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Title

Evaluation of the status and the potential of the local agrifood systems: integrated demand and supply of local and organic products

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Local Agrifood Systems (LASs) as a tool to preserve and develop the periurban agriculture

Ph.D. Thesis

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1. Introduction

1.1. Economic and political background

In developed countries agriculture, especially that of the specialized suitable areas, produces goods mainly for the global market and the food industry, so that only 20% of the production is traded locally, as opposed to what happens worldwide where this percentage rises to 80% (EU Committee of the Regions 2011).

Starting in the '90s with the Agenda 2000, pillar of Common Agricultural Policy (CAP) multiple functions have been attributed to agriculture, which have an effect mainly in the areas where the farms are located. So, today it is widely accepted that agriculture can be an instrument of control and enhancement of the landscape, conservation of plant and animal biodiversity, protection and transfer of traditional production techniques. In addition, through agritourisms, direct sales and didactic activities the farm has established a contact between the production and the territory by constructing small (or sometimes large) exchange circuits on a local scale.

Although now the spread of these activities is broad and known to most customers, remains a source of content and as previously mentioned, the agricultural production is mostly designed for global markets.

At the same time from several parts the imbalance in power relations within the food chain is complained. Farmers retain a small percentage (16%) of the value produced by the entire food chain, while the most relevant percentages are the prerogative of the other actors of the entire agrifood system (Nomisma, 2008).

In addition, the cost items for handling a broad range of goods, especially agricultural commodities, that have a contained market price, represent a limit that in the future can become binding, but even more can represent a negative externality in terms of consumption of fossil fuels, increasing of greenhouse gases and therefore environmental impact.

Over the past few years the demand for transparency and recognition of food products has considerably grown, also due to global scandals, real or only perceived, which had the effect of stimulating a new awareness of a rising share of consumers, who ever more rely to local products that are deemed healthier and above all more easily verifiable.

Last but not least, it must not be forgotten that the increased demands of food commodities, as determined both by population growth on a global scale and by changing the eating habits of the middle and wealthy classes of developing countries, may lead in the future to a different system of trade flows of foodstuffs and each country could be called upon to contribute more markedly to increase the production of food destined to domestic consumption.

All of these reasons seem to push towards the development of the agrifood sector in order to meet local demand and to develop new models of short food chains on a local/regional scale.

It should also be noted that, as several examples of good practice show, the Local Agrifood Systems (LASs, SAL in IT) can be a tool for local development of great importance since they are able to retain most of the added value in the area and may be the driving force for local development in the economic, occupational, social, cultural and environmental outlines.

The EU Committee of the Regions has forcefully place the LAS issue to the attention of the European Community, through a formal request for an outlook opinion to the EU Commissioner for Agriculture Dacian Cioloş. The aim of the report, setting out issues and problems of European agriculture in the light of the challenges of the new CAP (Common Agricultural Policy), is to propose a specific support for LASs as a tool for the development of agriculture and rural areas (Dwarshuis-Van De Beek, 2011).

Local Agrifood Systems (LASs) can be an important tool for local development as they are able to locally retain a significant share of added value and LAS may be the driving force for local development under different aspects: territorial, economic, employment, social, cultural and environmental.

Moreover they can define alternative food chain based on complex and deep relationships between agricultural production, processing, distribution and consumption in a specific place (Dunn et al, 2010). The LASs can also be a tool to strengthen the competitiveness of farms representing a defense against urban sprawl in periurban areas (Mazzocchi et al., 2013).

The development of LASs can meet local demand and structure new models of short chains on a regional (or subregional) scale. These will also help to rebuild multifunctional agrarian regions with high ecological and environmental values through the enhancement of agroecosystems services (reduction of GHG, mitigation of microclimate, ecological corridors, High Natural Value Farmland).

In fact LASs involves environment, products, people, local institutions, know-how, eating habits, and networks of relationships in a territory to produce a agrifood system, organizing production and services (farms, agribusiness, commercial, services, catering) in a specific territory, that means in a geographical space (CIRAD-SAR, 1996).

In Western countries, the dominant model of agriculture is highly centralized, consisting of large food processing and marketing companies that are increasingly operating on a global scale and produces goods (commodities) for the global market and for the agrifood industry (Van Der Ploeg, 2008). The global model of agriculture implies a significant impact in terms of “food miles”, namely the distance between the point of production and the point of consumption (INEA, 2012), resulting in high cost for long-range transports of goods, especially of that agricultural commodities characterized by low prices, increase of Green House Gases (GHG) emission and therefore of the total environmental impact of the entire cycle (production - consumption – waste).

The global model also includes several levels of intermediation that reduce the value added helded by farmers (Nomisma, 2008).

Although recent studies have questioned the environmental and economic sustainability of LASs (Coley et al., 2009), the current pattern of consumption has limits and impacts that can be overcome thanks to LASs.

Geographical proximity is only one component of the definition of "local" (Thompson et al., 2008), because customers associate to local food such as traditional production techniques, sustainable production and distribution practices aimed at reducing the use of pesticides, fertilizers and energy, protecting the environment, and promoting the protection of biodiversity and agrobiodiversity. Some customers extend the definition of sustainable agricultural production to include fair labor practices and animal welfare.

The USDA (United States Department of Agriculture) outlined concepts, impacts and consequences of LASs (Martinez, S. et al., 2010), furthermore it lists some of the most common alternative supply chains, as reported below.

Direct sale to the customer is the distribution channel often called "farm to fork". Different typology of sales belong to this channel, including farmers who direct sell their products (farmers' markets), Community Supported Agriculture (CSA) and pick your own experiences (Martinez, 2010). To these, the Joint Purchasing Groups JPG (GAS – Gruppi di acquisto solidale in IT) which are typically Italian experience, can be added.

Sale through middlemen is the distribution channel which includes the sale to retail chains and catering enterprises. The target market for the first is again the single customer while for the latter are the public and private institutions, such as schools and hospitals, company cafeteria services etc. (Martinez, S. et al., 2010).

Whereas the presence of territorial branded products (Protected Geographical Indication and Protected Designation of Origin) in the Large Retail Companies is very common, only recently, some large retail companies have begun to make space to local products thanks to specific agreements between producers and retailers.

Furthermore restaurant and catering companies, driven by the demands of customers, are scouting local products through a direct relationship with producers. Unfortunately this is a distribution channel rather not homogeneous and fragmented for which is very hard to define the current and potential market.

Finally one of the most interesting channels is the institutional catering. This sector accounts for a large share of the demand for food and also this is an homogeneous and seasonal demand according to menus that facilitate a direct relationship with local production.

The public mass catering, and the school one in particular, represent an important meeting point between production and consumption, which invest Public Administration and School Board with great responsibilities because allows parents and citizens to participate in choices and responsibilities, moreover is also an interesting market for producers.

1.2. Periurban areas and soil consumption

The soil consumption is actually one of the emerging problems involving both agriculture and spatial planning. The areas most at risk are those engaged by periurban agriculture. This areas are constantly under pressure of urbanization (Mazzocchi, 2011).

The relationship between towns and countryside is a critical element for the government of the territory: farmlands are often sacrificed to the needs of urban sprawl, while the protection of the territory is mostly entrusted to binding instruments (protected areas) that hardly ever exploit suitably the productive of agriculture.

In periurban areas, therefore, agriculture shows characteristics that identify it and some positive functions of farming activities, not always considered, emerge. Among these, the role of periurban agriculture in the preservation of open spaces, thanks to the permanence of farming on the territory is considered essential: this represents a further positive externalities generated by agriculture (OECD, 2006), of considerable value in its fringe areas, where the soil (free) is a scarce and precious resource. In fact, in the periurban context the building pressure exerted by the city towards the surrounding free space is very strong, but moreover is often not governed: the city grows in a disorderly and scattered way.

In many areas of the world the extension of the city on the territory occurs without any governance, often lacking a land use planning able to handle a harmonic development of the built areas: all this influence in a consistent manner the shape and function of the agricultural surrounding the cities.

The maintenance of agricultural activities in the periurban areas may help to preserve the territorial structure and promote a rational and comprehensive planning and is a key element to address the complex issues that occur in periurban area. Agriculture can therefore be an instrument of regulation of land use, contributing to a territorial management that allows a balance and a dialogue between cities and countryside.

“In broad terms, the process of land-use change is determined by universal driving forces such as population increase, urbanization, industrialization, and so on. On the other hand, it also depends on local characteristics such as inherent socio-economic and natural conditions and behavioral characteristics of the people.” (Morita, H. et al., 1997).

“According to local ecological condition and habitat, periurban agricolture can contribute to preserve natural areas despite the increase the price of land “ (Thapa, R.B. et al., 2008).

The EU Commission, in its Proposal for a Directive of the European Parliament and of the Council establishing a framework for the protection of soil (EU Commission, 2006), points out that “Soil is under increasing environmental pressure across the Community, driven or exacerbated by human activity, such as inappropriate agricultural and forestry practices, industrial activities, tourism or urban development”; and further “Soil is essentially a non-renewable resource in that the

degradation rates can be rapid whereas the formation and regeneration processes are extremely slow." and yet "In contrast to air and water, soil is mainly privately owned in the Community.

Nevertheless it is a natural resource of common interest that has to be protected for future generations."

In Europe in recent years, the urbanization is the main cause of the consumption of agricultural soil in periurban area. Faced with the continued growth of the built-up areas, in recent decades a not-proportional increase of the population occurs (EAA, 2006). In the same time a considerable loss of the compactness of urbanized territory is occurring: this phenomenon affects the agricultural system, resulting in the disintegration of the morphological, ecological and social relations (Mazzocchi, C. 2001).

The soil consumption in Italy in the last 10 years grew at an average of 8 m^2 per second and the historical series shows that it is a process that since 1956 never stopped. In other words, have been consumed, on average, more than 7 square meters per second for more than 50 years (ISPRA 2009).

A large part of the Italian territory is at high risk of overbuilding, particularly in the northern regions most urbanized as Lombardy (Pileri, P. et al., 2010). This phenomenon is highly evident if we analyze the data from different Italian regions and of the amount (in %) of the artificial surfaces. The following graphs shows that in both cases the Lombardy region has the negative leadership. (Regione Lombardia, 2011).

Fig. 1: Surfaces of the Italian regions with permission to build (%), 1995 - 2006 (source: Istat)

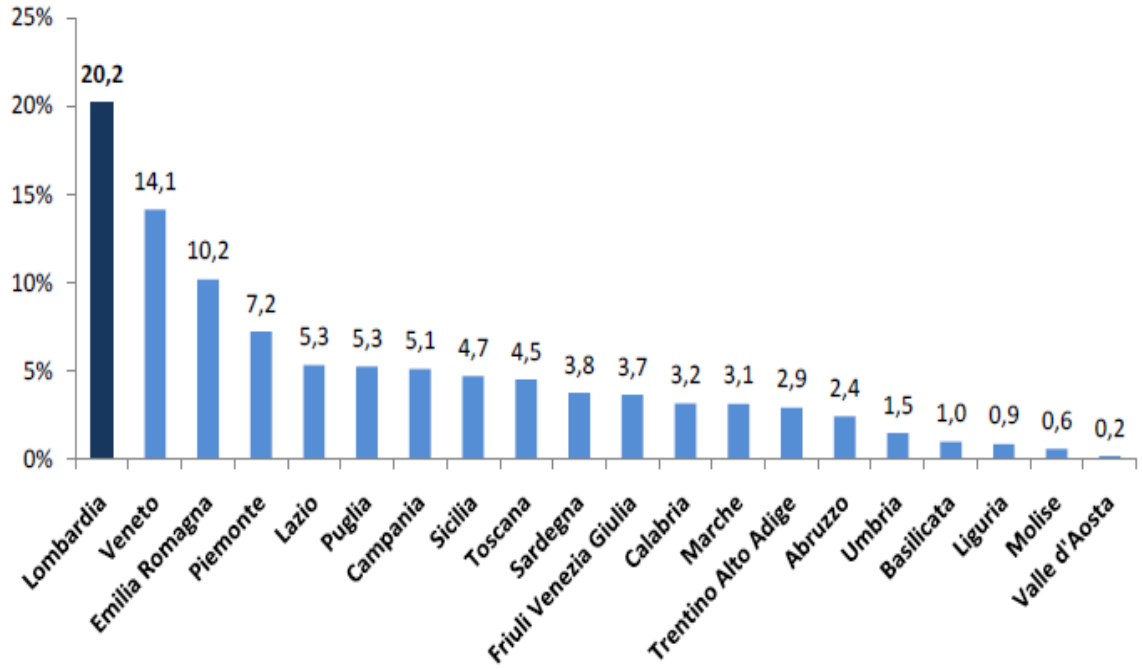
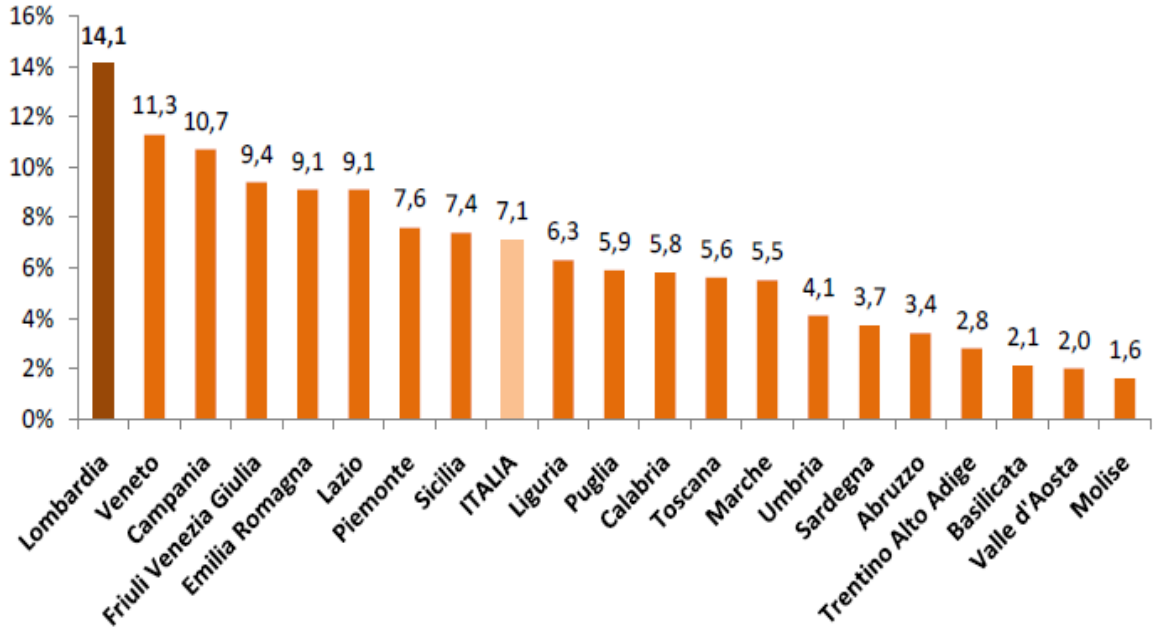


Fig. 2: Artificial surfaces in the Italian regions (%), 2010 (source: Ambiente Italia, Report 2011)



1.3. The Agrifood Systems

The **Agrifood System** includes all the steps of production, processing and distribution of food and traditionally includes agriculture, industries providing technical resources for agriculture, food processing industry and the commercial sector.

The different Agrifood systems are the result of the sharing of biologic, territorial, socio-economic and cultural characteristics of the context in which they develop. So, beside the environmental, geographic and climatic elements many other factors play a key role in building a Agrifood system: institutional and policy framework, the economic characteristics such as the degree of concentration of resources and capital, the spending power of consumers, but also their level of awareness, the traditions of production and consumption, as well as eating habits.

The agrifood market, like all other economic sectors, in the last decades has developed into a global perspective that involves the handling of commodities and products on a global scale, beside a standardization of consumption patterns; otherwise in the agrifood market, with higher intensity than others economic sectors, an awareness of the origin of products often connected to the characteristics of the territories of origin has developed.

The territorial designations, introduced for local wines from the 80s and more recently extended to other food products have given wide visibility and corresponding protection to territoriality of the productions. However, this concerns in particular the origin of raw materials and production techniques regulated by specific production specifications, without taking into account the distribution of the products and the distances between production and consumption.

1.3.1. The LASs (Local Agrifood Systems)

The LASs can be defined in the first instance as alternatives to the globalized food model that is based on the complex relationships between agricultural production, processing, distribution and consumption in a specific site (Dunn et al, 2004). However, **there is not still a commonly agreed definition of the term "local"** and about what characteristics and perceptions are given it by the different stakeholders.

According to an official definition of the USDA (United State Department of Agriculture) can be defined as local goods those which have been produced within 400 miles, about 643 km from the place of consumption and within the boundaries of the State (Martinez, S. et al., 2010). It seems evident that this distance, probably acceptable in the American context, is unattractive in Europe and Italy in particular.

The second important point concerns the attributes that are associated , more or less correctly, to local production: local products can then be conceived as environmentally sustainable, healthy, traditional, able to protect biodiversity, etc.

In January 2011, the EU Committee of the Regions has placed strongly the theme of LASs to the attention of the Community bodies, by a formal request for an outlook opinion to the Commissioner for Agriculture, Dacian Cioloş.

In this document, the rapporteur, Lenie Dwarshus-Van de Beek, a member of the provincial government of South Holland, described the issues and problems of European agriculture in relation to the challenges of the new CAP and proposed to support LASs as an operational tool for the development of agriculture and the rural areas (EU Committee of the Regions, 2011).

In the United States, with a certain advance on Europe, the issue of LASs was analyzed by a report by the USDA (United States Department of Agriculture) in May 2010 which outlined the concepts, impacts and consequences (Martinez, S. et al., 2010); this report was already preceded in July 2007 by a report from the National Association of Counties (NACO).

According to these documents the amount of the global volume of the market of local products corresponded in 2008 to 4.8 billion dollars, representing 1,6% of the overall market of food products, a percentage very low, but growing in the last decade.

Two types of activities within the local markets can be distinguished: direct sales to customers and selling through intermediaries. In the United States the amount of the market for direct sales of local products is around 0.9 billion dollars, while the market through intermediaries corresponds to 2.7 billion dollars, and finally the companies engaged in the two forms of the market have a market of 1.2 billions dollars. The total number of companies involved in local food systems is about more than 107,000, which corresponds approximately to 5% of the total number of American farms. (Martinez, S. et al., 2010)

Different types of activities including farmers' markets, the Community Supported Agriculture (CSAs), direct sales company and the operations of "pick your own" belong to the first distribution channel, that can be defined as "farm to fork".

The second distribution channel instead includes selling to restaurants, retailers and public and private institutions such as schools and hospitals.

1.3.2. Direct sale

With regard to direct sales, the easiest form of this distribution channel is **selling directly the products** in the farm, which however reflects the difficulty of this activity to reach a wide audience, is aimed primarily at a local market and is particularly effective where the farm is located in locations and paths that attract a great number of tourists. The benefit of this form of distribution is the connection between the product and the company that in many cases can be an attractive factor for the customers. Moreover, the physical presence of the producers in the farm, which allows the direct knowledge between the latter and the customer, is a key factor that can be defined as the first consumer experience from which develops the process of customer loyalty, which can also act as a sounding board by spreading the product at the circle of acquaintances.

In recent years on-line product sales is developing; this can be considered an extension of the opportunities of direct sales by farms, but in this case lack the direct knowledge between the producer and the customer.

A more simplified and, at least in Italy, less widespread, form of direct sale is the practice of "**pick your own**" which consists of the direct picking by the customer of fruit, vegetables or flowers. This form of direct sale has been developed in the United States in the '30s, during the Great Depression, when prices of agricultural products were so low as not to allow the use of manpower and mechanical equipment for harvesting, which was then assigned directly to the customers (Lloyd et al., 1995). Today the farms engaged in this form of distribution are often placed along communication routes and rely on the experience of the selection and harvesting by the customer who is accustomed to choose the product even at the shelves of supermarkets.

The diffusion and the effectiveness of the "pick your own" is still quite limited and is based on a fiduciary relationship towards the consumer that does not always exist.

An alternative distribution channel, comparable to direct sale, born in Switzerland and Japan in the 60s (Farnsworth, R.L. et al., 1996) and widespread mainly in the United States, is the **Community Supported Agriculture** (CSA), in which a group of customers buys a share of expected production of a farm. This experience is growing also in Italy in the recent years.

What happens can be traced to the financial model of the so futures: in this case the farmer receives an amount of money in advance of the production, thanks to which he can manage his farm and was equipped with a fundamental liquidity.

Payment can be made in a single solution at the beginning of the season or splitted during the year in equal semiannual, quarterly or monthly (Woods et al., 2009).

Consumers/lenders take part of the risks, ensure the production and in many cases become themselves promoters of the types of product to be cultivated and cultivation techniques. An interesting example regards farmers who wish to change the orientation of their production, e.g. from cereals to horticultural plants and/or the cropping system e.g. from conventional to organic, and therefore need liquidity to deal with business investments or reductions in yield. In these cases, the economic support by customers may become a strategic factor to allow conversion even through medium term agreements.

The CSA can support both individual companies and groups of companies and may also spread to a very large number of customers. The main benefit of a larger system is represented by the possibility of the farms to specialize their production, although of course the complexity also involves a higher level of management, as well as more resources devoted to realize a higher control of the production and distribution of products.

In the United States the CSA were only 2 in 1986 (Adam, 2006), but according to a reliable estimate in 2010 there were over 2500 (Local Harvest, 2010).

