricultural productive areas, but with all those areas in which farmers intervened, for productive purposes or maintenance. Fluctuations on the collected data can, therefore, alter the precision of the information. To contain these variations as much as possible and to make the sample as exhaustive as possible, the cadastral data were extracted for all the available years (from 2007 to 2018).

The data extracted from the Regional database served two purposes.

- A general analysis of the Farms: number of active companies in the Municipality of Turin, quantification of farms by class of UAA *-Utilized Agricultural Area-* the legal form of the company, the historical data of the farmlands, the ownership of land, the demographics of the owners, the variation of the UAA over the years; for which the extractions were used without reworking, to maintain the consistency of the content, and allow future comparisons and monitoring with the original database.
- The mapping of farmlands based on the cadastral survey and the GIS cartographic display of the cultivated surfaces in Turin. For the location of the surfaces of the agricultural land, UAA data of the farms distinct between Turin and the municipalities of the Metropolitan City, detail of the non-agricultural uses, surfaces of the companies inside and outside Turin, UAA within and outside Turin; an extrapolation from the *Sistemapiemonte* database, provided by the Region was

used. The contents of the database extraction were subject to a partial rework, due to the inconsistency in the records of the land uses inside the cadastral parcels (empty, partially filled, doubled database fields, overlapping uses and surfaces, differences in the registration methods depending on the municipality of origin).

Qualitative analysis:

The semi-structured interview is based on a questionnaire designed by *DIST, Coldiretti Torino* and *ODAF (Ordine dei Dottori Agronomi e Forestali)*. It is structured to acquire, from the farmer, qualitative and basic quantitative data together with observations on the state of health of the company, on the perceived quality of the environment in which the parcels of the farmer are located and on the possible external sources of threats (pollutants, illegal dumps, industries).

The information collected through the interview concerned the following topics:

- Company size and localization
- Type of Production
- Direct product transformation
- Cultivation methods
- Employees and economic yield
- Active Multifunctional activities
- Future/project multifunctional activities.
- physical limitations and threats to the land
- Necessity for new areas
- Livestock food supply dynamics
- Irrigation systems adopted
- Possible future company projects
- Need for new volumes or transformation of existing volumes
- Opportunities from proximity to the city
- Disadvantages of proximity to the city

The observations provided by the farmers were also useful to assess multi-functionality viability in the croplands of the City.

For the administration of the semi-structured interviews, the work was carried out together a current student in urban planning and with the help of *Coldiretti Torino*, which takes care of the company files of a large portion of the farms present in the City. The trade union association acted as intermediary with the farmers, selecting the companies that, for the purposes of this research, represented a relevant sample. These were a mix of small (family-led, less than 30ha), medium (again family led but with a greater amount of land between 30 and 100 ha, also outside Turin) and large (farming and livestock breeding companies over 100ha) farm enterprises, established in Turin or neighboring municipalities which farm land in the City under property, loan or rent. The questionnaires, for reasons of accessibility and timing, represent a sample, albeit significant, of companies with these characteristics.

Results

The city of Turin represents an attraction pole for farms operating in the Metropolitan context, that also reach the regional scale. This is due to the presence of the numerous wholesale and outdoor markets that attract farmers. From the data extraction on *Sistemapiemonte*, as of 2018, there are 360 registered farms gravitating on Turin, of which 41 also carry out livestock activities, for a total of 10495 animals.

Farms and farmers

Farms operating in the Municipality of Turin

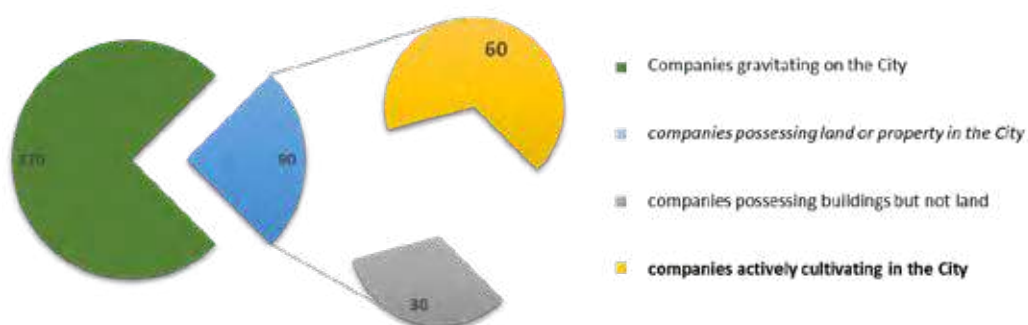


Figure 1 – farms operating in Turin

Out of these 360, 270 farms carry out commercial activities in the City of Turin, 30 possess a building property, but only 60 of these declared a piece of land -used for production or just maintained- inside the boundaries of the City. Of the 41 livestock farms, 29 have their livestock in Turin, for a grand total of 1700 animals. It is important to refrain that if a farm declares the upkeep of a field, not necessarily it means that the field is owned by the company, or that it serves a productive agricultural function.

To better understand the phenomena of farming in Turin, the parcels declared by the farmers were differentiated between those inside the City of Turin and those inside other towns of the Region. The last ones were not spatialized since the farmers, usually, own land in several different municipalities, resulting counter deductive to show this level of detail in the data.