A distribution model that is often associated with CSA are the **solidarity based purchasing groups** (in IT **GAS = Gruppi di Acquisto Solidale**), which instead is now widespread in Italy (nearly 800), mostly concentrated in the northern and center region: nearly ¼ are in Lombardy, followed by Veneto, Piedmont, Emilia and Tuscany. GAS are consumer groups who form an association to buy foodstuffs directly from small producers, following some principles that can be summarized in the concepts like small, local, solidarity and respect for environment.

The main difference between CSA and GAS lies in the different relationship between supply and demand. In fact, the CSA imply a concrete commitment of performance and financial results by customers who actually directly support producers and assume, in part, the risks associated with the production. This type of relationship necessarily imply a multi-year commitment and that customers can steer the production choices of farmers. In the case of GAS the relationship between supply and demand does not involve any preliminary commitment, but only the signature of the supply contracts (if any) and the promoters of GAS can change the purchasing decisions in the course of time.

In addition, GAS do not fall strictly in the direct sale, because, if it is true that they establish a direct relationship between consumers and producers, on the other hand often GAS are suppliers of a large number of families which, although finding all the information related to the producers, do not necessarily have a direct relationship with them. GAS therefore play the role of intermediaries in the supply chain and are thus halfway between the direct and the indirect channel.

1.3.3. Indirect sale

The second type of distribution within the LASs is the indirect channel that requires the passage local product from the farm to different forms of distribution.

The most important indirect channel is catering or more broadly defined HoReCa (Hotel, Restaurant, Catering). For several years now the caterers and more and more even catering companies obtain their supplies local products through a direct relationship with producers. This is a rather inhomogeneous and fragmented distribution channel. For this reason for the definition of the current and potential market is complex. However Italian regional cooking has always relied on the tradition of local production; moreover an increasing consumer awareness can be a further impetus to the use of local products and the development of the LASs.

The distribution channel that leads directly from agricultural production to large retail chains has today a great chance of development. For more than a decade the large retailers, typically the prerogative of commercial products, began opening to territorial brand products and today some PGI and PDO products are in the shelves of most of the distribution points of supermarkets.

A channel that has a greater chance of development is that from agricultural production leads to large retail chains. For more than a decade also large retailers, typically the prerogative of commercial products, it began opening to brand products territorial and today PGI and PDO are in the pews of most of the points of the distribution.

Only recently some retail chains have begun to give space to local produce, some examples of some interest were seen in Valtellina thanks to the agreement of exclusivity for the sale of certain fruit and vegetables, especially apples, and milk products sectors.

In the United States some of the major distribution chains including Wal-Mart, the largest retail distributor of the world, have started selling local products seizing the growing public interest dl for products grown and processed within the territory, a concept that very often in the American reality corresponds to the State.

1.3.4. The case of public mass catering

A distribution channel of great interest is the direct relationship between local production and institutional catering.

This sector represents a large share of the demand for food and moreover, it has homogenous characteristics and seasonal menus that make it particularly attractive for a direct relationship with the local production.

In the United States the rise of the projects the supply of local products for the catering school in particular are increased spectacularly in the last decade to more than 2,500 programs in the

federal territory. Even in Europe there are several examples of close correlation between public procurement and local production.

The growth of eating out home

The Italian Federation of public stores (in IT FIPE), has calculated that in the last thirty years the average expenditure for food consumption out of home has increased by 78.7% , reaching EUR 2,118 per year per family. In 2008, 32.1% (national average) of meals were eaten out of home (FIPE 2008).

If the trend detected by the latest opinion polls will continue in this direction, in 2,020 every Italian will spend at least 50% of their food needs out of home.

Above all the midday meal help, to boost the growth of this phenomenon. Workers and students especially in the big cities of the northern and central region usually consume lunch outside the home during the weekdays, canteens, bars, taverns, snack bars, restaurants (ACU 2006b). In Milan there are more than 1,600,000 meals eaten away from home every weekday, a number higher than the resident population.

The problems of public procurement

Public mass catering (canteens), but also large commercial catering, has its own supply channels dealing with increasing volumes of products, in which buyers interact with producers according to different logics than the large retail chains. These logics are still little known by the producers, as is often the case that the same buyers aren't aware of the characteristics of the world of food production.

These two systems tend to act according to separate logics (Nielsen, T. et al, 2009) and are still found several problems:

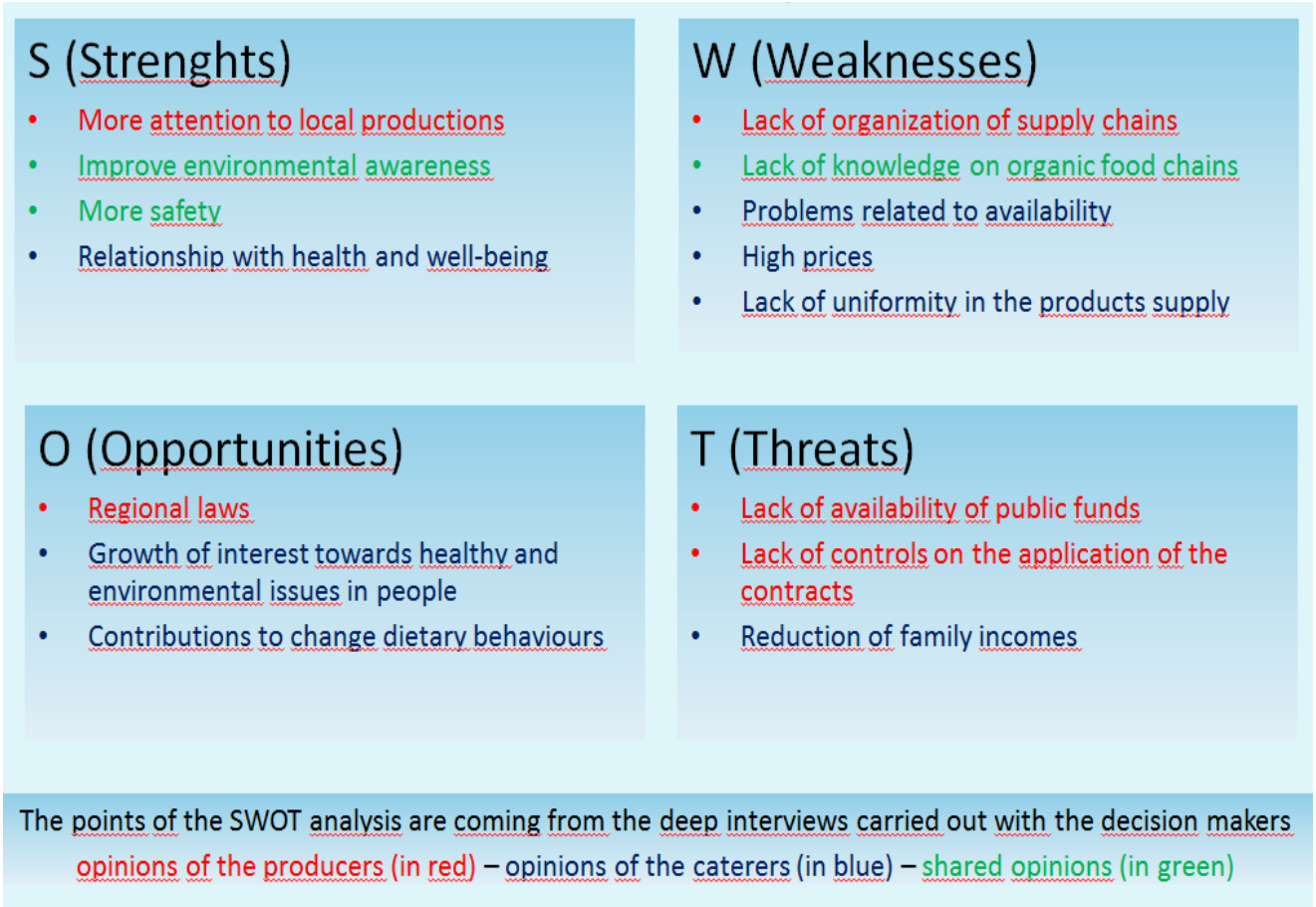
- requests of foodstuffs from the public mass catering system are regular and require a continuous supply and fixed deadlines;
- the quality requirements of raw materials are often different from those of large-scale distribution by size, by type of product and supply chain of origin (organic is much more consumed in Italy in school canteens than in families, in contrast e.g. to Germany);
- in the availability of products in the types and of the supply chain of origin requested by public procurement often occurs problems related to the real availability of the products and to the market prices;
- transportation of products to the cooking centers and from these to the terminals where it is consumed (e.g. refectories in schools) presents several logistic problems;
- purchases are not decided by individual customers, but from a decision-making center (Municipalities, Departments of Health Hospitals and Rest homes, etc..), which has its own policies usually constant over time..

All of these "critical issues" may result in obstacles to the sale of foodstuffs to catering system, but on the other hand they are also a challenge that, if properly exploited, could result in a change in the organization of food production and the supply chains of products for public mass catering system (Spigarolo, R et al. 2010a).

These problems are particularly relevant in the case of the supply of organic products, as shown in the SWOT analysis below.

Fig. 3: SWOT Analysis of the Public Procurement

(Bocchi, S. et al, 2008 - Workshop on Public Catering- IFOAM Congress Modena 2008)



According to the latest data by National Association of Mass Catering Companies (in IT ANGEM), taking part of Italian Federation of public stores (in IT FIPE), which represents the sector at national level, 7.5% of the population above the age of three lunches in the school canteen and business (FIPE 2008).

Eating in the canteen is mainly the prerogative of workers and of students aged from 3-4 to 13 years (from kindergartens to lower secondary schools). In the big cities of northern and central regions, only 35.4% of the working people eat at home, 14.8% eat in public or private canteens, 14.8% have lunch in a bar while 20.4% consume the meal at the workplace.

Focussing on the public mass catering sector, data are shown in the table below.

Table 1: Number of meals and turnover of public mass catering (*Source: FIPE - 2008*)

	number of meals/year (*1.000)	number of meals/deay (*1.000)	Tturnover (Millions €/year)
Companies	700.000	2.200	2.400
Hospital/Rest homes	730.000	2.300	2.520
Schools	380.000	2.000	1.300
Others	190.000	650	650
Total	2.000.000	7.150	6.870

These data take into account of all the catering services that companies, schools, hospitals, rest homes contract out to external catering companies, and do not include the number of meals provided either directly or through public companies, which currently represent about 20% of cases in school meals, a little more in the hospital catering, and over 50% in the social welfare while they are below 10% in the companies.

1.3.5. Focus on school catering

The supply chains destined for school catering have been thoroughly analyzed during the project iPOPY – innovative Public Organic food Procurement for Youth – 2007-2010 (Nölting, B. et al.., 2009 – Nielsen T et al. 2009).

From the research carried out by the project clearly emerges that the demands from the municipalities, which manage on their own or contract out school catering service in primary and lower secondary schools, and in a most of the nursery schools, are oriented to implement the purchase of products from controlled supply chain (organic and/or integrated agriculture, PDO and PGI products, fair-trade). This trend is accompanied by a constant reduction of the products from conventional agriculture, as well as, in the last years, by a significant increase in demand for local products (Bocchi, S. et al. 2009a).

This trend was confirmed in two subsequent surveys: Eating out of home (2005-2006) and iPOPY (2007-2010).

Table 2: Percentage of products (by weight) in the public procurement for school catering in IT

(*Source: ACU, 2006a)*

	Origin	Ratio
controlled chain	from organic agriculture	40%
	from integrated agriculture	18%
	typical products (DOP, IGP)	14%
	from fair trade	4%
non-controlled chain	from conventional agriculture	24%

Between the two subsequent surveys it was found a significant increase in demand for products by short supply chain, which was almost non-existent in 2006, but in 2009 it was found in 23% of cases.

The meaning of "short supply chain" still has a certain ambiguity: it is expressed using different formulas: zero km, local/regional products, number of steps in the supply chain.

It is still evident the need to reduce the number of steps between the producer and the final consumer, or at least shorten the path of the products, but also to enhance the bond between the food consumed and the territory.

Some cases of best practices discussed recently, such as those of Piacenza (Bocchi, S et al. 2009b) see Annex 1 - and Rome in Italy (Spigarolo, R. et al. 2010b), Andalusia and II Arroindessement Paris (Strassner, C. et al., 2009) are considered as examples to follow: they have shown that it is possible to organize new distribution channels which on one hand are safe sales opportunities for producers and on the other they can help to enhance the quality of the food products territory and to promote sustainability (Bocchi, S et al. 2009b).

In Italy, “most regions… [actually 8] have produced specific laws and/or guidelines to drive and encourage the development of a quality school catering system, focused in particular to the procurement of organic and typical products.

As a result, the municipalities (in particular in the northern and central Italy) introduce frequently organic and typical products in their menu and ask companies managing catering services to procure them.” (Spigarolo R. et al 2010c)

1.3.6. Focus on the supply chains of public mass catering

The public mass catering, and the school one in particular, represent an important meeting point between production and consumption. Invests responsibility of the government, and the school, allows the participation of parents and citizens in the choices and the responsibility, is an important market outlet for farmers.

The rationalization of the supply chains of public mass catering, their qualification and the improvement of sustainability of the system is a goal currently pursued at institutional level, in the belief that all these changes can combine the improvement of the quality of the products purchased and that of the service delivered with a greater focus on sustainability and the ethical and cultural aspects related to the consumption of meals. The growing demand for organic products, quality and local ones moves in this direction.

The difficulties in meeting the current demand can be overcome with the organization of supply chains that enhance both the quality of the products, their seasonality and their links with the territory.

Through a careful study of the flow of supply and demand of products specifically designed to meet the unique needs of public catering service, it is possible to organize these food supply chains, as many case studies has shown. (Bocchi et al. 2009a)

Where this goal has been achieved, the productive choices of farmers and of the small food industry are consciously oriented towards this direction, ensuring on the one hand the producers a safe market, where both the flows of goods and the prices are agreed, and, on the other hand, buyers of the public catering supplies the maintaining of a certain price / quality ratio and, moreover, sustainable standard of satisfactory quality.

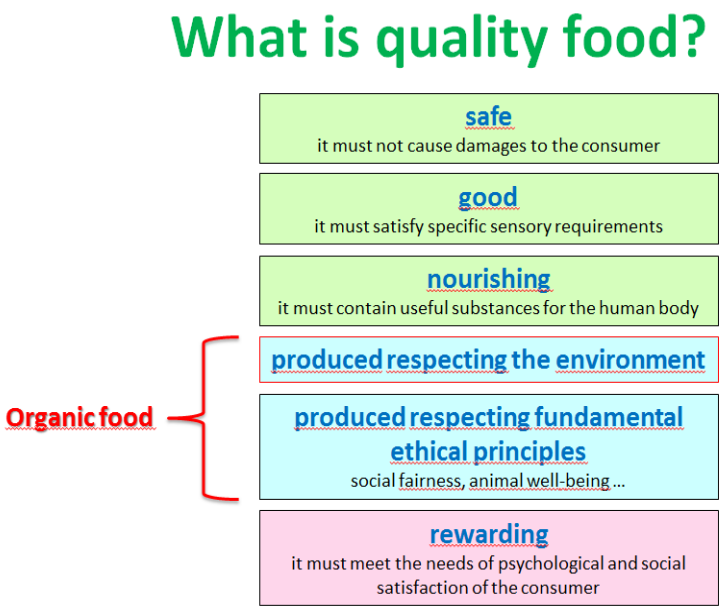
This trend has not only changed the choices of farmers relating to species, varieties and breeds to cultivate and nurture, but also helped to implement the introduction of systems of cultivation and breeding environmentally friendly.

The modification of the logistics concerning the small distances between the places of production and terminals, represented by the cooking centers, as well as streamlining delivery of meals or semi-finished products, through the adoption of transport of uncooked foods or of the system cook & chill go towards the direction of improving the environmental sustainability of the system.

It is not to be overlooked the cultural added value that is generated due to the proximity of producers to schools that consume their products.

This allows on one hand the schoolchildren to visit easily and at low cost companies that produce the ingredients of the meals in their canteens and on the other hand enables producers to carry out educational activities not only in companies but also in the schools; these are all activities today acknowledged as essential part of food education aimed at promoting the consumer awareness.

Fig. 4: A new concept of quality food (Source: Spigarolo R. et al. 2009)



Last but not least, the problem of quantity and type of waste produced by the catering system (not only the public canteens, but also eateries, snack bars, cafeterias, restaurants and all the places where meals were provided during weekdays) is relevant, although lacking in this regard of standardized data.

By some estimates made in a sample of school canteens results that about 40% of what is being served remains in the dishes.

If these wastes of consumption are added those of production (that accumulate during the process of preparation of meals), the total quantity is large, and is almost exclusively composed of organic wastes.

If all this waste were collected separately and treated in special composting facilities, could provide a significant amount of organic fertilizers; if these were also re-used on-site or, at least, in the neighboring territories, it would save considerable transportation costs. In Italy there are some examples of best practices in the local reuse of organic waste.

These considerations point out the fact that there are cases in which the issue of the sustainability of the food system is being addressed in a comprehensive way, but there are some significant experiences of sustainable practices that provide partial responses, however, often excellent, a problem that should be dealt with broader instruments.

The public mass catering, especially in urban areas, provides a high number of daily meals and therefore requires a sufficiently broad and organized supply to meet that demand. Furthermore, the contracts of public procurement are defined by specifications and tenders which require supplies of medium-term (several years), Maintaining high qualitative and quantitative levels and price competition.

Potential suppliers, usually small local producers, are hardly able to respond to requests for this magnitude nor are organized into associations and platforms that are able to cooperate for this purpose.

The problems related to the catering supply are similar to what happens in relations between local production and larger retailers or, probably to a lesser extent, HoReCa.

In the table below the main characteristics of the different distribution channels are shown.

Table 3: Synoptic table of the distribution channels of the LASs

Market Typology	Channel	Level of Organisation	Potential Demand	N of farms involved	Marketing Strategy	Territorial benefit	Dimension of area involved
Direct sale	Direct	Low	Low	One	Private	Low	Local
Pick your own	Direct	Low	Low	One	Private	Low	Local
Farmers' Market	Direct	Average	Average	From Few to Many	Private and Public	Average	Municipality/ province
CSA	Direct	Average	Average Low	From one to Many	Private	Average-Low	Mainly Local
GAS	Direct Indirect	Average	Average Low	From Few to Many	Private	Variable	Variable
Large Scale Retail	Indirect	High	High	Many	Private and Public	High	province/ Region
HoReCa	Indirect	Average	Average high	From one to Many	Private	Average	Municipality/ province/ Region
Public catering system	Indirect	High	High	Many	Public	High	province/ Region

1.3.7. The evolution of the demands of the collective consumption in Europe

Consumers are nowadays increasingly directed towards the purchase of goods and services in which the quality, understood in a global sense, is represent a key factor in their choices. As part of the overall concept of quality, *eco-labels* and *social labels* that identify products (as well as services) are among the most considered.

The sensitivity to these issues is very high in the individual consumers of northern European countries, towards which not surprisingly the main flows of export of organic Mediterranean products are directed, with Italy in a prominent position.

In Mediterranean countries, by contrast, the increased demand for organic, local and quality products, can be found in school public procurement, managed by municipalities, which acts as a "collective consumer" oriented and driven both by voluntary and mandatory standards, especially local ones (Guidelines and Regional laws), and by the choices of individual municipalities.

To cite a few examples, in Italy, considered to be the European leader for the amount of organic, local and quality supplied to the school meals system, 8 regional laws (and guidelines in many other regions) have been the driver of this phenomenon (Spigarolo, R. et al, 2010).

In Spain, Andalusia for the first time and Catalonia, have strongly stimulated the increase in the purchase of local and organic products in school meals.

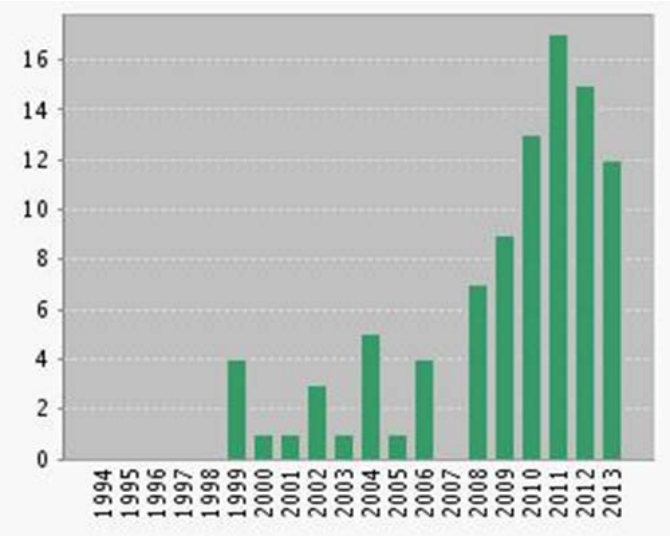
The growing demand for organic and quality, and recently local products for public mass catering, first and foremost the school, which is known in Europe as **the school Food Revolution** (Morgan, K. et al. 2008) has many added values compared to the choices made by individual consumers:

- the growing demand for organic products, quality and local stimulates the transformation of agriculture and supply chains in a sustainable way, giving value to the quality choices of producers→ **environmental sustainability**;
- the required volumes ensure that a direct relationship between producers and buyers of food can more easily be created, bypassing the intermediary business and ensuring in this way an adequate remuneration to the producers → **economic sustainability**;
- when this phenomenon is accompanied by food education efforts aimed at promoting consumer awareness and appreciation of the choices made by the municipalities in the theme of sustainability and product quality consumer perception changes as well as the eating behaviors can be improved → **social sustainability** (Spigarolo, R. et al, 2010).

2. Bibliometry

Topic: **Local food system**

Fig. 5: Publishing items in the last 20 years



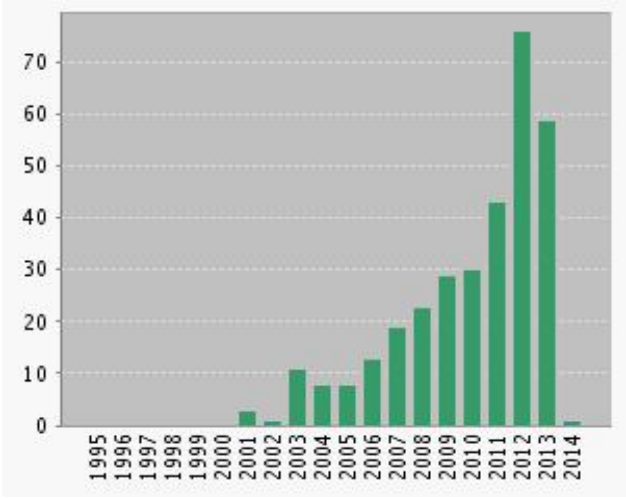


Fig. 6: Citations in each year in the last 20 years

Results found: 96 - **Sum of the Times Cited**: 326 - **Average Citations per Item**: 3.40 - **h-index**: 9

The first 10 articles classified by number of citations have the following rank

Table 4: Rank of the first 10 publications with topic: Local food system – per number of citations

Source Title	Publication Year	Total Citations	Average per Year
SOCIOLOGIA RURALIS	2002	72	5.54
POLICY SCIENCES	1999	54	3.38
Local Environment	2004	21	1.91
GEOGRAPHICAL REVIEW	2004	20	1.82
JOURNAL OF AGRICULT	2008	17	2.43
RENEWABLE AGRICULTU	2005	14	1.40
SOCIOLOGICAL INQUIRY	2009	12	2.00
Agriculture and Human	2002	12	0.92
APPLIED GEOGRAPHY	2011	10	2.50
APPLIED GEOGRAPHY	2011	8	2.00

Publishing items are strongly increasing until 2011, then slightly decrease. Citations in each year I strongly increasing too until 2012. The interest in the topic is growing fast in recent years both as items that like citations even if the number of articles published in the last 20 years is rather limited. However items strictly focused on the development of LASs are an even more limited and only 2 face the problem of the relationship between the producers and the catering system, but no one talks of public procurement as a chance to foster the development of the LASs.

3. Objectives

The main aim of the research is to analyze both demand and supply in public procurement of the school mass catering in Lombardy (administrative region of Northern Italy), at municipal level, in order to verify in this region the possibility to create some **Local Agrifood Systems** (**LASs**), relying as driver on demand represented by the school catering and involving local producers in the supply of the foodstuffs produced in the neighboring areas.

The data from scientific literature state that, at national level, public procurement of the school mass catering involves a potential demand, concentrated and of considerable size, with a significant amount of organic products.

The present thesis analyses the LASs and in particular the production of foodstuffs at municipal level, detected using the main sources of data available at national and regional level and the amount of the demand of the school public procurement, detected through a direct survey that involved the municipalities of Lombardy, aimed at quantifying the magnitude of this demand, focusing on the demand for organic and local products.

By analyzing the actual amount of the main products composing the menu of the school meals, broken down by the chains of origin (from conventional, integrated or organic agriculture) and comparing this data with which of the amount of local agricultural production, we want to check if local production is able to satisfy the demand of school public procurement, in quantitative and qualitative terms.

In order to verify the possibility to satisfy the demand for local products we also need to create a geodatabase, a tool for spatial analysis of data, which can represent a valid support for the farmers, to know how much and where the demand is concentrated, for the technicians of the municipalities who write the specifications for the tenders, and finally for buyers of the catering companies, to know how much and where the production of foodstuffs, in particular fresh ones, is located.

The general objectives of the research are to improve the sustainability of agrifood cycles in Lombardy enabling the conditions for a virtuous encounter between an organized demand for quality food and different types of local sustainable production, in order to promote a change in agricultural production and its sustainability over time and exploit periurban agriculture by providing economic opportunities for farmers and reducing the consumption of soil.

The main scientific references of this research are: ecological agriculture, the territorialist approach and the analysis of the territorial metabolism and food chains.

4. Methodology

4.1. Data mining

4.1.1. Data on crop production

The supply analysis was carried out by comparing the data of the national census of agriculture 2011 with those of the SIARL (Agriculture Information System of the Lombardy Region).

First of all, an accurate comparison between National Census 2011 and SIARL was carried out in order to choose which database was the most appropriate for the purposes of research. In order to compare the data coming from two different sources, which use different codes, it was necessary to create a table of correspondence between the codes of the two databases. This represented the first result of the research.

Furthermore, the SIARL is a tool designed to view and update the data of the file of corporate farms in Lombardy and to submit to regional government requests for contribution and/or electronic permission. Not all farms submit an application for contributions, and therefore it may not include the data of 100% of the farms in Lombardy.

On the basis of the assessment of strengths and weaknesses of the two databases, it was possible to choose the most appropriate source of data.

The data on acreage of the main crops and about the number of heads of animals bred were collected at the municipal level. This allowed us to know which crops are grown and how many hectares are allocated to each crop as well as which and how many animals are bred for every category.

4.1.2. Data on school meals provided

During the year 2011 a research on school catering in Lombardy was carried out, coordinated by former DiProVe (Department of Crop Production – nowadays DiSAA – Agricultural and Environmental Sciences - Production, Landscape, Agroenergy) of the University of Milan.

In order to draw an up -to-date overview of the procurement policies practiced in the school catering services of Lombardy region, a strategy was defined that take into account:

a) the type of service and other qualitative data relating to the school catering service system;
b) quantitative data on the purchases of the main food items requested, divided according to the different production systems (conventional, organic and integrated agriculture).

The research was based, with regard to the school meals provided by internal or external catering service, on a questionnaire sent to all the Municipalities of Lombardy. In Italy, the municipalities are responsible for providing canteen service in primary schools.

In the same time, public calls for tender written by 54 municipalities from all over Lombardy were collected. Calls for tenders for school catering are a key instrument for municipalities to influence the quality of the food products and the school food service in general.

Tender documents are crucial to bring the policies of the municipalities to the point, express them clearly and putting them into practice. On the basis of the call for tenders, the contract is closed with the company which wins the bidding.

The questionnaire was created by a working group which was attended by the research group of the University, as leader of the project, and the most important stakeholders, like officials of the municipalities and of the Region and representatives of the catering companies and of the producers, in particular organic ones.

All of these stakeholders have participated in several meetings at the offices of the Lombardy Region, in which it was decided how to structure the questionnaire and which items could have a significant bearing for the aims of the research.

The questionnaire is composed by 2 parts:

- a **qualitative part**, composed from 14 closed-answer question items and a final one, the only open-ended;

- a **quantitative part**, composed from 2 question items that will detect the number of meals that were monthly provided in different type of schools (nursery, primary and lower secondary) and the monthly frequency of foodstuffs in the menus.

The choice to ask in the questionnaire data about the monthly frequency of the presence in the menus of the different foodstuffs was done, after extensive discussions, to facilitate the compilation by municipal officials, to whom the questionnaire was doomed. These officials are in fact aware of the composition of the menus and their seasonal variations, while almost always do not know the total amount of purchased products because the school public procurement is generally made by the catering companies that won the tender.

Before deploying the questionnaire to the municipalities, it was submitted to a focus group testing. The aim of this test was to verify the clarity of all the question items and avoid any misunderstanding.

The focus group that tested the questionnaire was made up of matter experts and stakeholders. The members of the focus group was also required to assess the feasibility of the protocol for questionnaire administration was also assessed.

On the basis of focus group feedback both question items and administration protocol was modified in few parts.

The final questionnaire (see Annex 2), was organized in 4 Sections:

A) **School catering service organization**: consists of 6 question items, which concern the number of meals provided and the organization of the school catering service;

B) **Canteen Committees**: consists of 3 question items, which concern the presence and the role of canteen committees in assessing the quality of school catering service;

C) **Foodstuffs used**: consists in a list of 47 foodstuffs to fill, in which, for every foodstuff, must be specify:
   a. the monthly frequency in which it can be found in menus
   b. the different production systems (conventional, organic and integrated agriculture)
   c. the quality requirements (PDO – PGI – Fair-trade) and the origin (local/regional)

D) **Organic products**: consists of 7 questions regarding motivations, problems and perspectives in the use of organic and local products for school catering service.

The 47 foodstuffs are divided in 7 groups (for more details, see Table 7):

- **fruits** (9 items);
- **vegetables** (12 items);
- **milk and byproducts** (6 items);
- **meat and byproducts** (6 items);
- **miscellaneous** (9 items);
- **dry pulses, cereals and byproducts**(5 items);
- **other foodstuffs** (free fields to fill out).

The municipalities of Lombardy are totally 1546 with a population of 9,826,141 inhabitants (2011).

Normally in this type of investigation, for statistical purposes, a sample uniformly distributed, representing at least 5% of the total is considered significant.

No literature review showed previous research on this topic with this sample population dimension. That's the reason why the data retrieved by questionnaire would be useful to support future analysis. Also the methodology will be used as a benchmark for further investigation.

4.2. Calculation of the annual consumption of foodstuffs

The calculation of the Annual Consumption of Foodstuffs (**ACF**), performed for each foodstuff at municipal level, was done using the following formula:

$$ACF = MF * GR * MC$$

Where:

MF = **Monthly Frequency**, data gathered by the questionnaires collected.

GR = **NR * W** (see Table 7): the **Net Rations** (**NR**) correspond to those recommended by the national RDA (Recommended Dietary Allowance – in IT LARN) and by the Guidelines of the Ministry of Health for school catering; the **% of Waste** (**W**) for every foodstuff match with the amount reported in the RDA as "*not edible part*"; this correction is necessary to take into account of the waste produced during the processing in the kitchen.

MC = **Months of Consumption**(see Table 7) correspond to the months in which every foodstuff is effectively provided in school catering service: these data were collected from a comparative analysis of the public calls of tender gathered during the research; the maximum values – 9,5 months for nursery school and 8,5 months for primary and lower secondary school –were detected for all non-seasonal foodstuffs, while the consumption of seasonal foods, such as fruits and vegetables, occurs for a shorter period.

4.2.1. Adequacy test

In order to verify the adequacy of the results calculated by the method described above consumption data of 3 municipalities of Lombardy region (Pavia, Cremona and Varese), deducted from the respective public calls of tender for the school catering service, were analyzed; the average consumption of these 3 cases, referred to a single meal, of each of the 3 municipalities was multiplied by the total number of meals estimated provided in all schools of Lombardy.

To make a comparison with the results obtained by our research, among the most representative food, 2 for each of the 6 categories were chosen. It has been verified if the results of the research, in terms of all meals estimated to be provided every year in Lombardy, were placed or less within the range of minimum and maximum values found in the 3 municipalities chosen for comparison.

Table 7: Calculation of food rations

inf= nursery school – **ele**= primary school – **med** = lower secondary school

Calculation of food rations										
Foodstuffs	NR - Net Ration kg			W - %	GR - Gross Ration kg			MC - Months of Consumption		
detected	inf	ele	med	waste	inf	ele	med	inf	ele	med
apples	0,150	0,150	0,150	0,270	**0,191**	**0,191**	**0,191**	**6,00**	**6,00**	**6,00**
pears	0,150	0,150	0,150	0,260	**0,189**	**0,189**	**0,189**	**4,00**	**4,00**	**4,00**
peaches	0,150	0,150	0,150	0,090	**0,164**	**0,164**	**0,164**	**2,00**	**1,00**	**1,00**
bananas	0,150	0,150	0,150	0,350	**0,203**	**0,203**	**0,203**	**9,50**	**8,50**	**8,50**
kiwis	0,150	0,150	0,150	0,130	**0,170**	**0,170**	**0,170**	**5,00**	**5,00**	**5,00**
oranges	0,150	0,150	0,150	0,200	**0,180**	**0,180**	**0,180**	**3,00**	**3,00**	**3,00**
mandarins & clementines	0,150	0,150	0,150	0,200	**0,180**	**0,180**	**0,180**	**3,00**	**3,00**	**3,00**
plums & prunes	0,150	0,150	0,150	0,100	**0,165**	**0,165**	**0,165**	**2,00**	**1,00**	**1,00**
apricots	0,150	0,150	0,150	0,060	**0,159**	**0,159**	**0,159**	**2,00**	**1,00**	**1,00**
salads (mix)	0,060	0,070	0,080	0,250	**0,075**	**0,088**	**0,100**	**9,50**	**8,50**	**8,50**
fresh tomatoes	0,120	0,130	0,150	-00,000	**0,120**	**0,130**	**0,150**	**6,00**	**5,00**	**5,00**
carrots	0,120	0,130	0,150	0,150	**0,138**	**0,150**	**0,173**	**9,50**	**8,50**	**8,50**
potatoes	0,200	0,230	0,250	0,170	**0,234**	**0,269**	**0,293**	**9,50**	**8,50**	**8,50**
cauliflowers	0,128	0,150	0,173	0,340	**0,171**	**0,201**	**0,231**	**9,50**	**8,50**	**8,50**
onions	0,026	0,030	0,035	0,170	**0,030**	**0,035**	**0,040**	**9,50**	**8,50**	**8,50**
zucchini	0,128	0,150	0,173	0,120	**0,143**	**0,168**	**0,193**	**9,50**	**8,50**	**8,50**
fennels	0,085	0,100	0,115	0,410	**0,120**	**0,141**	**0,162**	**4,00**	**4,00**	**4,00**
spinach	0,120	0,125	0,150	0,170	**0,140**	**0,146**	**0,176**	**9,50**	**8,50**	**8,50**
cabbages	0,128	0,150	0,173	0,070	**0,136**	**0,161**	**0,185**	**4,00**	**4,00**	**4,00**
savoy cabbages	0,128	0,150	0,173	0,080	**0,138**	**0,162**	**0,186**	**4,00**	**4,00**	**4,00**
frozen vegetables	0,220	0,250	0,300	-00,000	**0,220**	**0,250**	**0,300**	**9,50**	**8,50**	**8,50**
fresh milk	0,120	0,130	0,150	0%	**0,120**	**0,130**	**0,150**	**9,50**	**8,50**	**8,50**
UHT milk	0,120	0,130	0,150	0%	**0,120**	**0,130**	**0,150**	**9,50**	**8,50**	**8,50**
yogurt	0,125	0,125	0,125	0%	**0,125**	**0,125**	**0,125**	**9,50**	**8,50**	**8,50**
butter	0,012	0,014	0,016	0%	**0,012**	**0,014**	**0,016**	**9,50**	**8,50**	**8,50**
fresh cheeses	0,070	0,090	0,100	0%	**0,070**	**0,090**	**0,100**	**9,50**	**8,50**	**8,50**
mature cheeses	0,040	0,050	0,060	0%	**0,040**	**0,050**	**0,060**	**9,50**	**8,50**	**8,50**
bovine meat	0,080	0,090	0,110	0%	**0,080**	**0,090**	**0,110**	**9,50**	**8,50**	**8,50**
pork meat	0,080	0,090	0,110	0%	**0,080**	**0,090**	**0,110**	**9,50**	**8,50**	**8,50**
poultry meat	0,080	0,090	0,110	23%	**0,098**	**0,111**	**0,135**	**9,50**	**8,50**	**8,50**
baked ham	0,050	0,060	0,070	0%	**0,050**	**0,060**	**0,070**	**9,50**	**8,50**	**8,50**
cured ham	0,050	0,060	0,070	0%	**0,050**	**0,060**	**0,070**	**9,50**	**8,50**	**8,50**
bresaola	0,050	0,060	0,070	0%	**0,050**	**0,060**	**0,070**	**9,50**	**8,50**	**8,50**
extravirgin olive oil	0,008	0,009	0,010	0%	**0,008**	**0,009**	**0,010**	**9,50**	**8,50**	**8,50**
vinegar	0,004	0,005	0,006	0%	**0,004**	**0,005**	**0,006**	**9,50**	**8,50**	**8,50**
eggs	0,070	0,090	0,100	13%	**0,079**	**0,102**	**0,113**	**9,50**	**8,50**	**8,50**
peeled tomatoes	0,050	0,060	0,070	0%	**0,050**	**0,060**	**0,070**	**9,50**	**8,50**	**8,50**
tomato sauce	0,040	0,050	0,060	0%	**0,040**	**0,050**	**0,060**	**9,50**	**8,50**	**8,50**
fruit juices	0,100	0,130	0,150	0%	**0,100**	**0,130**	**0,150**	**9,50**	**8,50**	**8,50**
biscuits	0,030	0,040	0,050	0%	**0,030**	**0,040**	**0,050**	**9,50**	**8,50**	**8,50**
honey	0,015	0,020	0,020	0%	**0,015**	**0,020**	**0,020**	**9,50**	**8,50**	**8,50**
marmalades	0,015	0,020	0,020	0%	**0,015**	**0,020**	**0,020**	**9,50**	**8,50**	**8,50**
bread	0,050	0,050	0,050	0%	**0,050**	**0,050**	**0,050**	**9,50**	**8,50**	**8,50**
pasta	0,060	0,070	0,080	0%	**0,060**	**0,070**	**0,080**	**9,50**	**8,50**	**8,50**
rice	0,060	0,070	0,080	0%	**0,060**	**0,070**	**0,080**	**9,50**	**8,50**	**8,50**
dry pulses	0,040	0,045	0,050	0%	**0,040**	**0,045**	**0,050**	**9,50**	**8,50**	**8,50**
flour	0,050	0,060	0,070	0%	**0,050**	**0,060**	**0,070**	**9,50**	**8,50**	**8,50**

4.3. Data analysis

4.3.1. Quantitative data

The analysis of the quantitative data of the questionnaires was carried out with scientific methods in different steps.

A) **First step**: A first data analysis was carried out with SPSS submitting the consumption both at municipality and province level of the products of conventional, organic and integrated agriculture to a bivariate correlation analysis related to 3 parameters:
   a. Population
   b. Population density
   c. Surface

   Data were analyzed using SPSS (Version 20). The analysis was carried out with Spearman rank-order correlation coefficient. This test is used for either ordinal variables or for interval data that has failed the assumptions necessary for conducting the Pearson's product-moment correlation.

   When appropriate, adjusted statistics were used.

B) **Second step**: After deleting insignificant data and revisiting the initial parameters on the basis of the results of the first analysis, the significant data were submitted to a further analysis carried out with SPSS using the method of bivariate correlation.
C) **Third step**: The results of the analysis carried out in the second step were submitted to a hierarchical cluster analysis with the method of linkage between groups and using the square Euclidean distance as measure of dissimilarity, in order to identify groups or single objects with similar patterns but different from the objects of other groups.

4.3.2. Comparison between supply and demand

The amount and the localization of the consumption was related to the amount and the localization of the production using a spatial database.
This analysis was carried out considering 4 main categories of organic products chosen from among those more requested by the school public procurement: cereals, dry pulses, fruits and vegetables. The analysis was carried out processing data with a spatial database, which functions are described below.
For this purpose an index (organic hectares as the sum of hectares of different production compared to municipality hectares, that is UAA - Utilized Agricultural Area) that made this indicator less dependent from the "greatness" of the municipality was designed.
Even in this case, a representation for classes of values of the calculated indicator was developed, thus leading to the representation with two classes based on the criterion that the surface used in organic production is lower / higher than 0.2% of the municipal UAA.
By using the data of the average yields, available at regional level, it was possible to calculate the the demand for organic products, expressed in equivalent hectares, detected in the sample with

the total surface cultivated with organic methods of the same products in the Lombardy region. All data were detected at municipal level.

From data to spatial database

The process of data collection, followed by appropriate post-processing operations and related elaboration, has led to the implementation of a database (structured according to the logic of relational databases).

The tables that compose the database are all organized according to the same logic diagram, in which the smallest unit of reference, which is associated with all the data, corresponds to the municipality. Each municipality is associated with basic attributes (which are the first fields of the tables of data) such the ISTAT code (which represents the primary key of each table that composes the database), the municipal area, the resident population, the province to which the municipality belongs.

The tables are then populated by thematic data, object of collection and census, as well as some derived measures (in the case where the data were not available it was necessary to estimate them or derive them as a function of parameters suitably calibrated) and simple indicators useful to bring synthesis in the large amount of data collected.

The implemented database allows to perform some interesting statistical analysis but its natural evolution is the integration of the geographical and spatial component of the data. The goal is to transform a database into a spatial database (**geodatabase**), with all additional benefits and opportunities that geo-referenced data allow.

This operation allows us to build the instrument by which the geographical and territorial integration between demand and supply of foodstuffs, the public mass catering and food production, the production of a particular territory and its consumers, was carried out. The geodatabase is also the informative (geographical) substrate necessary to generate new information starting from the existing one.

The evolution of the database in the geodatabase occurs through the use of appropriate GIS (Geographic Information System) and is based on the ISTAT code of the municipalities as unique attribute that allows the join operation between the layer containing the spatial information relating to municipal administrative boundaries (spatial data used as reference) and the data populating the analytic database.

The geodatabase is compatible with the layers of information and the databases (spatial and otherwise) provided, for the data collected during the research.