Farms - Distribution of cultivated surfaces Inside and outside the City of Turin

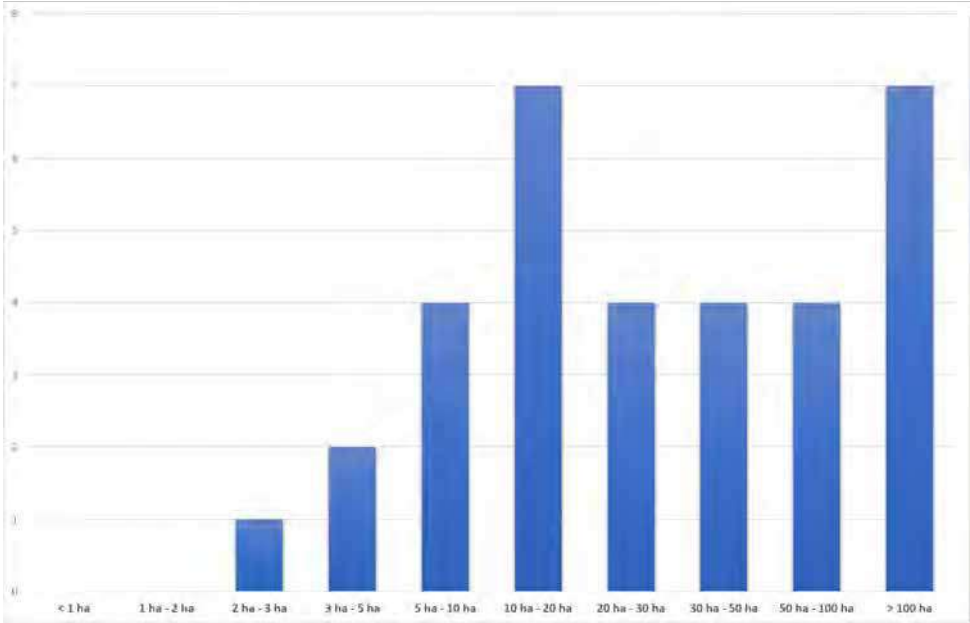


Graph 1 – proportion of land inside and outside Turin per farm.

In order to provide a more relevant representation it was decided to extrapolate a sample from the population of the 60 farms owning a piece of land in Turin. Only the companies whose surfaces, overall, fell inside the standard deviation, and were subject to the interview, were included. In graphs n.1 and n.2, each number represents a farm, and the bar split represents the ratio of land inside the City, and that in other towns of the Region.

and lack of economic differentiation. But they are also those that have deeper ties with the territory and can contribute more actively to preserve and maintain it.

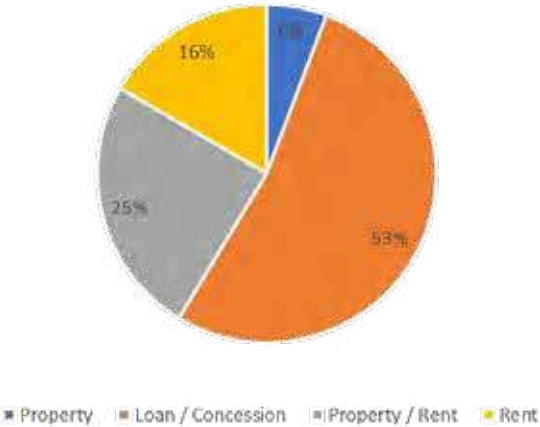
Farms by class of UAA size in hectares



Graph 3 – classification of farms based on the dimension of their UAA

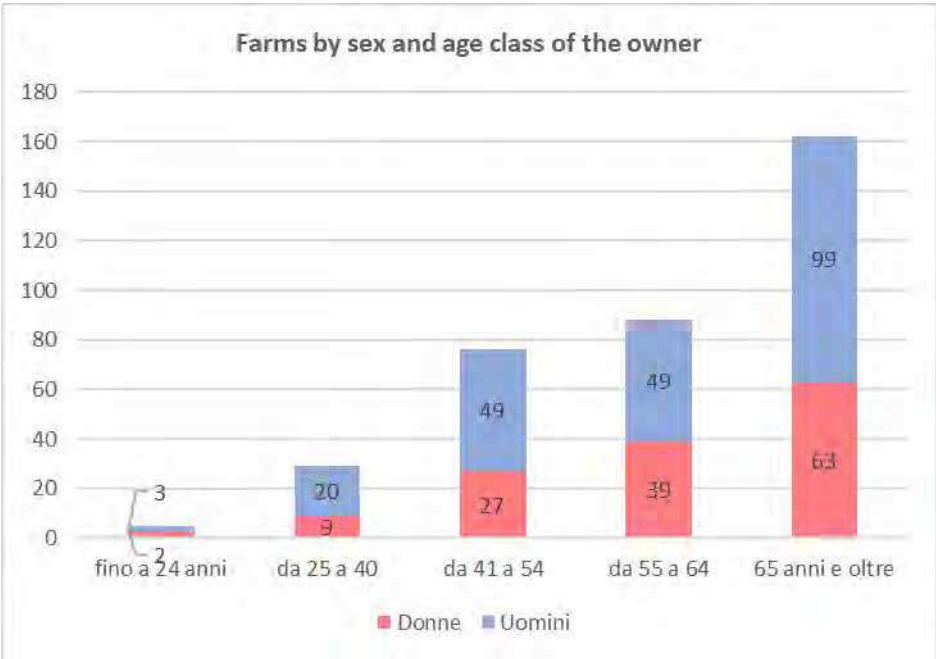
Even though farmlands in Turin are limited in extension, the average dimension of a farm is around 60 hectares. This data, connected with results in graphs n.1 and n.2 (that show an average split of 30% of land inside the City, 70% outside), tell us that, an average farm in Turin will hold 18 ha inside the City, and the remaining 42 ha in other Towns; which indirectly confirm the marginality of the sector in the Turin, where most of the enterprises need extensive farmlands outside the boundary to maintain their economic sustainability.

Tenure status of the land



Graph 4 – Tenure of property of the land declared by the farmers

Overall, 69% of the land is leased or loaned. Only 6% of the total land declared is owned in property, while 25% of the surfaces of the farms are mixed, with used surfaces that can be partially owned and partially under loan from third parties.



Graph 5 – farms by sex and age of the owners

On the 360 companies registered in Turin, the aging of the owners is noticeable. Half of the companies are managed by over 65 holders, 25% of the owners are between 55 and 64 years old, while the other quarter is divided among the residual age groups, where young owners (up to 40 years old) represent just a 9%. The data itself is not enough to draw up a risk profile of interruption of activity due to the lack of new generations interested in carrying out agricultural activity. It shows, nonetheless, a significant threat, which does not only affect continuity, but also competitiveness and profitability. Furthermore, it is not possible to know how many of the owners represented have a successor who can, or wants, to carry on the activity, or if there are any associated forms that guarantee continuity.