One of the operations allowed by the geodatabase consists in creating thematic maps for spatial analysis. This operation was used to create thematic maps that allowed to analyze the spatial distribution of supply and demand of organic products in Lombardy region.

4.3.3. Qualitative data

The analysis of the qualitative data of the questionnaires was carried out by calculating the relative percentages of the different responses on the total and comparing the results.

The results were analyzed both by province and by classes of population, dividing the towns into 7 classes according to the decreasing number of inhabitants, plus a class 0, which includes only the City of Milan, as shown in the Table 8.

Table 8: Classes of population

Classes of population	Number of residents	Number of the municipalities
0	> 200.000 (only Milan)	1
1	50.000 - 200.000	14
2	30.000 - 50.000	24
3	20.000 - 30.000	29
4	10.000 - 20.000	121
5	5.000 - 10.000	266
6	2.000 - 5.000	460
7	< 2.000	631

For all the questions in which for every item only one response was allowed the analysis was carried out by comparing the data both at territorial level (province) and by classes of population. Instead, in the questions in which for every item multiple responses were allowed, a single analysis was carried out.

Analysis of the public calls for tender

Calls for tenders for school meal catering are a key instrument for municipalities to influence the quality of the food procured and, generally, the school food service (The tender, by definition, is the document including all the requirements that a public body - municipality in case of school catering - asks to the private companies).

The political will of the municipalities are realized through the preparation of tenders and the subsequent contracts with the companies that win tenders and that will provide the school meal service. The call for tender is the first part of a complex production chain (the school meal system), but we consider that the choices contained in the tender largely determine the quality of school meal service provided, which aim is to change good ingredients into a tasty and quality meal.

The analysis of the tender was directed to verify the means by which the products with specific quality requirements, such as organic, integrated farming and local products were requested.

5. Results

5.1. Choice of the database for the data mining of crop production and livestock

Comparing data from two main sources (the National Census of Agriculture 2011, carried out by ISTAT and SIARL – the Agriculture Information System of the Lombardy Region) we found significant differences between the two databases.

First of all must be pointed that the codes used by the National Census and those used by SIARL are different: ISTAT, in order to exchange data at the international level, uses EUROSTAT codes, while the SIARL uses its own codes, which moreover can be implemented by users. The result is that in SIARL some duplication of codes can be found. Anyway, there is no correspondence between the ISTAT/EUROSTAT codes and those used by SIARL. In order to allow a correct comparison of the data, it was necessary to create a table of correspondence between ISTAT/EUROSTAT and SIARL Codes (Table 10).

Another important point is related to the homogeneity of data collection: in the case of the National Census all data were all collected in the same period, in a restricted span of time, while those of SIARL may be updated day by day by the farmers, so we can find in the same database updated data beside the old data.

We found, in particular, an underestimation of data on organic farms compared with those recorded by the Census and SINAB (National Organic Agriculture Information System). This means that different organic farms, although part of the SIARL database, may be excluded by size, other ones may be excluded for participation in different and more profitable measures (in terms of funding). Last but non least, other organic farms may not participate for the scarce remuneration per hectare (especially arable land) if they even think of paying someone to compile the application.

In contrast, we found in the absence, in the National Census, of the data of 8 municipalities of Lombardy, listed in Table 9, which has not given the authorization ISTAT for their publication.

Table 9: List of the municipalities of Lombardy whose data do not exist in the Census

Prov.	Municipalities missing in National Census
BG	Valnegra
CO	Blevio
CO	Campione d'Italia
CO	Pognana Lario
LC	Introzzo
LC	Malgrate
VA	Marnate
VA	Pino sulla Sponda del Lago Maggiore

Neither the census nor in SIARL has been possible to find data on integrated agriculture, because it is not recognized in a distinct way from other farming systems. Assessing strengths and weaknesses of the two databases, we decided to use for our purposes the data of the National Census.

Table 10: Table of correspondence between and ISTAT/EUROSTAT and SIARL Codes

10a

Codici ISTAT					ISTAT Utilizzazione dei terreni - Descrizione in chiaro	Codici SIARL	SIARL Utilizzazione dei terreni - Descrizione in chiaro
ARLAND					seminativi	320	ALTRI SEMINATIVI
					cereali per la produzione di granella		
		WHEATS			frumento tenero e spelta	40	GRANO (FRUMENTO) TENERO
		WHEATS			frumento tenero e spelta	41	FARRO
		WHEATS			frumento tenero e spelta	42	TRITICUM SPELTA L.
		WHEATD			frumento duro	50	GRANO (FRUMENTO) DURO
		RYE			segale	70	SEGALE
		BARLEY			orzo	80	ORZO
		OATS			avena	90	AVENA
	CEREAG	MAIZE			mais	10	MAIS DA GRANELLA
		MAIZE			mais	30	MAIS DOLCE
		RICE			riso	230	RISO
		SORGH			sorgo	100	SORGO DA GRANELLA
		SORGH			sorgo	101	SORGO DA FIBRA
		CEREAOG			altri cereali	60	FRUMENTO SEGALATO (TRITICALE)
		CEREAOG			altri cereali	120	GRANO SARACENO
		CEREAOG			altri cereali	130	MIGLIO
		CEREAOG			altri cereali	140	SCAGLIOLA
		CEREAOG			altri cereali	150	ALTRI CEREALI
					legumi secchi		
		PEA			pisello	200	PISELLO SECCO
		PEA			pisello	201	PISUM SATIVUM L.
		BEANK			fagiolo secco	307	FAGIUOLO SECCO
	DRPUL	BEANBF			fava	210	FAVA E FAVETTA
		LUPIN			lupino dolce	220	LUPINO DOLCE
		PULSEO			altri legumi secchi	301	LENTICCHIA
		PULSEO			altri legumi secchi	302	CECE
		PULSEO			altri legumi secchi	305	ALTRI LEGUMI SECCHI
	POTAT				patata	710	PATATA
	BEETS				barbabietola da zucchero	240	BARBABIETOLA DA ZUCCHERO
	FODR				piante sarchiate da foraggio		
					piante industriali		
		TOBAC			tabacco	250	TABACCO
		HOPS			luppolo	731	LUPPOLO
			COTTON		cotone		
			FLAX		lino	740	LINO TESSILE
			FLAX		lino	590	LINO NON TESSILE
			HEMP		canapa		
			CROPOT		altre piante tessili		
			RAPETR		colza e ravizzone	180	COLZA E RAVIZZONE DA GRANELLA
			SUNFLO		girasole	170	GIRASOLE DA GRANELLA
			SOYA		soia	160	SOIA DA GRANELLA
			FLAXOI		semi di lino	591	LINUM USITATISSIMUM L. (SEMI DI LINO)
			CROPOS		altre piante di semi oleosi	290	ALTRE PIANTE DA SEMI OLEOSI
	CROPIN	APOHPS			piante aromatiche, medicinali, spezie e da condimento	270	PIANTE AROMATICHE, MEDICINALI, DA CONDIMENTO
		APOHPS			piante aromatiche, medicinali, spezie e da condimento	245	PIANTE, PARTI DI PIANTE, SEMI E FRUTTI DI SPECIE UTILIZZATE IN PROFUMERIA, MEDICINA O PREPARAZIONE DI INSETTICIDI, ANTIP
		APOHPS			piante aromatiche, medicinali, spezie e da condimento	246	PIANTE, PARTI DI PIANTE, SEMI E FRUTTI DI SPECIE UTILIZZATE IN PROFUMERIA, MEDICINA O PREPARAZIONE DI INSETTICIDI, ANTIP
		APOHPS			piante aromatiche, medicinali, spezie e da condimento	249	SPEZIE, ESCLUSI ZENZERO, ZAFFERANO, CURCUMA, TIMO, FOGLIE DI ALLORO, CURRY E MISCUGLI
		APOHPS			piante aromatiche, medicinali, spezie e da condimento	252	ANICE, BADIANA, FINOCCHIO, CORIANDOLO, CUMINO, CARVI, BACCHE DI GINEPRO
		APOHPS			piante aromatiche, medicinali, spezie e da condimento	185	SENAPE
		APOHPS			piante aromatiche, medicinali, spezie e da condimento	732	RABARBARO
		CROOIN			altre piante industriali	730	ALTRE PIANTE INDUSTRIALI

10b

Codici ISTAT					ISTAT Utilizzazione dei terreni - Descrizione in chiaro	Codici SIARL	SIARL Utilizzazione dei terreni - Descrizione in chiaro
					ortive		
		VEGFRO			ortive in piena aria	260	PIANTE ORTICOLE A PIENO CAMPO
			OFTT	OFTT	pomodoro da mensa in pieno campo	653	POMODORO TONDO ALTRE VARIETA'
			OFTT	OFTT	pomodoro da mensa in pieno campo	654	POMODORINO
			OFTP	OFTP	pomodoro da industria in pieno campo	650	POMODORO
			OFTP	OFTP	pomodoro da industria in pieno campo	651	POMODORO ALLUNGATO SAN MARZANO
			OFTP	OFTP	pomodoro da industria in pieno campo	652	POMODORO ALLUNGATO ALTRE VARIETA'
						190	PISELLO FRESCO
						191	FAGIUOLO FRESCO
						192	FAVA FRESCA
						248	RADICI DI CICORIA
						255	TOPINAMBUR
						901	AGLIO
						902	ASPARAGO
						903	BASILICO
						904	BIETOLA DA ORTO
						917	CETRIOLO
						909	CARCIOFO
						911	CAROTA
						914	CAVOLO
						919	CICORIA O RADICCHIO
						921	CIPOLLA
						924	COCOMERO
						925	FAGIOLINO
	VEGFR		VEGFROF	VEGFROF	altre ortive in pieno campo	926	FINOCCHIO
						927	FRAGOLA
						938	SEDANO
						930	MELANZANA
						931	MELONE
						932	PEPERONE
						933	PREZZEMOLO
						939	SPINACIO
						940	ZUCCA
						941	ZUCCHINO
						942	BARBABIETOLA DA ORTO
						943	BROCCOLETTO DI RAPA
						944	CAVOLFIORE
						945	INDIVIA
						946	LATTUGA
						947	FUNGHI
						948	PORRO
						949	RAPA
						951	ALTRE ORTICOLE
		MGTT	MGTT	MGTT	pomodoro da mensa in orti stabili ed industriali		
		VEGFRMG	VEGFRMG	VEGFRMG	altre ortive in orti stabili ed industriali	790	PIANTE ORTICOLE IN ORTO STABILE O INDUSTRIALE
		VEGCO	VEGCO	VEGCO	ortive protette		
		GHTT	GHTT	GHTT	pomodoro da mensa in serra		
		VEGGH	VEGGH	VEGGH	altre ortive in serra	750	PIANTE ORTICOLE PROTETTE IN SERRA
		VEGLCO	VEGLCO	VEGLCO	ortive protette in tunnel, campane, ecc.	751	PIANTE ORTICOLE PROTETTE IN TUNNEL O ALTRO
	FLOW	FLOW	FLOW	FLOW	fiori e piante ornamentali		
		FLOWO	FLOWO	FLOWO	fiori e piante ornamentali in piena aria	510	FIORI E PIANTE ORNAMENTALI IN PIENA ARIA
						515	DANAE RACEMOSA
		FLOWGH	FLOWGH	FLOWGH	fiori e piante ornamentali protetti in serra	520	FIORI E PIANTE ORNAMENTALI PROTETTE IN SERRA
		FLOWLCO	FLOWLCO	FLOWLCO	fiori e piante ornamentali protetti in tunnel, campane, ecc	530	FIORI E PIANTE ORNAMENTALI PROTETTE IN TUNNEL O ALTRO
	SEEDL	SEEDL	SEEDL	SEEDL	piantine		
		SEEDLH	SEEDLH	SEEDLH	piantine orticole		
		SEEDLF	SEEDLF	SEEDLF	piantine floricole ed ornamentali		
		SEEDLO	SEEDLO	SEEDLO	altre piantine		
	TGRA	TGRA	TGRA	TGRA	foraggere avvicendate		
		LUCE	LUCE	LUCE	prati avvicendati: erba medica	330	ERBA MEDICA
						340	TRIFOGLIO
						350	PRATO POLIFITA DA VICENDA
						600	SULLA
						610	LUPINELLA
		OTMAGRA	OTMAGRA	OTMAGRA	altri prati avvicendati	607	FESTUCA ARUNDINACEA SCHREB
						608	FESTUCA OVINA L.
						609	FESTUCA PRATENSIS HUDS.
						614	LOLIUM PERENNE L.
						619	POA PRATENSIS L.

10c

Codici ISTAT					ISTAT Utilizzazione dei terreni - Descrizione in chiaro	Codici SIARL	SIARL Utilizzazione dei terreni - Descrizione in chiaro
		MAIZG	MAIZG	MAIZG	erbai: mais in erba	390	MAIS DA FORAGGIO
		MAIZS	MAIZS	MAIZS	erbai: mais a maturazione cerosa	20	SILOMAIS E MAIS CEROSO
		OTMFC	OTMFC	OTMFC	altri erbai monofiti di cereali	102	SORGO DA FORAGGIO
						613	LOLIUM MULTIFLORUM LAM.
						308	VECCIA
						309	VICIA SATIVA L.
		OTAGRA	OTAGRA	OTAGRA	altri erbai	341	TRIFOLIUM ALEXANDRINUM L.
						343	TRIFOLIUM INCARNATUM L.
						620	ERBAIO DI GRAMINACEE
						630	ERBAIO DI LEGUMINOSE
						640	ERBAIO MISTO
	SEEDS	SEEDS	SEEDS	SEEDS	sementi	810	SEMENTI E PIANTINE PER SEMINATIVI
						950	ORTICOLE DA SEME
	FALLAND	FALLAND	FALLAND	FALLAND	terreni a riposo		
						961	RIPOSO VOLONTARIO - COPERTURA VEGETALE SEMINATA O SPONTANEA
						962	RIPOSO VOLONTARIO - PRATICHE AGRONOMICHE
						963	RIPOSO VOLONTARIO - SUPERFICIE INTERESSATA DALL'ESECUZIONE DI INTERVENTI DI MIGLIORAMENTO FONDIARIO
						964	RIPOSO VOLONTARIO - SOVESCIO IN PRESENZA DI SPECIE DA SOVESCIO O DI PIANTE BIOCIDE
						965	RIPOSO VOLONTARIO - LAVORAZIONI MECCANICHE INTENZIONE DI SEMINA DOPO IL 15 LUGLIO
						966	RIPOSO VOLONTARIO - LAVORAZIONI MECCANICHE - MAGGESE
						967	RIPOSO VOLONTARIO - COLTURE A PERDERE PER LA FAUNA - MISCUGLIO DI SORGO, GRANOTURCO E GIRASOLE
		FLANDW	FLANDW	FLANDW	terreni a riposo non soggetti a regime di aiuto	968	SUPERFICI AGRICOLE NON SEMINATE - DISATTIVATE
						S33	RIPOSO - PRATICHE AGRONOMICHE (TITOLI DA RITIRO)
						S34	RIPOSO - INTENZIONE DI SEMINA DOPO IL 15 LUGLIO (TITOLI DA RITIRO)
						S35	RIPOSO - COPERTURA VEGETALE SEMINATA O SPONTANEA (TITOLI DA RITIRO)
						S38	RIPOSO - PRATICHE AGRONOMICHE (TITOLI ORDINARI)
						S39	RIPOSO - INTENZIONE DI SEMINA DOPO IL 15 LUGLIO (TITOLI ORDINARI)
						S40	RIPOSO - COPERTURA VEGETALE SEMINATA O SPONTANEA (TITOLI ORDINARI)
						S71	RIPOSO - COPERTURA VEGETALE SPONTANEA
						S72	RIPOSO - LAVORAZIONI PER IL CONTENIMENTO DELLE ERBE INFESTANTI
						S84	RIPOSO NO FOOD - SPELTA, FRUMENTO TENERO
		FLANDP	FLANDP	FLANDP	terreni a riposo soggetti a regime di aiuto	310	SEMINATIVI RITIRATI DALLA PRODUZIONE PER SCOPI DI CARATTERI AMBIENTALE AI SENSI DEL REG. CE N.1257/99
						680	SEMINATIVI RITIRATI DALLA PRODUZIONE PER INTERVENTI AGROAMBIENTALI EX REG. CEE 2078/92
						682	SUPERFICI AMMISSIBILI AI SENSI DELL'ARTICOLO 34.B DEL REG. (CE) 73/2008
						960	SUPERFICI RITIRATE DALLA PRODUZIONE AI SENSI DELL'ART. 22-24 MISURA F DEL REG. CE N. 1257/99 - RITIR
PCROPS	PCROPS	PCROPS	PCROPS	PCROPS	coltivazioni legnose agrarie		
						406	VITE PER PIANTE MADRI DA PORTAINNESTO
						407	VITE PER PIANTE MADRI DA MARZE
						408	VITE PER SELVATICI DA INNESTO
						409	VITE PER VITIGNI SPERIMENTALI
						410	VITE
VINEY	VINEY	VINEY	VINEY	VINEY	vite	411	VITE PER UVA DA VINO DI QUALITÀ (DOC, IGT, DOCG)
						412	VITE PER UVA DA VINO COMUNE
						413	VITE PER UVA DA TAVOLA
						414	VITE PER UVA DA VINO IN ZONA DOC E/O DOCG
						415	VITE PER UVA DA VINO IN ZONA IGT
						416	VITE PER UVA VINO DA TAVOLA IN ALTRE ZONE
						417	VITE PER UVA DA MENSA
						418	VITE PER UVA DA AUTOCONSUMO
OLIV	OLIV	OLIV	OLIV	OLIV	olivo per la produzione di olive da tavola e da olio	420	OLIVO
OLIVT	OLIVT	OLIVT	OLIVT	OLIVT	olive da tavola	421	OLIVO PER OLIVE DA TAVOLA
OLIVO	OLIVO	OLIVO	OLIVO	OLIVO	olive per olio	422	OLIVO PER OLIVE DA OLIO
						424	OLIVO PER OLIVE DA OLIO DI CUI AL REG. CE N. 1782/03-ART. 44, PAR. 2
CITRFR	CITRFR	CITRFR	CITRFR	CITRFR	agrumi		
ORANGE	ORANGE	ORANGE	ORANGE	ORANGE	arancio	431	ARANCIO
CLEMEN	CLEMEN	CLEMEN	CLEMEN	CLEMEN	clementina e suoi ibridi		
CITRFRO	CITRFRO	CITRFRO	CITRFRO	CITRFRO	altri agrumi		
MANDAR	MANDAR	MANDAR	MANDAR	MANDAR	mandarino		
LEMON	LEMON	LEMON	LEMON	LEMON	limone	436	LIMONE
FRUIT	FRUIT	FRUIT	FRUIT	FRUIT	fruttiferi		
APPLET	APPLET	APPLET	APPLET	APPLET	melo	440	MELO
PEACHT	PEACHT	PEACHT	PEACHT	PEACHT	pesco	460	PESCO
APRICT	APRICT	APRICT	APRICT	APRICT	albicocco	671	ALBICOCCO
PLUMT	PLUMT	PLUMT	PLUMT	PLUMT	susino	673	SUSINO
						254	FRUTTI DELLA SPECIE ARONIA ARBUTIFOLIA, SPINO MERLO E SAMBUCO
						470	ALTRE PIANTE ARBOREE DA FRUTTO
						471	LOTO O KAKI
						473	LAMPONE
						474	MORA
						475	MIRTILLO
FRTCZ	FRTCZ	FRTCZ	FRTCZ	FRTCZ	altra frutta fresca di origine temperata	476	NESPOLO
						477	RIBES
						478	UVA SPINA
						660	ALTRE POMACEE
						661	COTOGNO