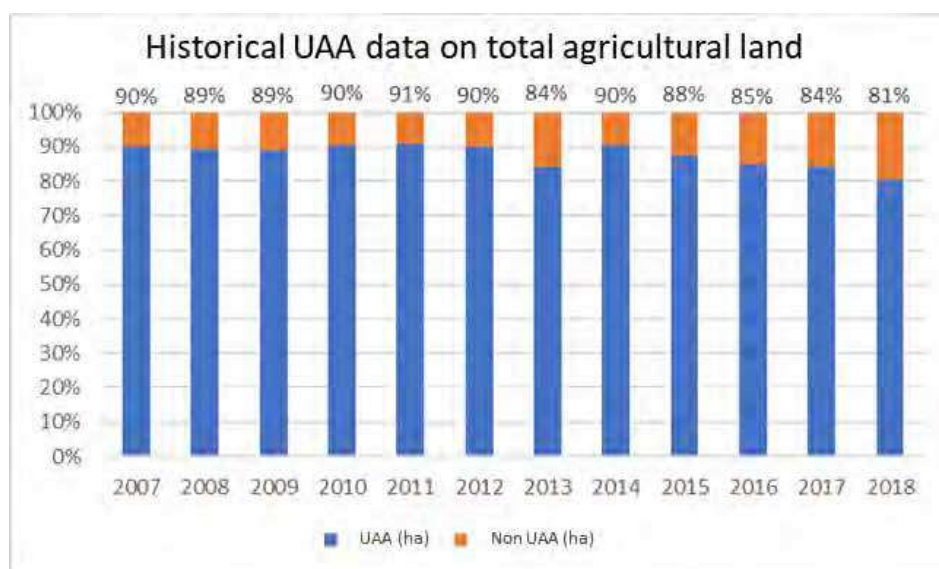
Farmlands in Turin

As stated before, the sources from which to obtain data about agricultural surfaces in the City of Turin are few, and their precision is not entirely reliable. However, the information registered on the data warehouse of agriculture by the *Regione Piemonte* represents a starting point. These surfaces are not strictly dedicated to farming, but are those declared by farmers, on which they also performed other agriculture related activities that are not necessarily connected to production (mowing and general maintenance for example, also in the parks and the forest areas of the City).

Year	Farmswith farmalands	UAA (ha)	Total surface (ha)
2007	90	602.04	670.29
2008	88	620.31	696.48
2009	84	640.66	720.34
2010	80	610.22	677.02
2011	78	637.70	702.98
2012	80	574.30	638.15
2013	95	539.44	642.86
2014	82	583.64	647.21
2015	92	514.33	587.51
2016	96	516.79	608.69
2017	91	536.95	638.69
2018	99	537.98	667.90
Average	88	576.20	658.18

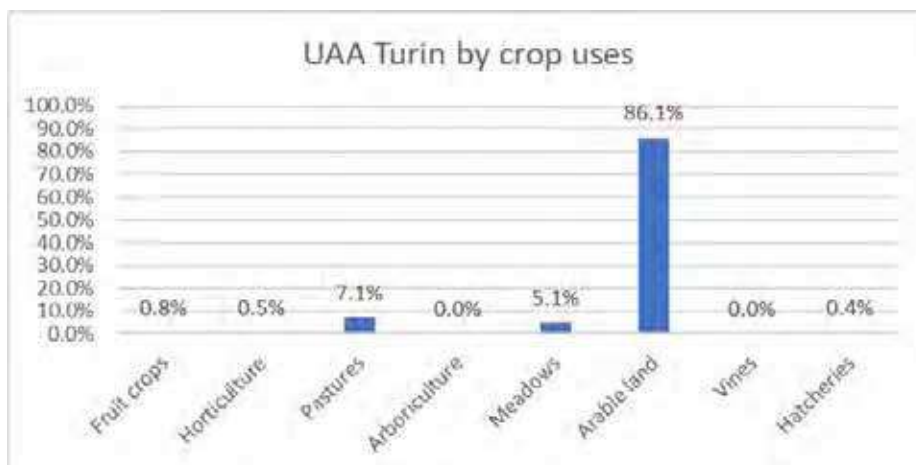
Table 1 – Variations in the declared surfaces in the period 2007-2018

The data in table n.1 helps to determine the dimension of agriculture in Turin. It shows variations, which can also be steep, in the declared surfaces on a yearly basis. In the 12-year data series, on average, the active farms in the city are 90, and the declared land amounts to around 660 ha.



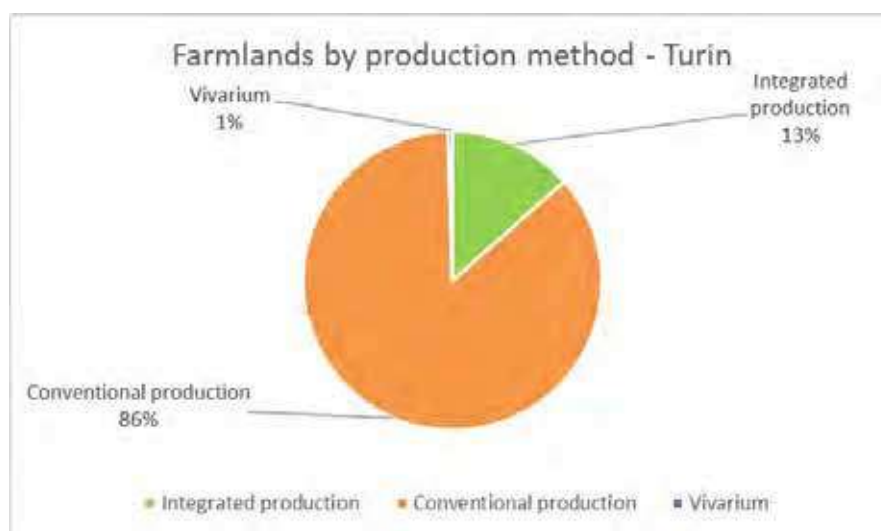
Graph 6 – Variations of the ration of UAA in the period 2007 - 2018

When the surface of each year is normalized to 100%, the quota of UAA fluctuates, with a tendency of reduction in the most recent record, where the non UAA surface comes near 20%, up from the typical value of 10% registered in previous years. The composition of non-UAA surfaces confirmed that more surfaces are being classified as non-agricultural in the data warehouse. Which may suggest that an increasing amount of surface has lost the original purpose. Although a more detailed survey to confirm this trend is needed.