Codici ISTAT					ISTAT Utilizzazione dei terreni - Descrizione in chiaro	Codici SIARL	SIARL Utilizzazione dei terreni - Descrizione in chiaro
						670	ALTRE DRUPACEE
						674	PRUGNE DA DESTINARE ALLA TRASFORMAZIONE
FRSTCZ	FRSTCZ	FRSTCZ	FRSTCZ	FRSTCZ	altra frutta fresca di origine sub-tropicale	830	ALTRA FRUTTA FRESCA DI ORIGINE SUB TROPICALE
HAZELT	HAZELT	HAZELT	HAZELT	HAZELT	nocciolo	824	NOCCIOLO
WALNU	WALNU	WALNU	WALNU	WALNU	noce	825	NOCE
PEART	PEART	PEART	PEART	PEART	pero	450	PERO
NECTAT	NECTAT	NECTAT	NECTAT	NECTAT	nettarina (pesca noce)	461	NETTARINA
CHERRT	CHERRT	CHERRT	CHERRT	CHERRT	ciliegio	672	CILIEGIO
FIGT	FIGT	FIGT	FIGT	FIGT	fico	472	FICO
KIWIT	KIWIT	KIWIT	KIWIT	KIWIT	actinidia (kiwi)	831	ACTINIDIA
ALMOT	ALMOT	ALMOT	ALMOT	ALMOT	mandorlo	823	MANDORLO
CHESTT	CHESTT	CHESTT	CHESTT	CHESTT	castagno	822	CASTAGNO
NUTSO	NUTSO	NUTSO	NUTSO	NUTSO	altra frutta a guscio	820	ALTRA FRUTTA A GUSCIO
NURSE	NURSE	NURSE	NURSE	NURSE	vivai		
NURSEFT	NURSEFT	NURSEFT	NURSEFT	NURSEFT	vivai fruttiferi	552	VIVAIO FRUTTICOLI
						553	VIVAIO VITE
						554	VIVAIO OLIVO
NURSEOR	NURSEOR	NURSEOR	NURSEOR	NURSEOR	piante ornamentali da vivaio	247	PIANTE DA PIENA ARIA VIVACI
						551	VIVAIO FLORICOLI E PIANTE ORNAMENTALI
						558	VIVAIO FLORICOLI E PIANTE ORNAMENTALI IN VASO
NURSEOT	NURSEOT	NURSEOT	NURSEOT	NURSEOT	altri vivai	550	VIVAIO
						555	VIVAIO FORESTALE
						556	ALTRI VIVAI
PCROO	PCROO	PCROO	PCROO	PCROO	altre coltivazioni legnose agrarie	832	ALTRE COLTIVAZIONI LEGNOSE AGRARIE
PCROG	PCROG	PCROG	PCROG	PCROG	coltivazioni legnose agrarie in serra		
KITGAR	KITGAR	KITGAR	KITGAR	KITGAR	orti familiari	540	ORTO FAMILIARE
PGRAPM	PGRAPM	PGRAPM	PGRAPM	PGRAPM	prati permanenti e pascoli		
PGRASSU	PGRASSU	PGRASSU	PGRASSU	PGRASSU	prati permanenti (utilizzati)	360	PRATO POLIFITA NON AVVICENDATO (PRATO STABILE)
						370	PRATO-PASCOLO
PASMEAU	PASMEAU	PASMEAU	PASMEAU	PASMEAU	pascoli (utilizzati)	386	PASCOLO CESPUGLIATO/ARBORATO CONTRATTO ATI (TARA 20%)
						387	PASCOLO ARBORATO CONTRATTO ATI (TARA 50%)
						388	PASCOLO CON ROCCIA AFFIORANTE CONTRATTO ATI (TARA 50%)
						389	PASCOLO CON ROCCIA AFFIORANTE CONTRATTO ATI (TARA 20%)
						400	ALTRE FORAGGERE
NATPAS	NATPAS	NATPAS	NATPAS	NATPAS	pascoli naturali		
ROUGRA	ROUGRA	ROUGRA	ROUGRA	ROUGRA	pascoli magri		
PGPNP	PGPNP	PGPNP	PGPNP	PGPNP	prati permanenti e pascoli non più destinati alla produzione, ammessi a beneficiare di aiuti finanziari		
LSRC	LSRC	LSRC	LSRC	LSRC	arboricoltura da legno annessa ad aziende agricole		
POPPLA	POPPLA	POPPLA	POPPLA	POPPLA	pioppeti annessi ad aziende agricole	491	PIOPPETO
						497	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1698/05 MISURA 221 - CICLO BREVE (PIOPPETI)
						500	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1257/99 MISURA H - CICLO BREVE (PIOP
OLSRC	OLSRC	OLSRC	OLSRC	OLSRC	altra arboricoltura da legno annessa ad aziende agricole	493	ALBERI DA BOSCO A BREVE ROTAZIONE (ES. PIOPPETO) DI CUI AL REG. CE N. 795/2004-ART. 2, LETT. C
						495	ALBERI DA BOSCO A BREVE ROTAZIONE, CON UN PERIODO DI COLTIVAZIONE MASSIMO DI VENTI ANNI
						498	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1698/05 MISURA 221 - ARBORICOLTURA DA LEGNO
						502	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1257/99 MISURA H - ARBORICOLTURA DA LEGNO
						504	FASCE TAMPONE
						505	SIEPI
AREAWO	AREAWO	AREAWO	AREAWO	AREAWO	boschi annessi ad aziende agricole		
HFWO	HFWO	HFWO	HFWO	HFWO	boschi a fustaia	481	FUSTAIA DI CONIFERE
						482	FUSTAIE DI LATIFOGLIE
						483	FUSTAIA MISTA DI CONIFERE E LATIFOGLIE
COPPIC	COPPIC	COPPIC	COPPIC	COPPIC	boschi cedui	484	CEDUO SEMPLICE
						485	CEDUO COMPOSTO
						496	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1698/05 MISURA 221 - CICLO BREVE (BIOMASSA)
						501	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1257/99 MISURA H - CICLO BREVE (BIOM
OTWO	OTWO	OTWO	OTWO	OTWO	altra superficie boscata	480	BOSCO MISTO
						490	ALTRE PIANTE ARBOREE DA LEGNO
						492	ALTRI ARBORETI DA LEGNO
						499	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1698/05 MISURA 221 - BOSCHI PERMANENTI
						503	ALBERI DA BOSCO - SUPERFICI IMBOSCHITE AI SENSI DEL REG.(CE) N. 1257/99 MISURA H - BOSCHI PERMANENTI
						681	SEMINATIVI RITIRATI DALLA PRODUZIONE PER IMBOSCHIMENTO EX REG. CEE 2080/92
						683	SUPERFICI IMBOSCHITE PER ARBORICOLTURA DA LEGNO (REG. CEE 2080/92)
UNLAND	UNLAND	UNLAND	UNLAND	UNLAND	superficie agricola non utilizzata	560	TARE E INCOLTI
OTLAND	OTLAND	OTLAND	OTLAND	OTLAND	altra superficie	580	ALTRA SUPERFICIE NON UTILIZZATA (TERRENI ABBANDONATI, ATTIVITA' RICREATIVE)
						X14	FABBRICATI AGRICOLI
MUSH	MUSH	MUSH	MUSH	MUSH	funghi in grotte, sotterranei o in appositi edifici		
GREENH	GREENH	GREENH	GREENH	GREENH	serre		
ENCRO	ENCRO	ENCRO	ENCRO	ENCRO	coltivazioni energetiche		

Codici ISTAT				ISTAT Tipo allevamento - Descrizione in chiaro			SIARL Tipo allevamento - Descrizione in chiaro		
TOTCATT				totale bovini					
TOTCATT	CUOYO			totale bovini	bovini di età inferiore a un anno			BOVINI VITELLI FINO A 6 MESI - BOVINI VITELLI DA 6 A 12 MESI	
	CUOYO	UOYO			bovini di età inferiore a un anno	bovini di età inferiore a un anno: maschi			
		UOYOF				bovini di età inferiore a un anno: femmine			
	C1BLT2YO				bovini da uno a meno di due anni				
	C1BLT2YO	C1BLT2YOM			bovini da uno a meno di due anni	bovini da un anno a meno di due anni: maschi			BOVINI MASCHI DA 1 A 2 ANNI DA ALLEVAMENTO - BOVINI MASCHI DA 1 A 2 ANNI DA MACELLO
		C1BLT2YOF				bovini da un anno a meno di due anni: femmine			BOVINI FEMMINE DA 1 A 2 ANNI DA ALLEVAMENTO - BOVINI FEMMINE DA 1 A 2 ANNI DA MACELLO
	C2YOAO				bovini di due anni e più				
	C2YOAO	C2YOAOM			bovini di due anni e più	bovini di due anni e più: maschi			BOVINI MASCHI DA 2 ANNI E PIU' DA MACELLO - TORI
		C2YOAOF				bovini di due anni e più: femmine			
		C2YOAOF	2YOAOHFB			bovini di due anni e più: femmine	bovini di 2 anni e più: giovenche da allevamento		BOVINI FEMMINE DA 2 ANNI E PIU' DA ALLEVAMENTO
			2YOAOHFS				bovini di 2 anni e più: giovenche da macello		BOVINI FEMMINE DA 2 ANNI E PIU' DA MACELLO
			2YOAODC				bovini di 2 anni e più: vacche da latte		VACCHE DA LATTE
			2YOAOOC				bovini di 2 anni e più: altre vacche (da carne e/o da lavoro)		ALTRE VACCHE
TOTBUFF				totale bufalini					
TOTBUFF	BUFCAL			totale bufalini	annutoli (vitelli bufalini)			VITELLI FINO A 6 MESI - VITELLI DA 6 A 12 MESI	
	FBUFF				bufale			BUFALE - FEMMINE DA 1 A 2 ANNI DA ALLEVAMENTO - FEMMINE DI 2 O PIU' ANNI DA ALLEVAMENTO	
	OTHBUFF				altri bufalini			BUFALI - MASCHI DA 1 A 2 ANNI DA ALLEVAMENTO	
TOTHOR				totale equini				EQUINI CON MENO DI 6 MESI - EQUINI CON PIU' DI 6 MESI	
TOTHOR	HOR			totale equini	cavalli				
	OTHOR				altri equini (asini, muli, bardotti)				
TOTSH				totale ovini					
TOTSH	SH			totale ovini	pecore			PECORE	
	SH	DSH			pecore	pecore da latte			
		OSH				altre pecore			
	OTSH				altri ovini			ALTRI OVINI	
TOTG				totale caprini					
TOTG	G			totale caprini	capre			CAPRE	
	OG				altri caprini			ALTRI CAPRINI	
TOTPIG				totale suini					
TOTPIG	FPL20KGAM			totale suini	suini di peso inferiore a 20 kg			SUINI DI PESO INFERIORE A 20 KG (LATTONZOLI)	
	FPL50KGAM				suini da 20 kg a meno di 50 kg			SUINI DI PESO TRA I 20 KG E I 50 KG (MAGRONI)	
	FP50KGAM				suini da ingrasso di 50 kg e più			SUINI DI PESO SUPERIORE A 50 KG (DA INGRASSO)	
	FP50KGAM	FPL80KGAM			suini da ingrasso di 50 kg e più	suini da ingrasso da 50 kg a meno di 80 kg			
		FPL110KGAM				suini da ingrasso da 80 kg a meno di 110 kg			
		FPM110KGAM				suini da ingrasso da 110 kg e più			
	BP50KGAM				suini da riproduzione di 50 kg e più				
	BP50KGAM	BPB			suini da riproduzione di 50 kg e più	verri			VERRI
		BPMS				scrofe montate			SCROFE
		BPOS				altre scrofe			SUINI DI PESO SUPERIORE A 50 KG (SCROFETTE DA RIPRODUZIONE)
TOTPOU				totale avicoli					
TOTPOU	BRO			totale avicoli	polli da carne			POLLI DA CARNE	
	LHE				galline da uova			GALLINE OVAIOLE	
	TUR				tacchini			TACCHINI	
	GFO				faraone			FARAONE	
	GEE				oche			ANATRE - OCHE	
	OPO				altri avicoli			ALTRI AVICOLI	
OSTR				struzzi				STRUZZI	
TOTRAB				totale conigli					
TOTRAB	FBREED			totale conigli	conigli: fattrici			CONIGLIE MADRI (FATTRICI)	
	OTRAB				altri conigli			ALTRI CUNICOLI	
B				api				API (IN ARNIE)	
OL				altri allevamenti				SELVAGGINA AVICOLA - ALTRI VOLATILI - SELVAGGINA NON AVICOLA - ALLEVAMENTO ITTICO - ALTRI ALLEVAMENTI	
ALLEBOL				tutte le voci tranne api e altri allevamenti					
ALL				tutte le voci					

5.2. Production of the main fresh foodstuffs

In the National Census the cultivated crops and the animals bred with the organic method are grouped into broad categories (such as cereals and cattle), while data on total production are more detailed (rice, wheat, beef cattle and dairy cattle of different ages). In order to compare the data of crop and animal production conventional and organic farming, we have therefore chosen, to use all the available categories for organic production.

The categories submitted to this analysis were:

A) for the cultivated crops:

Categories	**ISTAT/EUROSTAT Code**
Cereals	CEREAG
Dry pulses	DRPUL
Potatoes	POTAT
Vegetables	VEGFR
Fruit plants	FRUIT

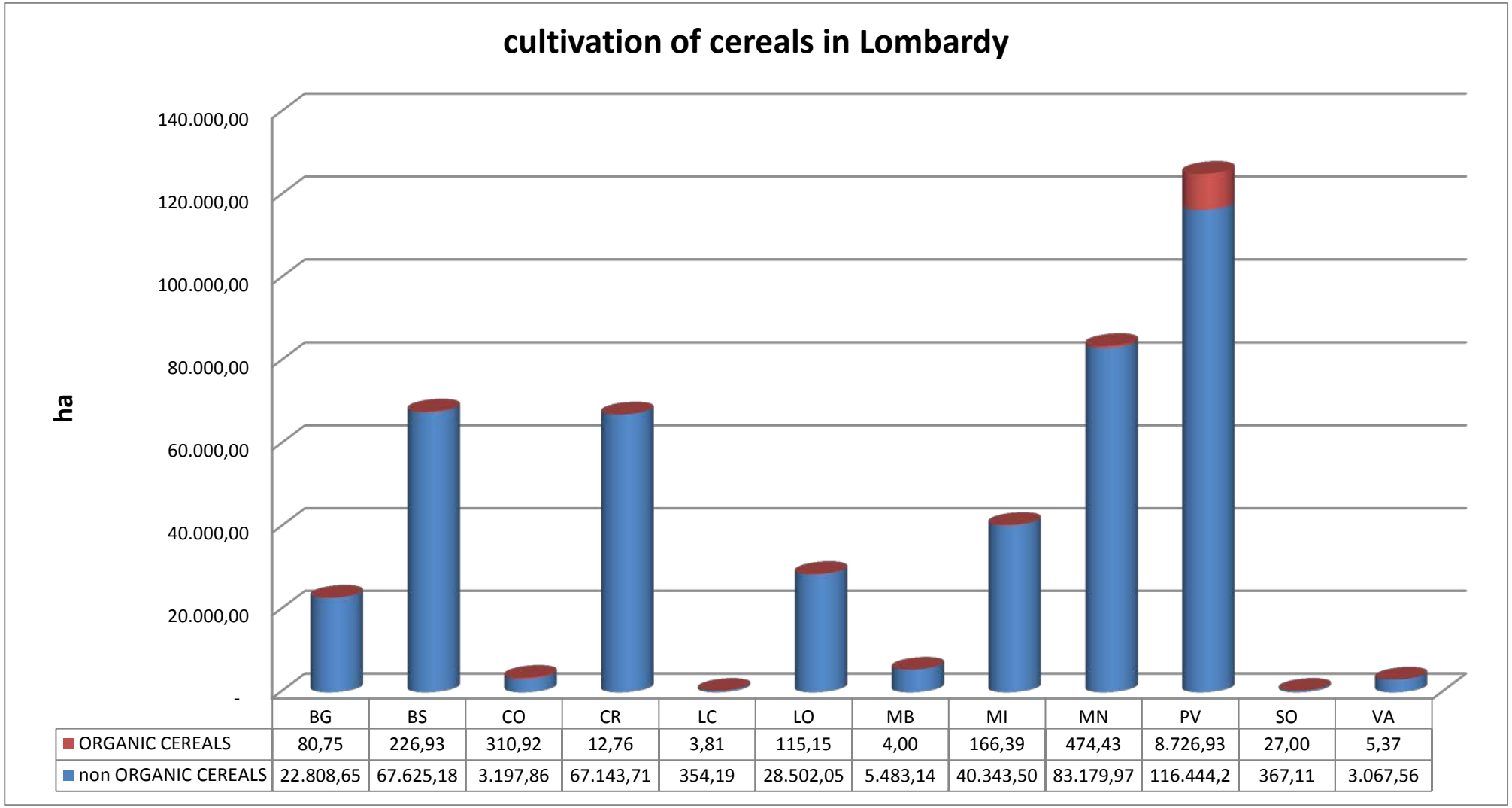
B) for the animals bred:

Categories	**ISTAT/EUROSTAT Code**
Cattle	TOTCATT
Pigs	TOTPIG
Poultry	TOTPOU

All data collected were compared with national data (total area cultivated for vegetables and total number of animals bred). The results, grouped at provincial level, are shown in the graphs of the following pages.

Furthermore, the data were submitted to a spatial analysis, at municipal level, to verify the distribution of crops and livestock, comparing the total production (conventional + organic) with organic farming, using the ArcGIS platform. The results are shown in the next pages.

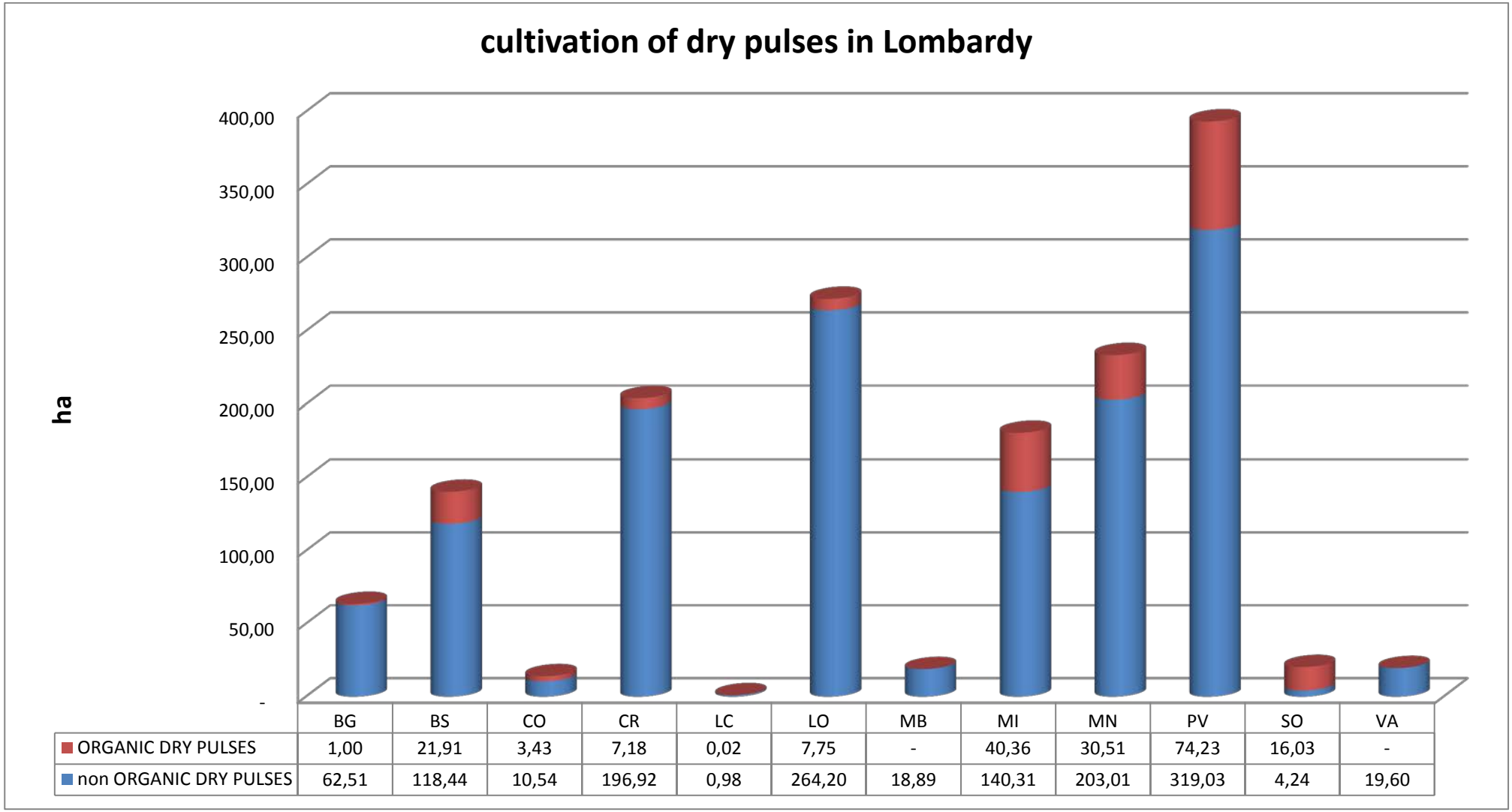
Fig. 11: Cereals in Lombardy (total and organic) – ha cultivated



	BG	BS	CO	CR	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC CEREALS	80,75	226,93	310,92	12,76	3,81	115,15	4,00	166,39	474,43	8.726,93	27,00	5,37
non ORGANIC CEREALS	22.808,65	67.625,18	3.197,86	67.143,71	354,19	28.502,05	5.483,14	40.343,50	83.179,97	116.444,2	367,11	3.067,56

The cultivation of cereals in the Lombardy region covers an area of 448,671.55 hectares (12.43% of the national total), including those grown with the organic method, which surface amounts at 10,154.44 ha (4.54% of the national total).

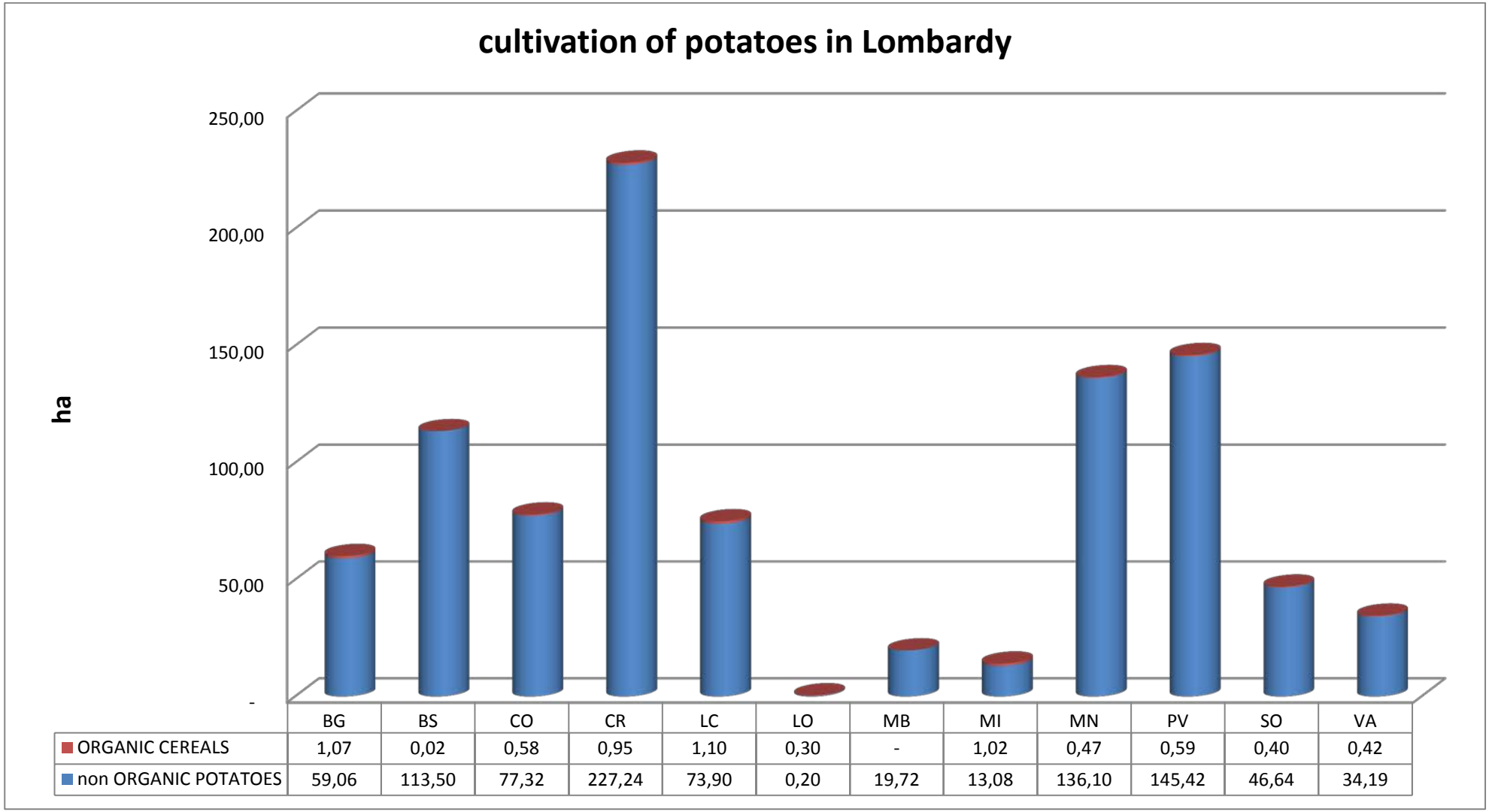
Fig. 12: Dry pulses in Lombardy (total and organic) – ha cultivated



	BG	BS	CO	CR	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC DRY PULSES	1,00	21,91	3,43	7,18	0,02	7,75	-	40,36	30,51	74,23	16,03	-
non ORGANIC DRY PULSES	62,51	118,44	10,54	196,92	0,98	264,20	18,89	140,31	203,01	319,03	4,24	19,60

The cultivation of dry pulses in the Lombardy region covers an area of 1,561.09 hectares (1.12% of the national total), including those grown using the organic method, which surface amounts at 202.42 ha (0.85% of the national total).

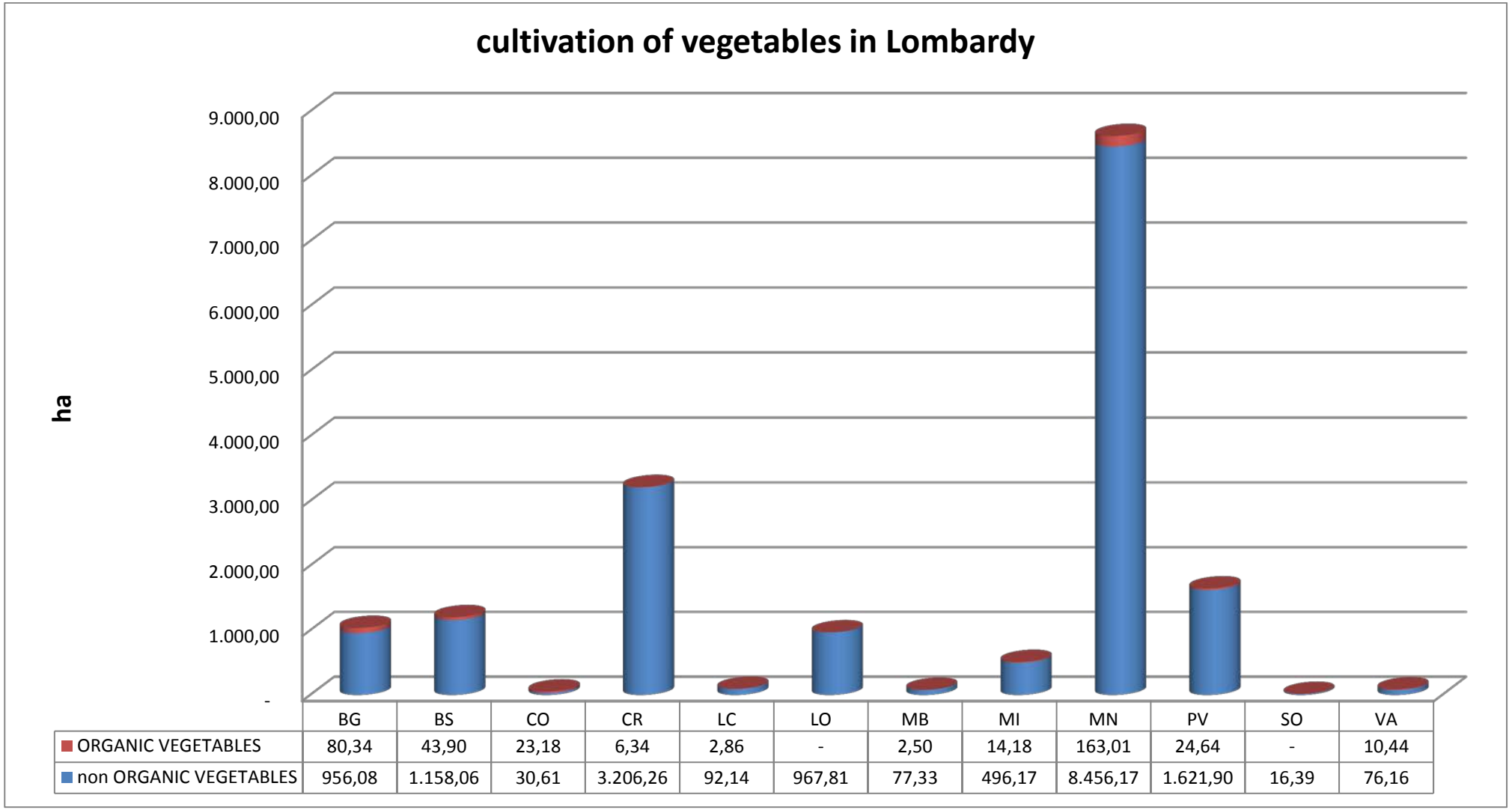
Fig. 13: Potatoes in Lombardy (total and organic) – ha cultivated



	BG	BS	CO	CR	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC CEREALS	1,07	0,02	0,58	0,95	1,10	0,30	-	1,02	0,47	0,59	0,40	0,42
non ORGANIC POTATOES	59,06	113,50	77,32	227,24	73,90	0,20	19,72	13,08	136,10	145,42	46,64	34,19

The cultivation of potatoes in the Lombardy region covers an area of 953.29 hectares (3.28% of the national total), including those grown using the organic method, which surface amounts at 6.92 ha (0.52% of the national total).

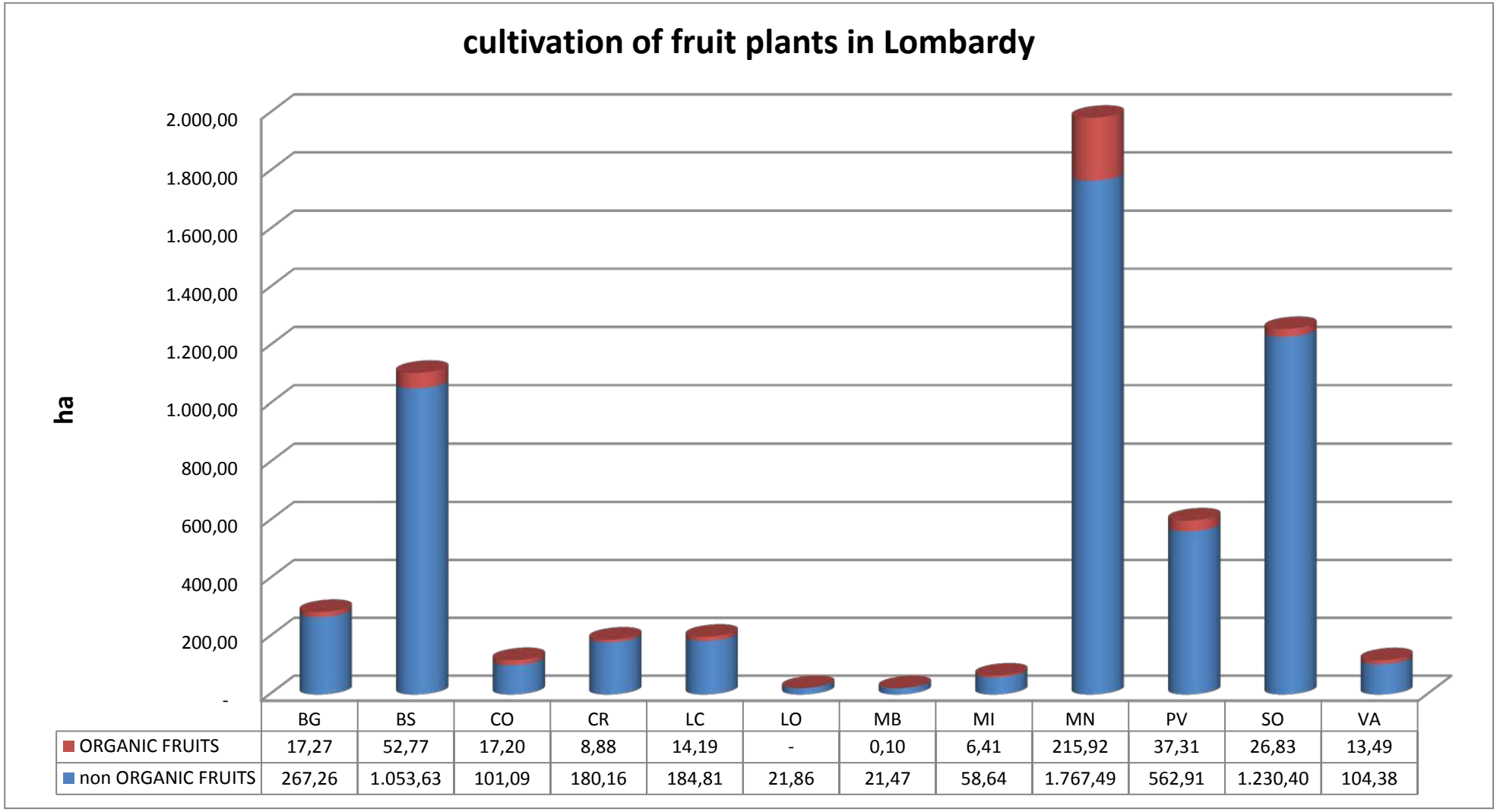
Fig. 14: Vegetables in Lombardy (total and organic) – ha cultivated



	BG	BS	CO	CR	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC VEGETABLES	80,34	43,90	23,18	6,34	2,86	-	2,50	14,18	163,01	24,64	-	10,44
non ORGANIC VEGETABLES	956,08	1.158,06	30,61	3.206,26	92,14	967,81	77,33	496,17	8.456,17	1.621,90	16,39	76,16

The cultivation of vegetables in the Lombardy region covers an area of 17,526.47 hectares (5.84% of the national total), including those grown using the organic method, which surface amounts at 371.39 ha (2.29% of the national total).

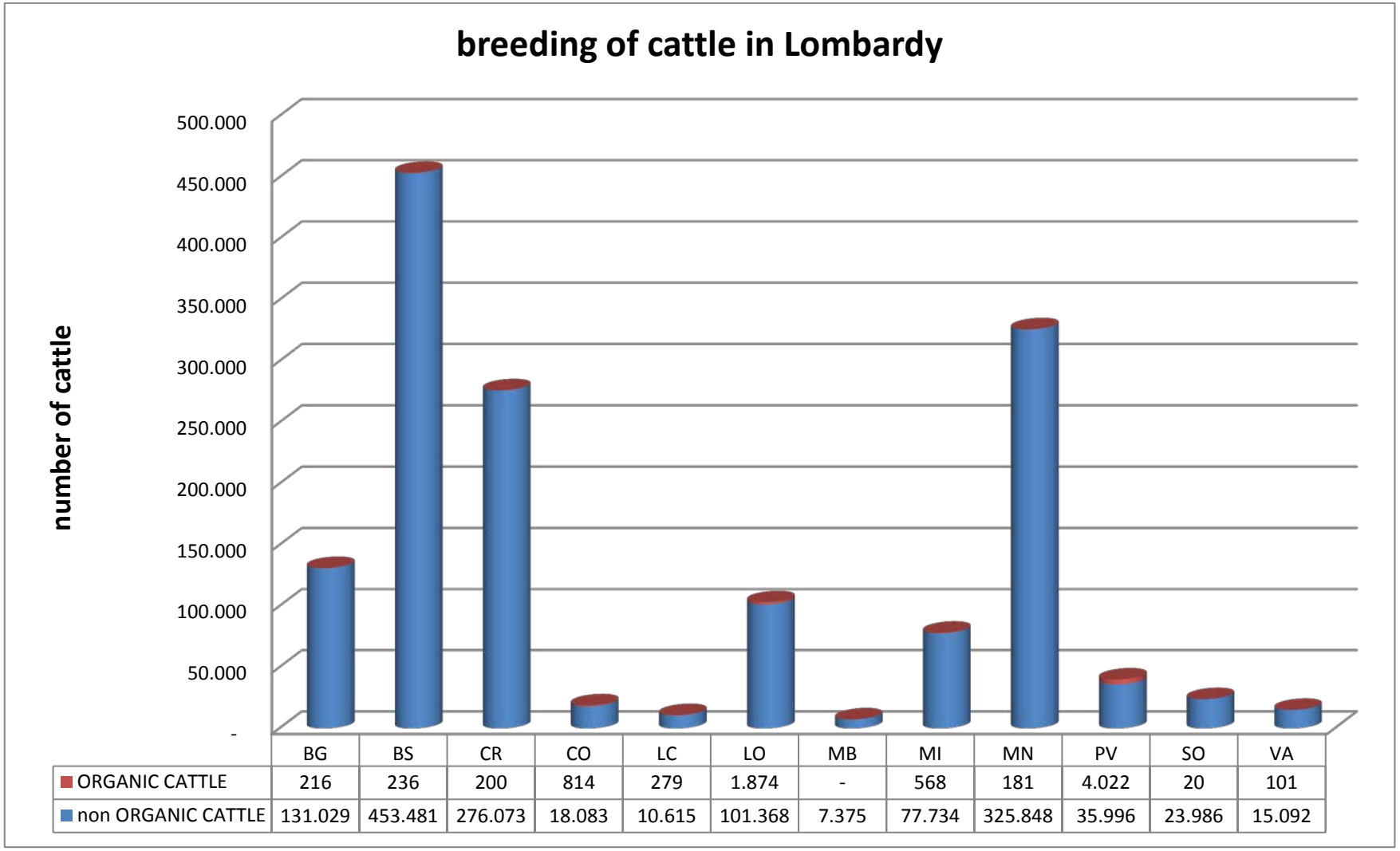
Fig. 15: Fruit plants in Lombardy (total and organic) – ha cultivated



	BG	BS	CO	CR	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC FRUITS	17,27	52,77	17,20	8,88	14,19	-	0,10	6,41	215,92	37,31	26,83	13,49
non ORGANIC FRUITS	267,26	1.053,63	101,09	180,16	184,81	21,86	21,47	58,64	1.767,49	562,91	1.230,40	104,38

The cultivation of fruit plants in the Lombardy region covers an area of 5,964.47 hectares (1.39% of the national total), including those grown using the organic method, which surface amounts at 410.37 ha (0.91% of the national total).

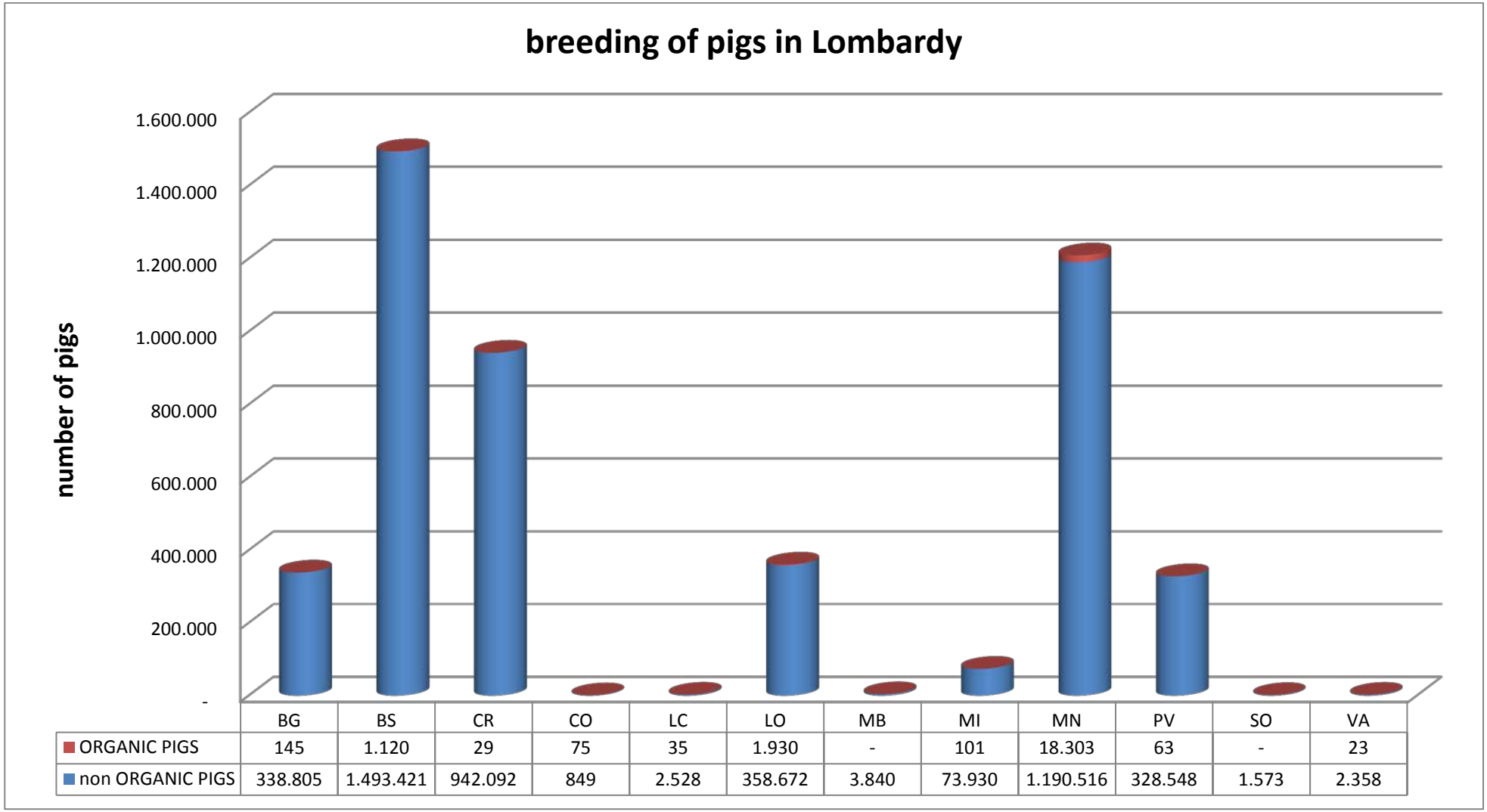
Fig. 16: Cattle in Lombardy (total and organic) – n. of animals bred



	BG	BS	CR	CO	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC CATTLE	216	236	200	814	279	1.874	-	568	181	4.022	20	101
non ORGANIC CATTLE	131.029	453.481	276.073	18.083	10.615	101.368	7.375	77.734	325.848	35.996	23.986	15.092

The cattle bred in the Lombardy region are 1,485,191 (26.55% of the national total), of which 8,511 are bred using the organic method (3.67% of the national total).