Graph 7 – Crop categories in Turin, 2018

Graph n.7 highlights the prevalence of arable crops over the others, which is coherent with the prevalent vocation of companies covered by the interview. The graph highlights the monofunctional character of Turin's agriculture.

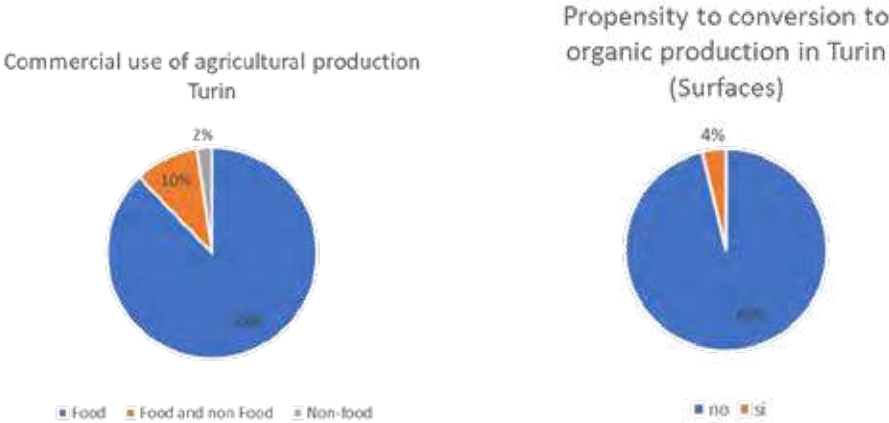


Graph 8 – different production techniques in the City of Turin 2018

Conventional agriculture is the cultivation system commonly used in intensive production. It involves the use of chemical aids to maintain soil fertility and defend plants. This can lead to the discovery of residues (which must be in any case below the legal limits defined by the EU) in products and environmental problems linked to certain practices (monoculture, continuous use of the same active ingredient in the pest control, etc.). However, even conventional agriculture currently moves towards a production model with a lower environmental impact that is, therefore, less intensive.

Integrated production is the food production system that uses methods and means of production and defense, against the adversities to agricultural production, aimed at reducing the use of synthetic chemicals and rationalizing fertilization, respecting ecological, economic and toxicological principles. For the integrated agricultural production of the *Regione Piemonte*, reference must be done to the commitments envisaged by the technical standards drawn up in compliance with the National Guidelines

for Integrated Production and approved with the “*Determinazione Dirigenziale del Settore Fitosanitario e Servizi tecnico-scientifici n. 230 del 14 febbraio 2018*”. The *Regione Piemonte* identifies specific practices and regulations for this method, detailing agronomic practices, fertilization, phytosanitary defense, weed control and plant growth regulators methodologies (Regione Piemonte, 2018). From the questionnaire component of the interview it results that, in Turin, 86% of the production is carried out with conventional methods and integrated production is only diffuse on the 13% of surfaces.

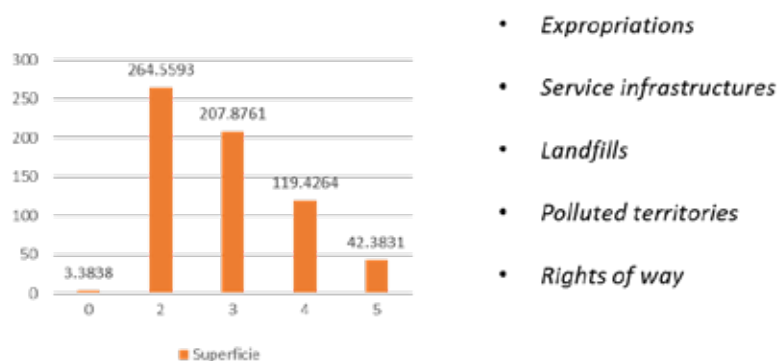


Graphs 9 and 10 – Destination of the production / Propensity of conversion to organic production

Farm owners declared that most of their productive lands are devoted to food production in Turin. Only a minor percentage of surfaces is dedicated to mixed uses, and just 2% of declared lands are devoted to non-food productions. The interview also exposed a very low propensity of the farmers to organic conversion.

The proximity of the City, the presence of multiple contaminated sites, the seniority of the owners and the very nature of the companies (intensive production for the purpose of food consumption and breeding) are often limiting factors that push farmers to renounce organic farming. It is important to notice that, on the metropolitan scale, the conditions change and the propensity to organic seems to be greater (a subject that needs deeper investigation), also because urbanization leaves more space for agricultural areas, reducing the factors of impact and making organic a more viable choice. Difficulties that companies encounter as regards the conversion to organic will be further developed in more detail in the qualitative analysis of the questionnaires and results.

External pressure factors on agricultural areas



Graph 11 – Farmlands surfaces by number of pressure factors

In the interview it was asked to the farmers what types of pressures and externalities their fields were under. The information collected, associated with the cadastral data, allowed to quantify the agricultural soils that are subject to external critical factors such as:

- expropriations and service infrastructure systems, which contribute to the fragmentation of production and ecosystems;
- proximity to landfills, also illegal, and abandoned or polluted land;
- presence of rights of way on the soils of the farm, which hamper agricultural activities.

The results are, of course, limited by the fact that the interview was on a sample of farms. This output covers a sample of soils inside the City and in the first belt (we asked to the farmers to identify, on a map, the lands they referred to, in order to quantify them with cadastral data). Nearly all the farmland of this sample was subject to at least two limitations, for a total of 250 ha analyzed in Turin, and 360 ha analyzed in the first belt of the City.