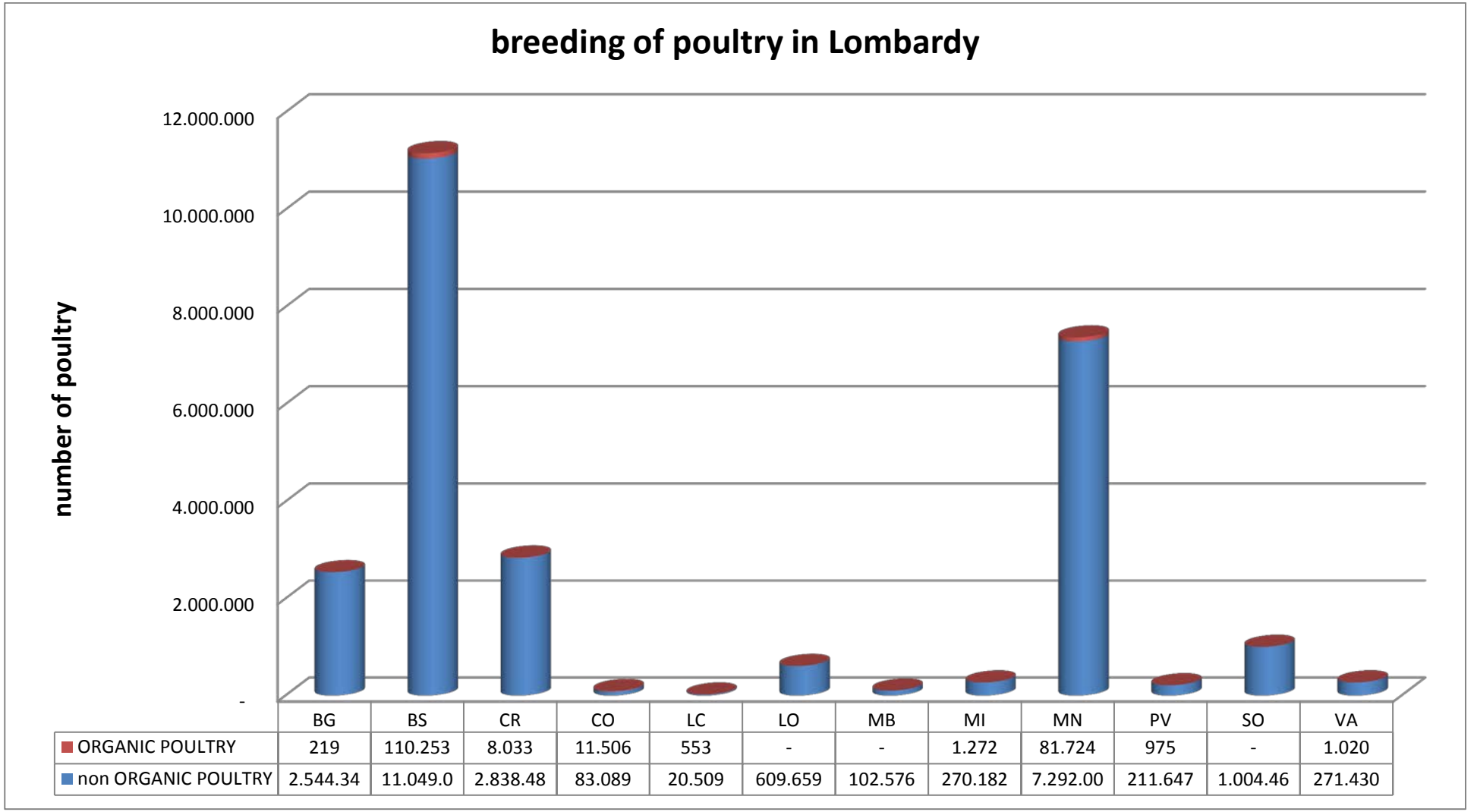
Fig. 17: Pigs in Lombardy (total and organic) – n. of animals bred



	BG	BS	CR	CO	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC PIGS	145	1.120	29	75	35	1.930	-	101	18.303	63	-	23
non ORGANIC PIGS	338.805	1.493.421	942.092	849	2.528	358.672	3.840	73.930	1.190.516	328.548	1.573	2.358

The pigs bred in the Lombardy region are 4,758,956 (51.00% of the national total), of which 21,824 are bred using the organic method (20.04% of the national total).

Fig. 18: Poultry in Lombardy (total and organic) – n. of animals bred

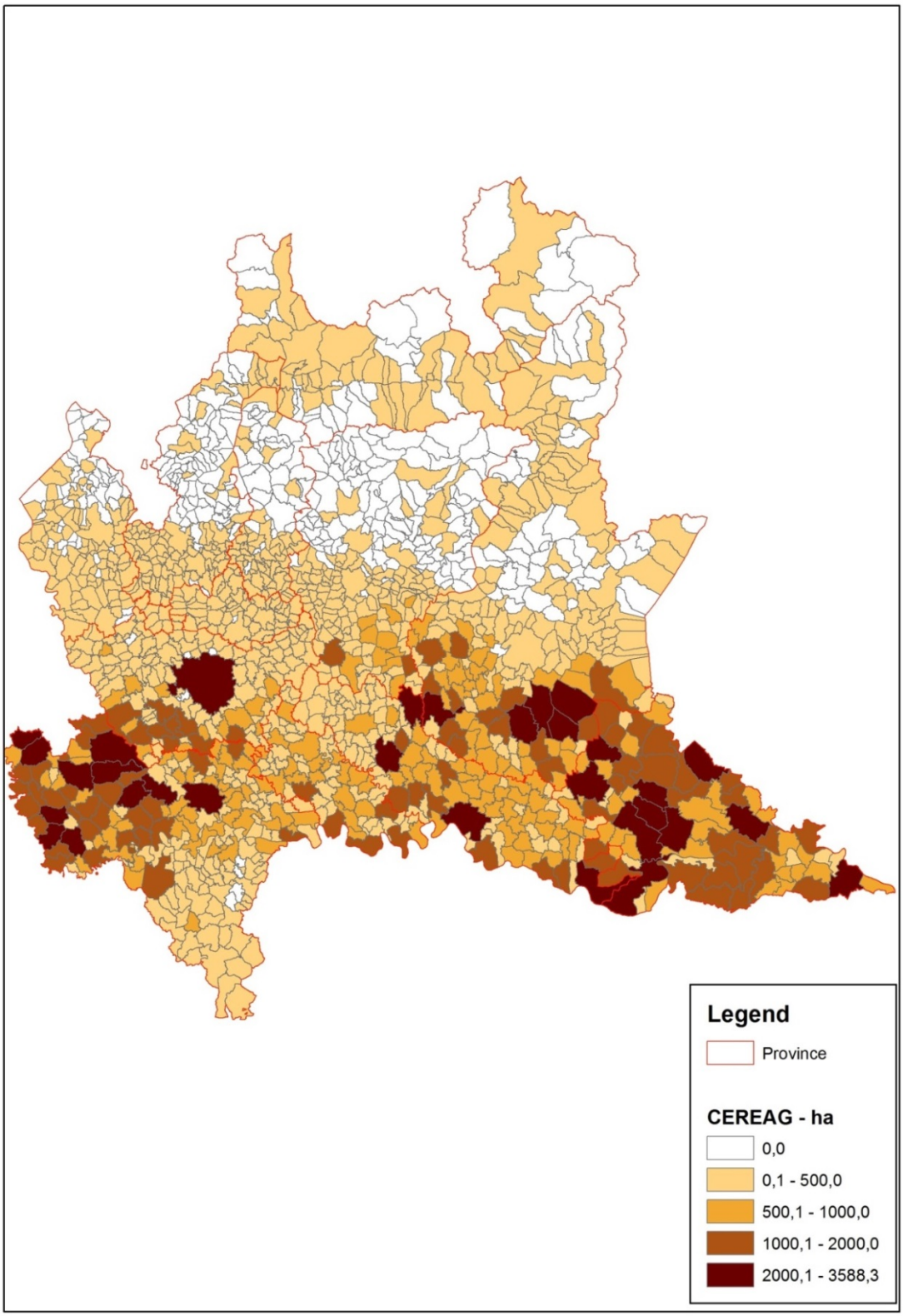


	BG	BS	CR	CO	LC	LO	MB	MI	MN	PV	SO	VA
ORGANIC POULTRY	219	110.253	8.033	11.506	553	-	-	1.272	81.724	975	-	1.020
non ORGANIC POULTRY	2.544.34	11.049.0	2.838.48	83.089	20.509	609.659	102.576	270.182	7.292.00	211.647	1.004.46	271.430

The poultry bred in the Lombardy region are 26,513,013 (15.83% of the national total), of which 215,555 are bred using the organic method (7.52% of the national total).

Fig. 19: – Spatial comparison between the cultivation of total and organic cereals in Lombardy

19a



Comments: while the cultivation of all cereals has a wide distribution in the plain of Lombardy, the organic cereals are concentrated in the western part of the province of Pavia.

19b

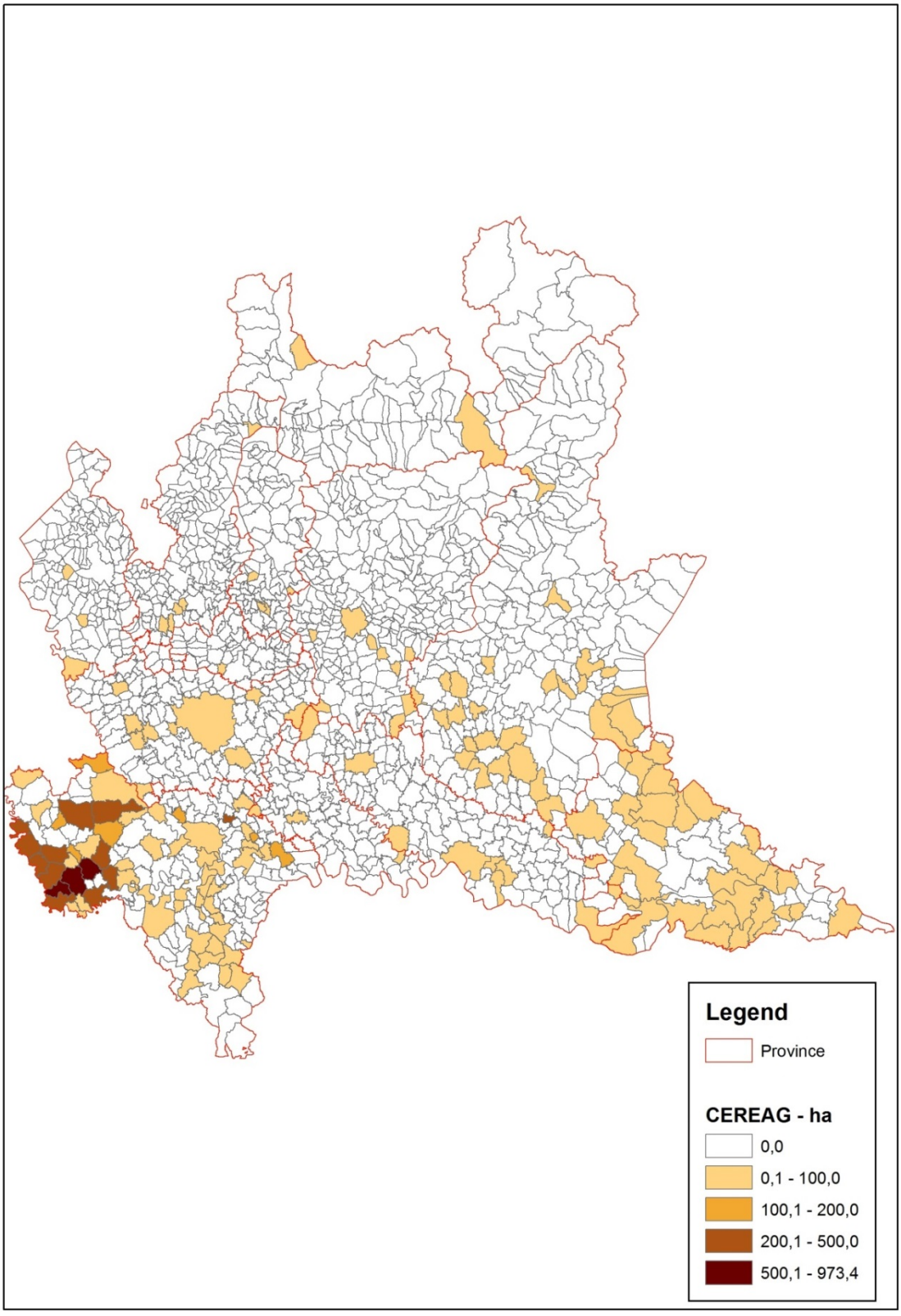
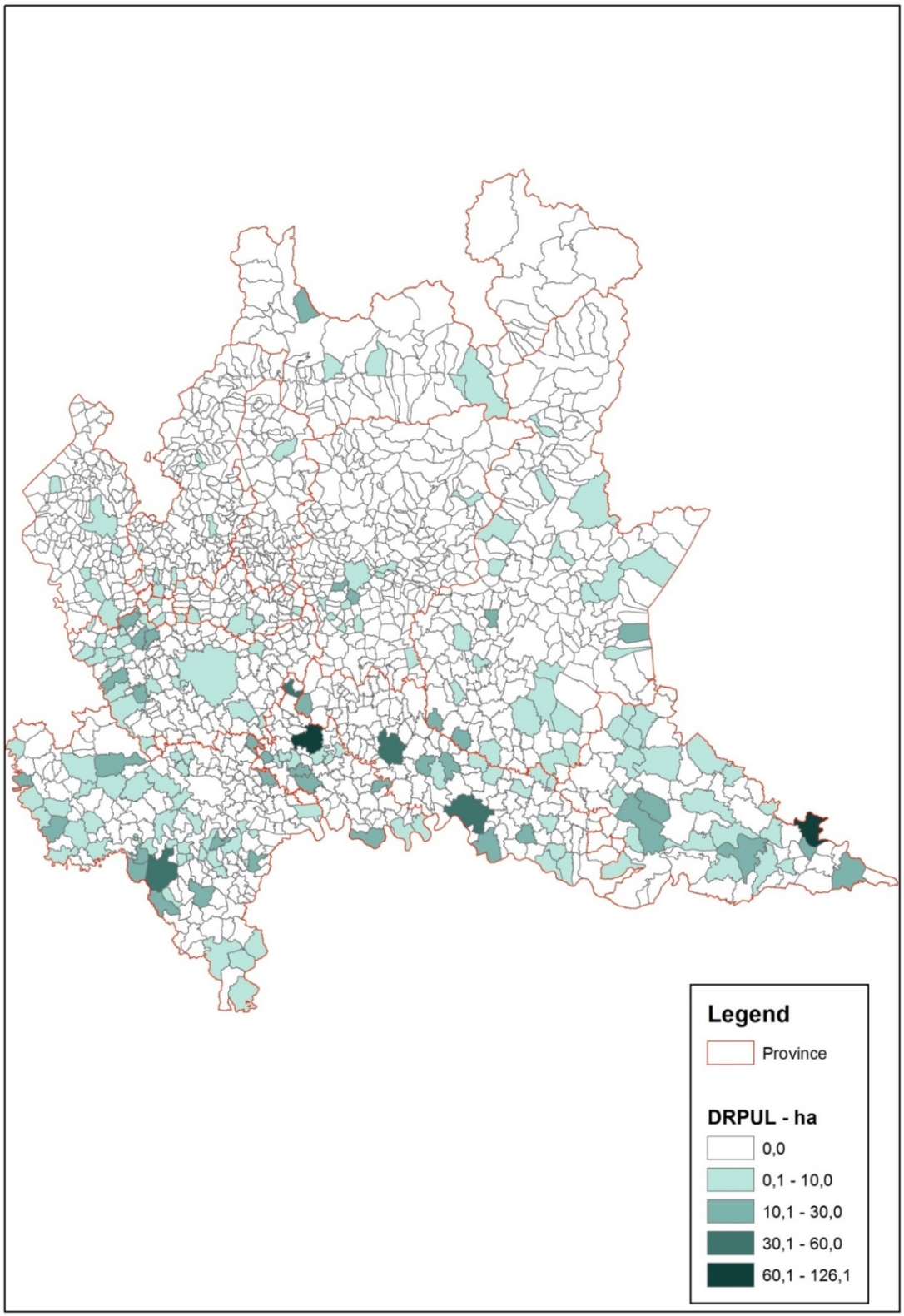


Fig. 20: Spatial comparison between the cultivation of total and organic dry pulses in Lombardy

20a



Comments: while the cultivation of all dry pulses has a wide distribution in the plain of Lombardy, the organic dry pulses are concentrated in the provinces of Pavia and Mantua.

20b

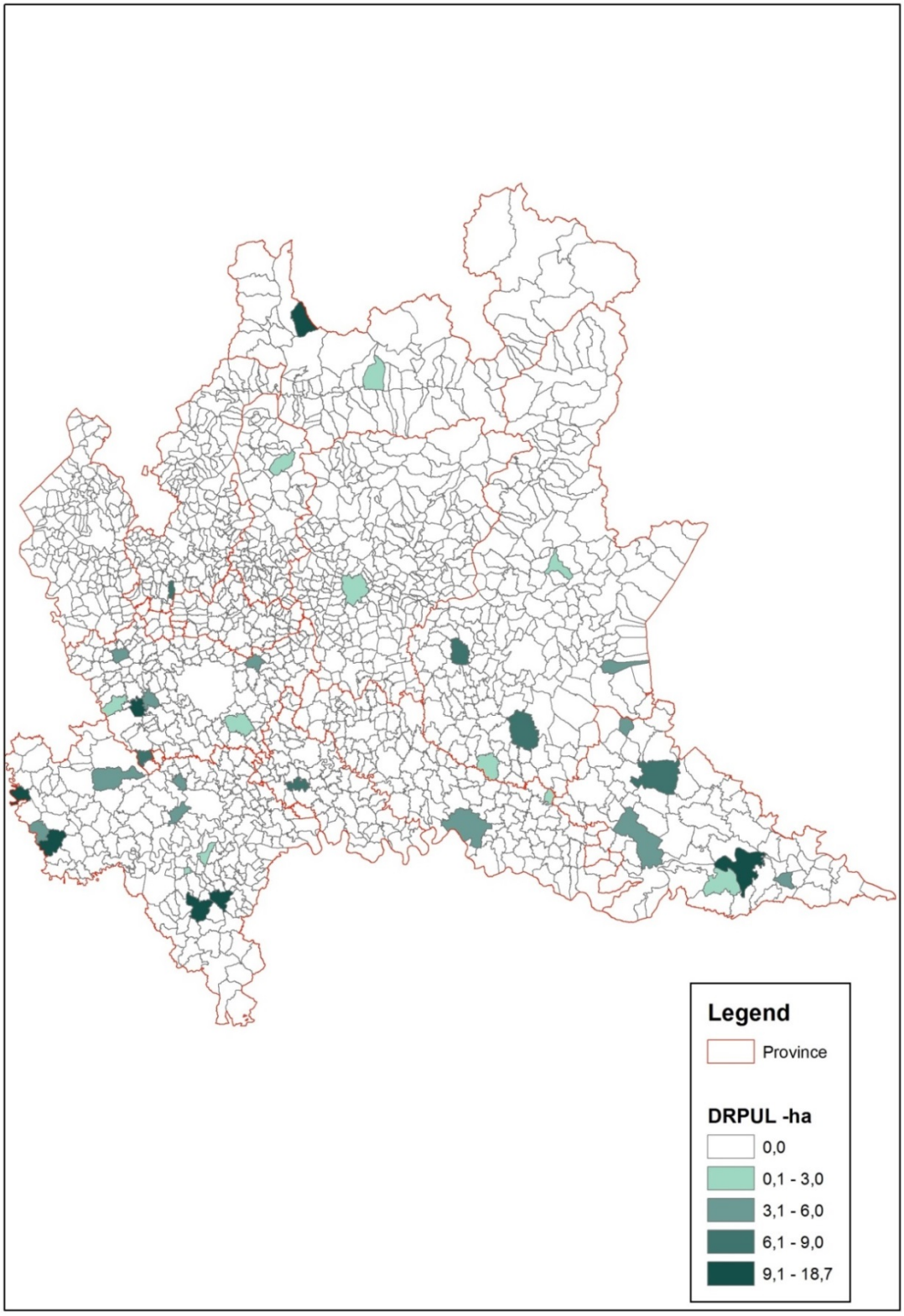
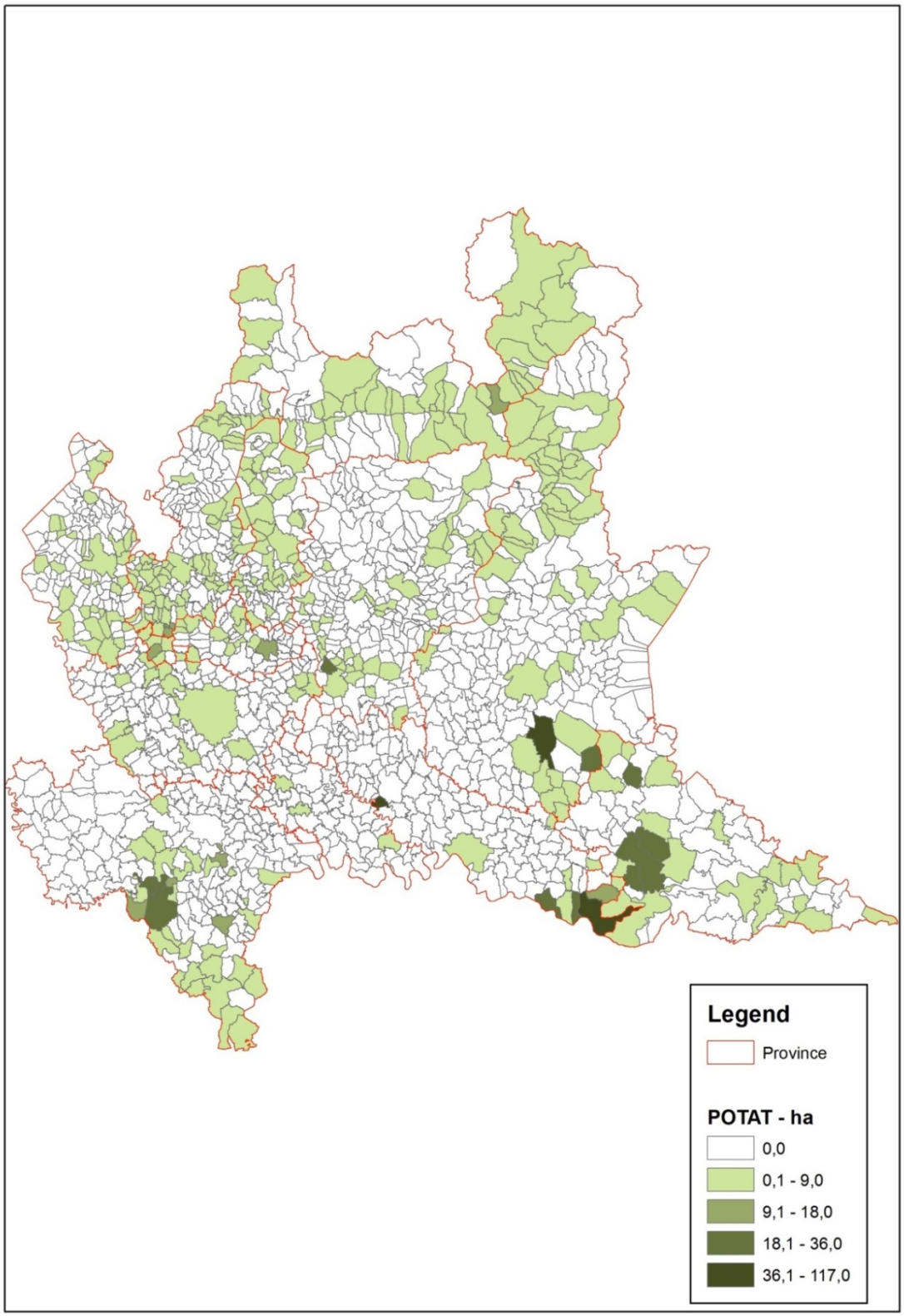


Fig. 21: – Spatial comparison between the cultivation of total and organic potatoes in Lombardy

21a



Comments: while the cultivation of all potatoes has a wide distribution in all Lombardy, the organic potatoes is very limited.