Interviews

Farmers were questioned on the topics described in the methodology, and asked to provide points of view, ideas, personal observations on the addressed issues. The sample consists of 45 farms of the City, and the interviews currently covered 25 of them, due to low response rate. The questions of the semi-structured interview concerned the following themes.

- *Propensity to conversion to organic farming* - on the environmental sustainability front, almost all the farmers interviewed showed a good sensitivity to environmental issues and to reduce the pollution of agricultural activities. The owners show awareness and try to reduce their environmental impact by containing the use of pesticides or artificial fertilizers. However, they expressed themselves, in most cases, negatively when asked if they are inclined to convert to organic production (96% gave a negative answer in Turin, while 69% gave a negative answer for the fields in less urbanized areas outside the City).

- *Observations on adopted cultivation methods and employees* - owners prefer to use as little as possible external personnel, taking over the workload of the farm almost entirely on a family level, thus failing to deal with alternative projects. Farms are therefore specialized on a limited number of productions that guarantee the maximum possible yield while keeping the commitment constant in terms of necessary working hours.
- *Propensity to multifunctionality* - at present, the interviewed farmers have shown little interest, and sometimes concerns about multi-functionality and the introduction of innovative agricultural practices (only 27% of farms are positive about multifunctional farming activity). Among other things, it emerged that farms that also breed livestock are less likely to differentiate their activities than those that only carry out agricultural activities.
- *Observations on physical limitations to land* - farmers are aware of the conditions of the land and the impact of large transport infrastructures, proximity to landfills or areas polluted by the presence of industries. Elements of risk that, in the periphery of Turin, are a constant. Contributing to the contamination of the lands are the frequent abusive discharges complained by the owners, especially those located in north Turin. These discharges take place on the street or in the irrigation canals and contaminate the waters and therefore the lands. Farmers in addition to complaining about this issue have also highlighted the difficulties in dealing with the abusive waste which, in some contexts, cannot be collected by the waste companies.
- *Observations on the irrigation system* - all the farmers expressed positively about the quality of the water they collect from the irrigation canals, which started improving with the gradual dismissal of industries. Today water quality is not a concern, however, the farmers with land near the border of the City complain about the disruption of the canal system by the urbanization processes. This results in fields that cannot be irrigated and, therefore, can only support non-irrigated crops.
- *Future company projects* - owners were tendentially negative about new projects to differentiate their activity. 82% answered negatively to the opportunity of experimenting with new crops, 88% would not try to process their own products in the company, 82% do not contemplate of opening a structure for direct on-site sales. On the other hand, 65% of the farmers have machinery renewal projects and 49% of them need new structures, but most of them do not have a clear idea or the funds to pursue these needs.
- *Opportunities and disadvantages deriving from the proximity to the City* - we observed a clear split. Owners of small farms mostly expressed negatively about the proximity, listing in the major disadvantages the fragmentation and the loss of land they had to withstand. For them the big demand of the City is not enough to offset the drawbacks. They often do not have the resources to counteract differentiating their activity. On the other side there are the big owners. They are often owners of livestock, that need extensive surfaces to feed their animals, or big cultivators that can offset the problems of the City with the fields they farm also in less compromised environments far from the city. For them the City still represents an opportunity. Livestock owners find easier



to sell their products, while other big farmers usually experiment multifunctionality in different ways, and try different productions.

All farmers agree on the main disadvantages of proximity to the city: pollution, landfills, abusive discharge of trash near the fields, conflicts with other citizens living near the farmlands, fragmentation of the soils due to the pervasive infrastructure system, and difficulty of movement with the agricultural machines on the roads.

Mapping

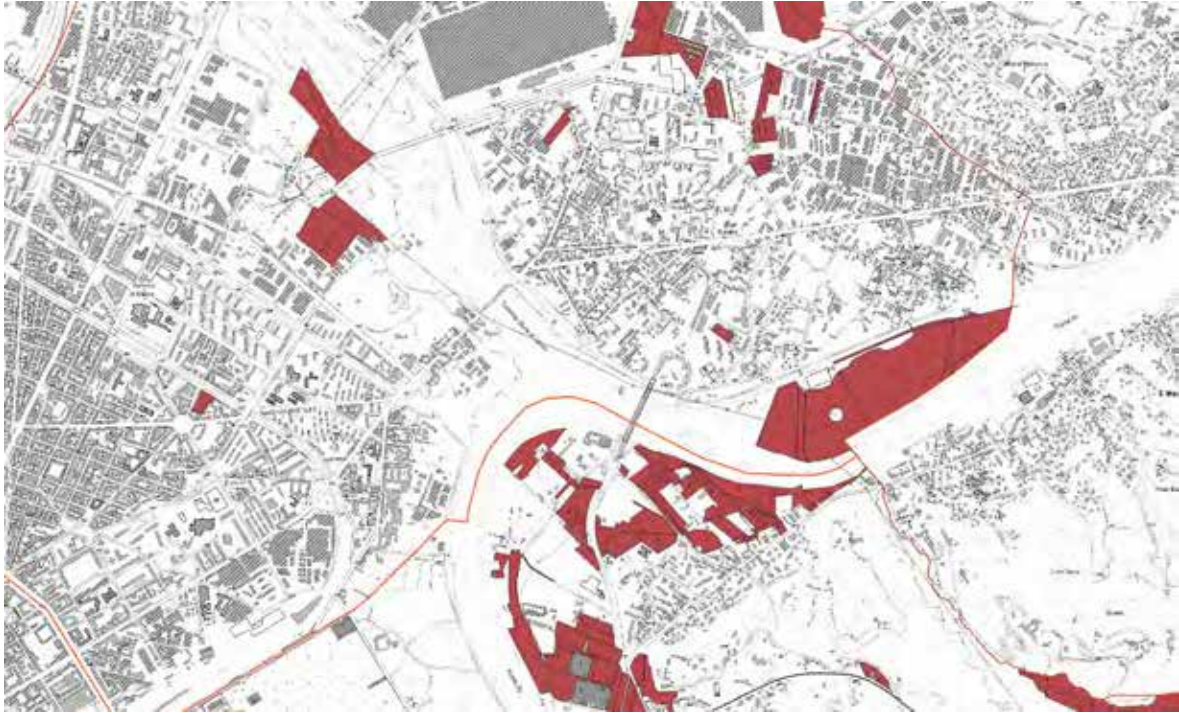
The mapping process to identify agricultural use and cultivated areas started with data collected in previous works (Sini, 2015) which has been integrated with the database extraction the *Regione Piemonte* (table 2) provided us, and an updated cadastral map of the City.

Comune	Foglio	Particella	Nome azienda	Macrouso	Occupazione	Superficie	SUP1	PERFICI3	PERFICI4	PERFICI5	SUPMAX	Destinazione uso
TORINO	1359	1	2183830013	Superfici seminabili	899 - prato pascolo	0,0243	243	0,04	0,0391		391	002 - DA FORAGGIO
TORINO	1119	1	2323740031	Usi non agricoli - Tare ed incolti (aree n	770 - uso non agricolo - aree n	516	516	1459	1,4581	942	14581	0
TORINO	1119	1	2323740031	Superfici seminabili	001 - granturco (mais)	0,9421	9421	1459	1,4581	942	14581	002 - DA FORAGGIO
TORINO	1119	1	2323740031	Usi non agricoli - Fabbricati (aree occ	660 - manufatti	0,4601	4601	1459	1,4581	942	14581	0
TORINO	1192	1	4302030012	Superfici seminabili	001 - granturco (mais)	1,0923	10923	1215	1,2222		12222	011 - FAVE, SEMI, GRANELLA
TORINO	1192	1	4302030012	Usi non agricoli - Fabbricati (aree occ	660 - manufatti	0,1055	1055	1215	1,2222		12222	0
TORINO	1192	1	4302030012	Elementi caratteristici del paesaggio	788 - siepi e fasce alberate	0,0244	244	1215	1,2222		12222	015 - ELEMENTI DEL PAESAGGIO/EFA - AREA
TORINO	1027	1	6345300013	Usi non agricoli - Tare ed incolti (aree n	770 - uso non agricolo - tare	73	73	4,3422	4,3363	4,2633	43422	0
TORINO	1027	1	6345300013	Usi non agricoli - Tare ed incolti (aree n	770 - uso non agricolo - aree n	73	73	4,3422	4,3363	4,2633	43422	0
TORINO	1012	1	6345300013	Superfici seminabili	001 - granturco (mais)	1,1537	11537	1,1565	1,1565	1,1534	11565	002 - DA FORAGGIO
TORINO	1012	1	6345300013	Elementi caratteristici del paesaggio	788 - siepi e fasce alberate	0,0028	28	1,1565	1,1565	1,1534	11565	015 - ELEMENTI DEL PAESAGGIO/EFA - AREA
TORINO	1027	1	6345300013	Elementi caratteristici del paesaggio	788 - siepi e fasce alberate	0,0017	17	4,3422	4,3363	4,2633	43422	015 - ELEMENTI DEL PAESAGGIO/EFA - AREA
TORINO	1027	1	6345300013	Superfici seminabili	001 - granturco (mais)	4,2633	42633	4,3422	4,3363	4,2633	43422	002 - DA FORAGGIO
TORINO	1115	1	BSCMSM70D01L219R	Elementi caratteristici del paesaggio	788 - siepi e fasce alberate	0,0157	157	1285	1,2833	1,2275	12833	015 - ELEMENTI DEL PAESAGGIO/EFA - AREA
TORINO	1115	1	BSCMSM70D01L219R	Superfici seminabili	575 - fave, favino e favette	1,2275	12275	1285	1,2833	1,2275	12833	011 - FAVE, SEMI, GRANELLA
TORINO	1115	1	BSCMSM70D01L219R	Usi non agricoli - Fabbricati (aree occ	660 - manufatti	0,0401	401	1285	1,2833	1,2275	12833	0
TORINO	1066	1	CHMGCR62E11L219T	Usi non agricoli - Fabbricati (aree occ	660 - manufatti	95	95	0,66	0,6806	0,5287	6806	0
TORINO	1066	1	CHMGCR62E11L219T	Superfici seminabili	587 - grano (frumento) tenero	0,5287	5287	0,66	0,6806	0,5287	6806	011 - FAVE, SEMI, GRANELLA
TORINO	1066	1	CHMGCR62E11L219T	Elementi caratteristici del paesaggio	788 - siepi e fasce alberate	0,0569	569	0,66	0,6806	0,5287	6806	015 - ELEMENTI DEL PAESAGGIO/EFA - AREA

Table 2 – cadastre-parcel based database of declared farmlands, *Sistemapiemonte*

The first cartographic output was jointly checked with farmers, employees and managers of trade associations, to collect as much information as possible to complete the map with the missing -non declared- areas.

The last step was the identification of the areas that are effectively devoted to productive purposes. For this, the *Comune di Torino* provided a 4-band orthophoto (Red, Green, Blue plus near infrared) updated to 2019. With a multiple overlay of the orthophoto, the regional BDTRE database, the uses already declared and a raster analysis application for QGIS (*From GIS to Remote Sensing plugin*), the cultivated areas were discerned from other areas.



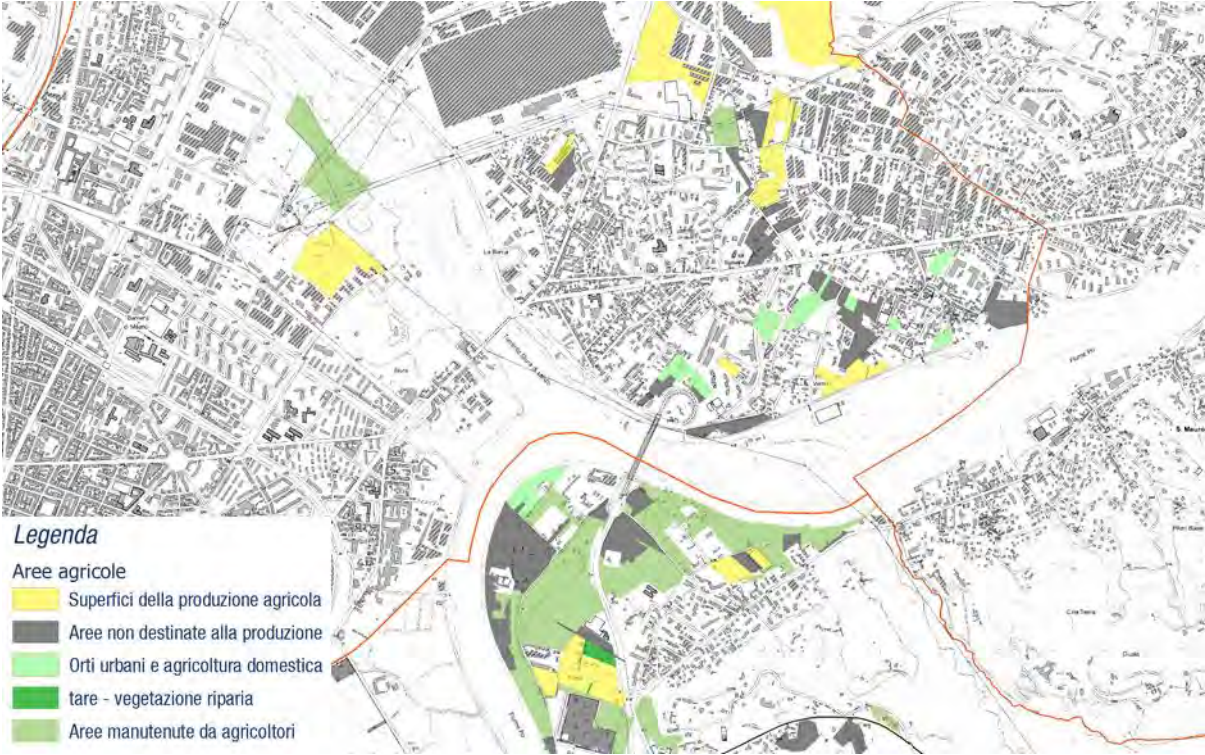
Picture 1 – agriculture related soils, previous data and information, 2015

Mapping initially involved the collection of previous maps created on this subject. The data was extracted for each available year, from 2014 to 2018, from the data warehouse. These were integrated on the Cartographic cadastre of the City of Turin, with GIS join functions. With the general map available, the next step was to integrate data about the owners of the farms from the database shown in table 2.

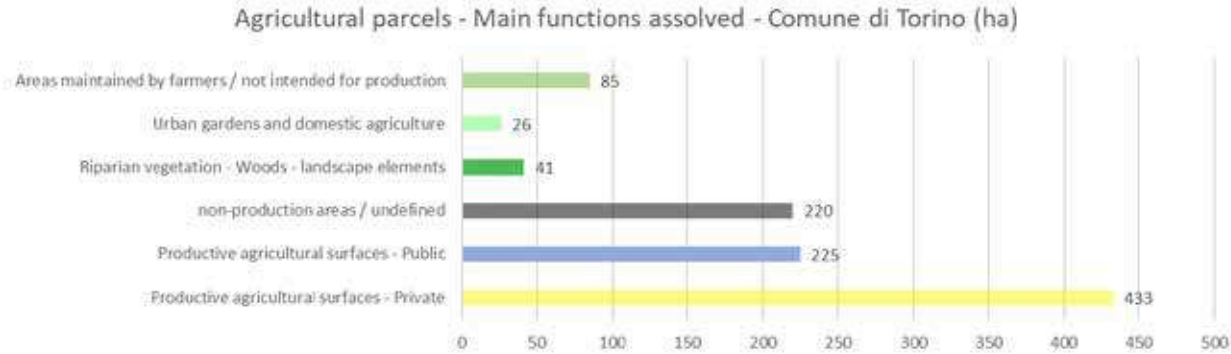


Picture 2 – 4-bands orthophoto- Torino 2019

At this point however, the map represented both the lands of the production and the parcels where the farmers were doing regular maintenance for third party or in the City parks, without a clear distinction. To detect the productive farmlands the former areas were, when possible, identified through the declared uses. The process to recognize the parcels that were not declared -but clearly served a productive function- was supported by the experience of the farmers and representatives of the farming trade unions active in the City, who helped to identify and confirm the areas. Some further areas were then located with the raster analysis tool for QGIS (Congedo, 2016).



Picture 3 – Final output and definition of productive farmlands, 2018



Graph 12 – Surfaces related to agriculture, 2018

In Turin, in late 2018, there were 658 hectares of parcels used for production, that (considering the UAA ratio of graph n.6) amount to at least 530 hectares of UAA on the City. With this study, moreover, it was possible to identify 85 hectares of land that are actively maintained by the farmers in public areas and parks. Public farmlands amount to the 34% of the total productive parcels and are given in conduction to local farmers by the City. Moreover, at least 41 hectares of parcels are occupied by woods and vegetation

related to farms. There still is an amount of parcel surfaces that need further examination to be clearly identified. It can be stated, therefore, that farming contributes to upkeep at least 780 hectares of land in the City.

Final Observations

The results, especially from the interviews, show that agriculture in the peri-urban space of Turin is currently under pressure. Agriculture's main problem is the resilience toward changes in the economy and globalization dynamics. The low added value generated (complained by all the farmers subject to the interview), in fact, make it susceptible to external pressures. The sensitivity is amplified in the peri-urban space, where the landscape has often little recognized value, and the soil represents a precious and scarce resource for many other, not always environmentally friendly, uses.

Farmers, in the peri-urban space of Turin, show low propensity to differentiation, and farms tend to be strictly mono-functional. This can be brought back to the next causes:

- The seniority of the farmers, who prefer to simplify the activity;
- the desire to reduce as much as possible the use of labor outside the family and the recruitment of employees;
- the low economic value generally attributed to agricultural production that favors latifundiums;
- the shortage of time and resources, not only economic, determined by the previous points.

A situation that does not lend itself to multifunctional agriculture activities and practices, making the penetration of new ideas and projects difficult. On the contrary, multifunctionality requires a different approach, more specialized professionals and asks farmers to project and plan with a business mindset (Zasada, 2011). Ideal conditions for this to happen may also be the reduction of the age of the owners and a greater attention to their training on the management. Substantial economic investments, supported by profitability evaluations, are also fundamental (problematic for companies that have difficulty in the update of the machines).

Needs that clash with the reality, were price volatility (European Parliament, 2017) hinder economic planning of major transformations or long-term projects in local farms. Proximity to the city is a natural opportunity for a farm that also carries out tertiary service functions. But it is also a threat, given the frequent landscape degradation of the residual rural peri-urban areas of Turin. Hardly a farmhouse inn will be economically sustainable near the belt highway, the numerous landfills the industrial areas or the incinerator. Moreover, all the interviewed farmers expressed a negative outlook towards their work and, in general, the agricultural sector in the proximity of the City.

Nonetheless, they also showed good sensitivity to environmental issues and about reducing the footprint of farming. However, in most cases they expressed themselves negatively when asked if they are inclined to convert to organic farming. Farmers are aware of land conditions, external pressure factors and territorial criticalities, such as large transport infrastructures, proximity to landfills or areas contaminated by the presence of industries. They show low propensity to undertake the process of conversion because the results are not entirely under their control.

The City of Turin owns 225 hectares of agricultural land, and leases or loans it to farmers. This represents an opportunity, as the administration can decide to implement, on these lands, practices and pilot projects aimed at multi-functionality and sustainable agriculture. A solution that would also make it easier to deploy the necessary facilities and infrastructures. The same principle applies for the implementation of sustainability policies. However, currently, the PRG includes rules about farming in the areas that are inside the parks, but still there is no clear planning strategy or framework for the *agricultural parks* that the City identified (NUEA, art. 21 - Parchi urbani e fluviali).

With regards to the mapping process, it was useful to better understand the layout of the soils that, in several respects, are related to farming or farmers. But the databases are currently not enough to directly understand which terrains are used for production. Besides, it was possible to discover that, apart from the productive soil, there are at least 85 hectares of land that are maintained with the help of farmers, and most probably this number is higher. Farmers, hence, already offer a service to the City, also on private land. Over 780 hectares of land are associated to agriculture and upkept by farmers in Torino.

The survey highlights how the issue of peri-urban agriculture needs to be addressed in a systemic perspective that transcends the municipal dimension. In fact, most of the analyzed companies have the largest part of their land outside the Municipality of Turin. In the first belt of the metropolitan area the agricultural system, whose offshoots penetrate inside the Turin peri-urban area, is much more relevant and many of the criticalities detected for Turin still apply. The complex of these areas constitutes a real infrastructure of agricultural production, a landscape that joins other not only anthropic but also natural and green infrastructures. In addressing the issue of green infrastructures, especially productive ones, the metropolitan area is an ideal field of study. Also it should be noted that, for the definition of any strategy about peri-urban agriculture and agricultural park, the local dimension is not enough, and areas identified by the city as Agricultural parks should be studied in connection to the system of rural and natural areas connected to them, also outside of the city borders.

The methodology used to assess agricultural areas in the City of Turin can be replied on the metropolitan scale, especially in the first belt, although with some adaptations. The interviews should be administered on specifically chosen farms, based on the identified issues of the study areas. Factors of pressure can be identified through spatial analysis and databases on polluted sites with the help of the administrations (especially the *Città Metropolitana*); cadastral data can be collected for a multitude of communities, thanks to a project (*progetto catasto*) which is a collection of GIS based cadastre files; the data extracted from the regional database can be reworked with semi-automatic methods, in order to fix the intrinsic errors already found during the development of this study. An addition to the method may also be the inclusion of the datasets of the project *Corona Verde*, which will add information on the historic and cultural heritage of this space, that is strongly connected to agriculture and can be an important source to define restoration policies integrated with agricultural production (Gottero *et al*, 2018).

To conclude, it is still difficult to implement sustainability practices in agriculture in peri-urban landscapes like the one of the City of Turin. Here agricultural land is an actual third space (Fanfani, 2006), sparsely treated on the local scale and still somehow overlooked at the regional one. For this space, a different planning framework is necessary, that does not rely on traditional planning practices. What is important to note, though, is the value of farmers' land management, which would be difficult to replicate

if the agricultural areas were converted to entirely different uses or hindered in their productive dimension. A value not only economic, but also social, since agriculture is one of the few activities that involve citizens in the active upkeep of land and soil. Before converting these spaces in parks (due to abandonment) or sacrificing them because of lack of interest from the farmers themselves, this should be kept in consideration. Multifunctionality can serve a role in this transitional phase, but it should be supported by a clear strategy. A possible answer for a more environmentally sustainable peri-urban agriculture would be to promote its conversion to integrated production. It would result in a higher control over the chemicals used in the soils, potentially recovering the ecosystem value of the farmlands (PAN, 2010). A move that can raise the quality of food production near the City and, therefore, positively impact also on its economic sustainability.

Contribution

This small work was an opportunity to deepen the knowledge about peri-urban agriculture in the City of Turin. The acquired information is a starting point that can be used to orient future research. More importantly, this work focused on the point of view of farmers, which was useful to highlight some of the weaknesses of the system on a socio-economic perspective. Multifunctionality, in agriculture strongly depends on the capabilities of the agricultural system. If the farmers do not have the necessary resources, policies will be difficult to apply. This represents a useful starting point to expose some of the factors limiting its diffusion.

The cartographic output of this study has already been used to implement the next City masterplan update. It may further prove to be useful to the City if new policies for agriculture will be discussed in the future. But mostly it is a way to highlight again that, also in a deeply urbanized metropolitan Capital, agriculture can still be relevant, not only for the production but also for the other services that farmers can carry out in parks and other areas. This document and its outputs can be a reference for the City to understand how to better exploit a territorial resource that is both material and immaterial.

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