21b

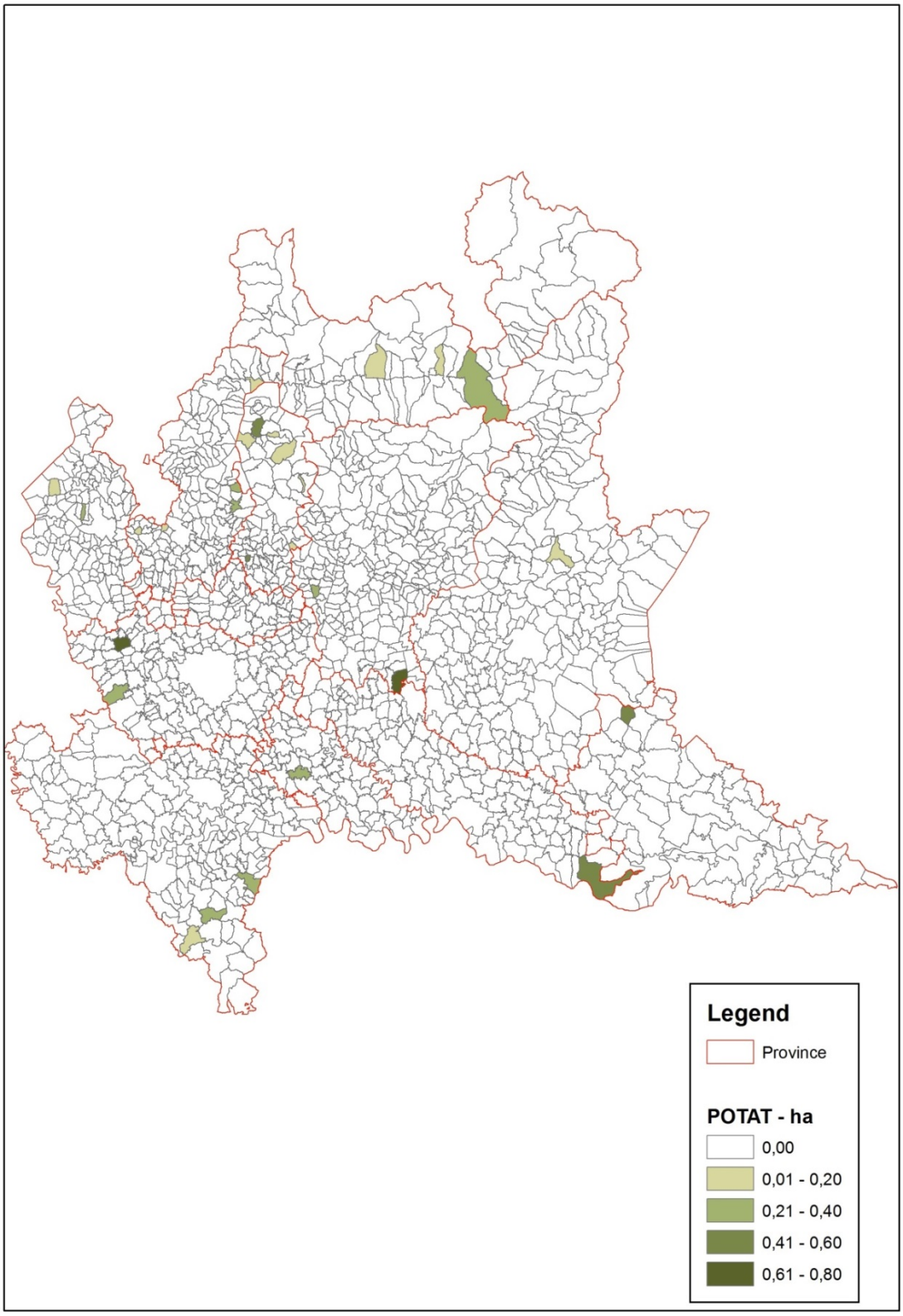
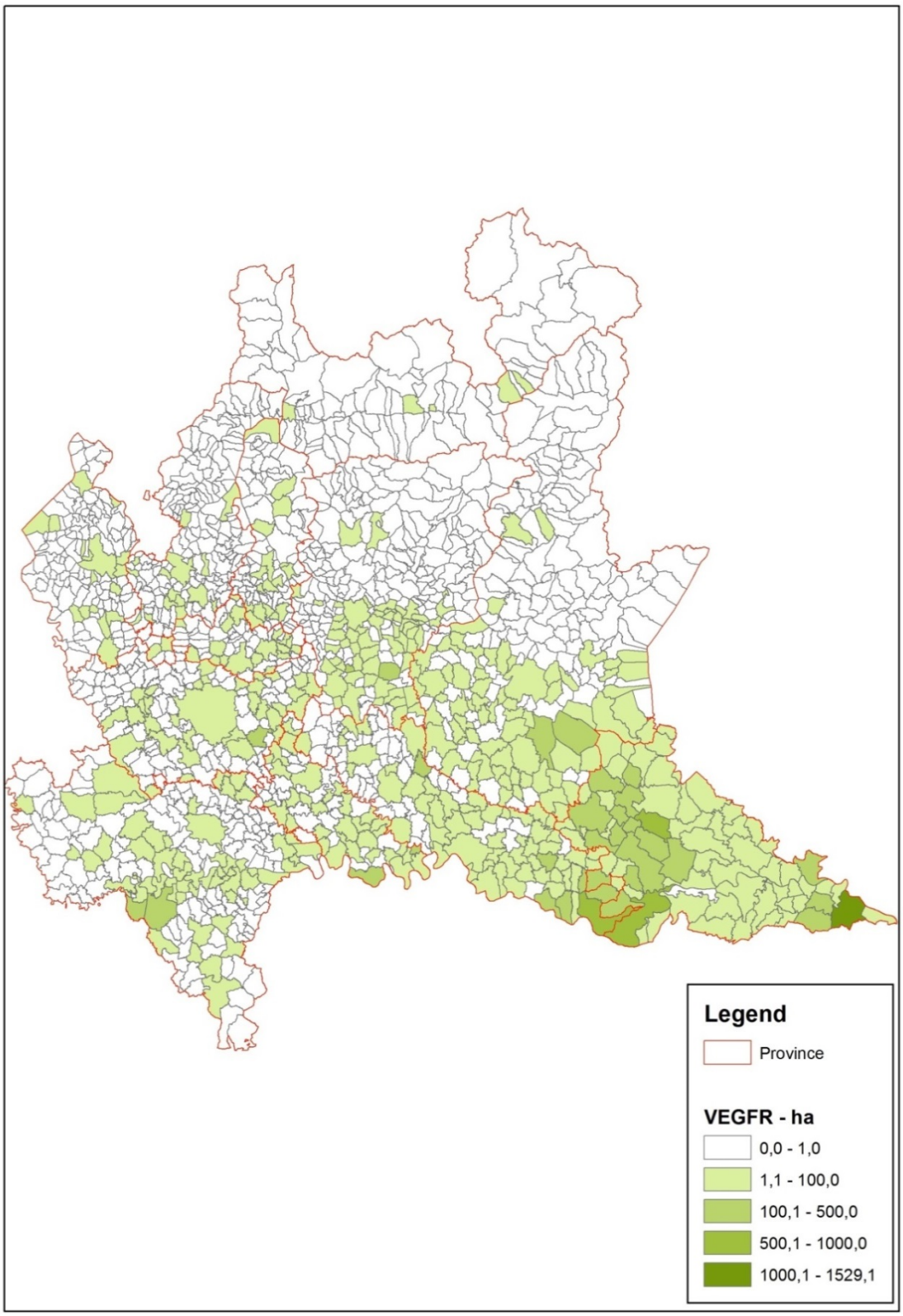


Fig: 22: Spatial comparison between the cultivation of total and organic vegetables in Lombardy

22a



Comments: while the cultivation of all vegetables has a wide distribution in all Lombardy, the organic vegetables are concentrated in the province of Mantua.

22b

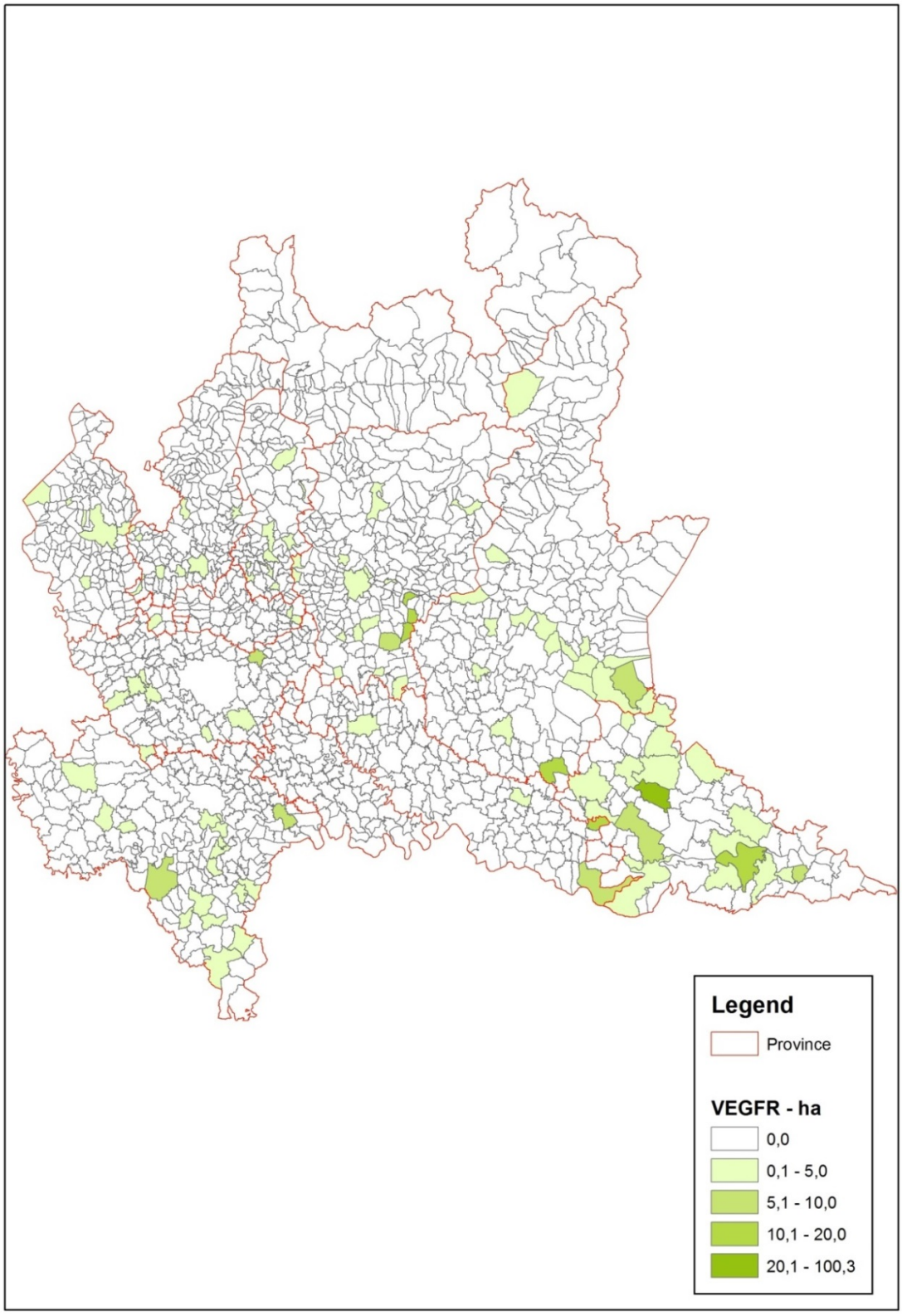
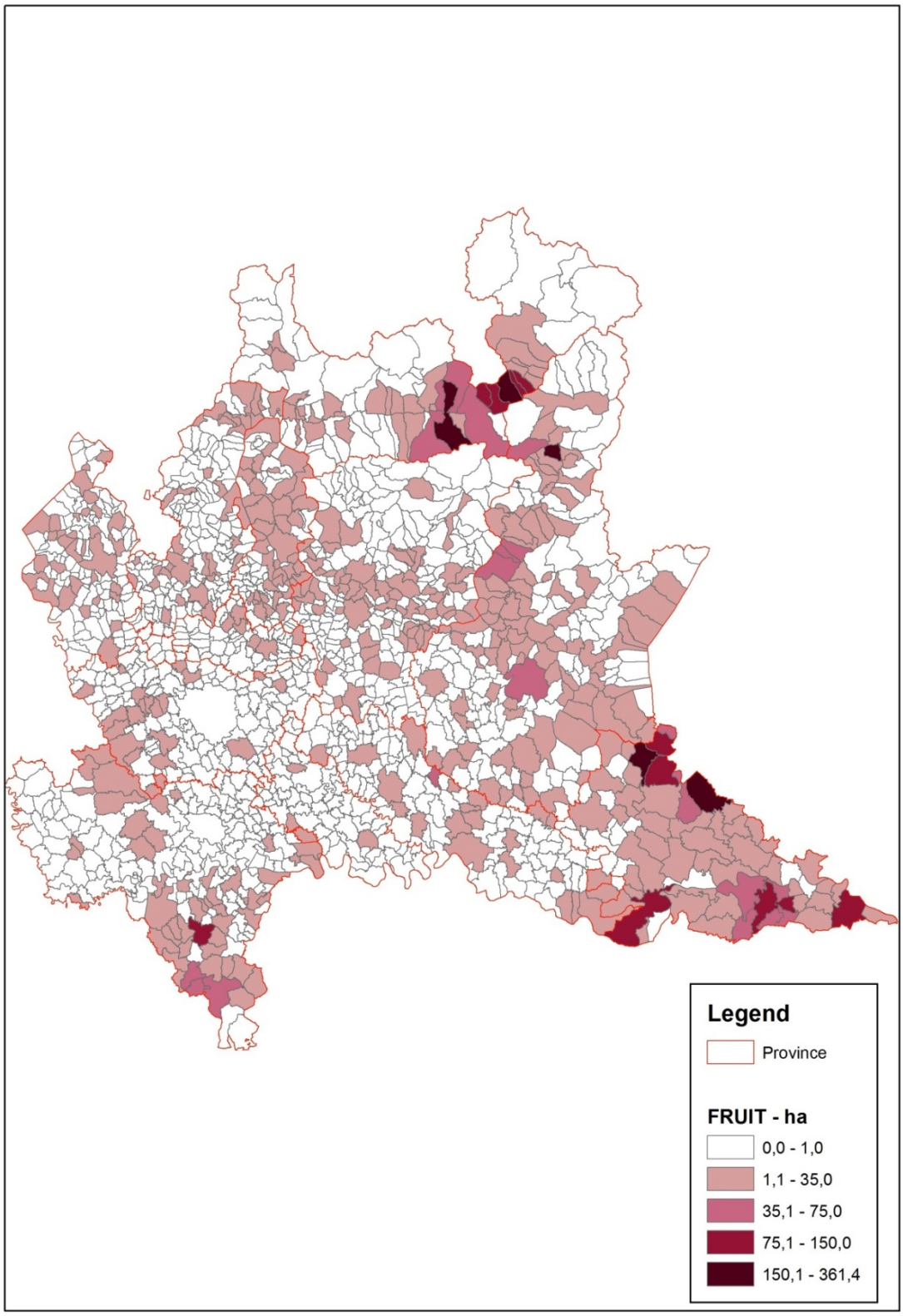


Fig. 23: Spatial comparison between the cultivation of total and organic fruit plants in Lombardy

23a



Comments: while the cultivation of all fruit plants is concentrated in the provinces of Sondrio and Mantua, the organic fruit plants are concentrated only in the province of Mantua.

23b

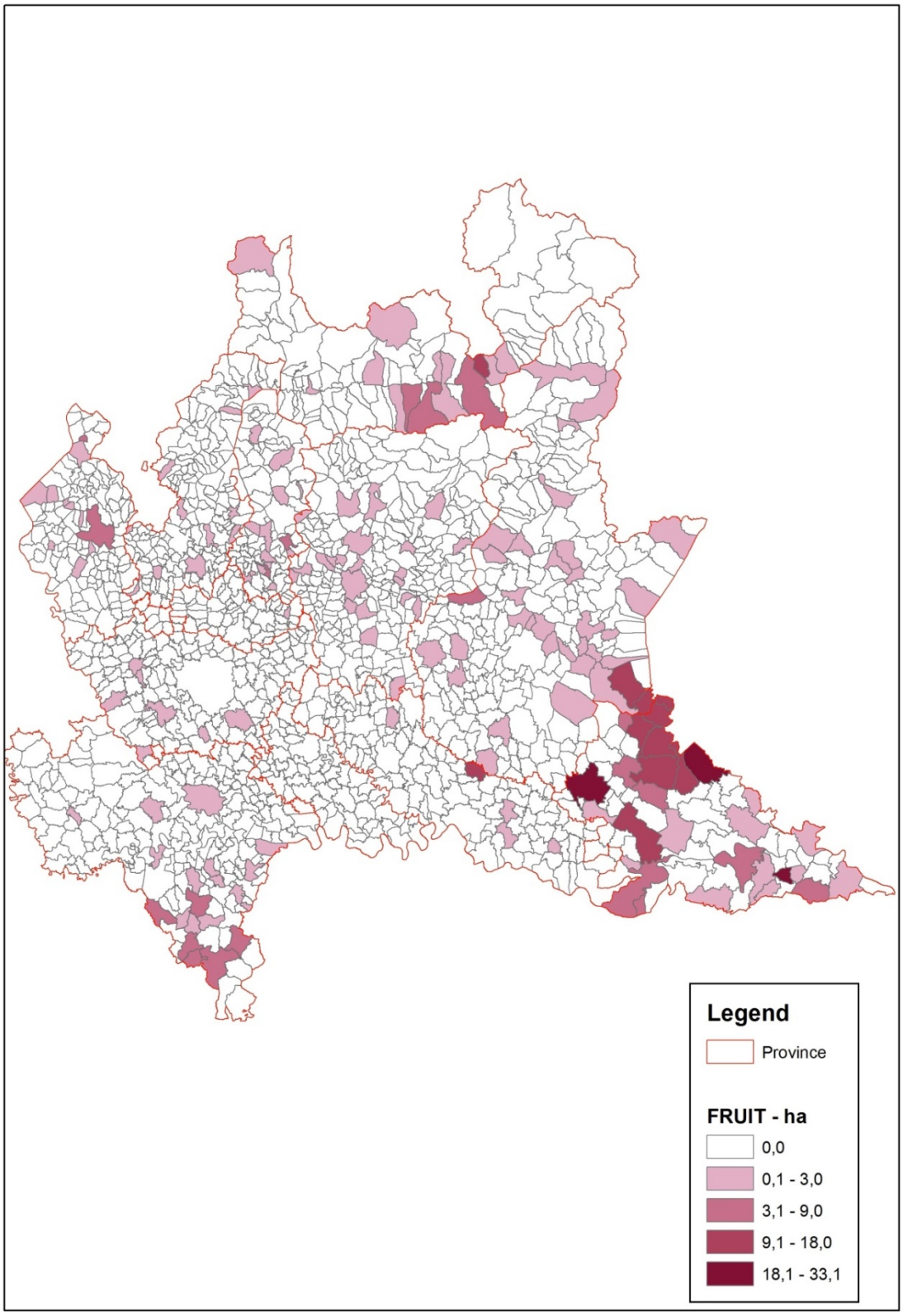
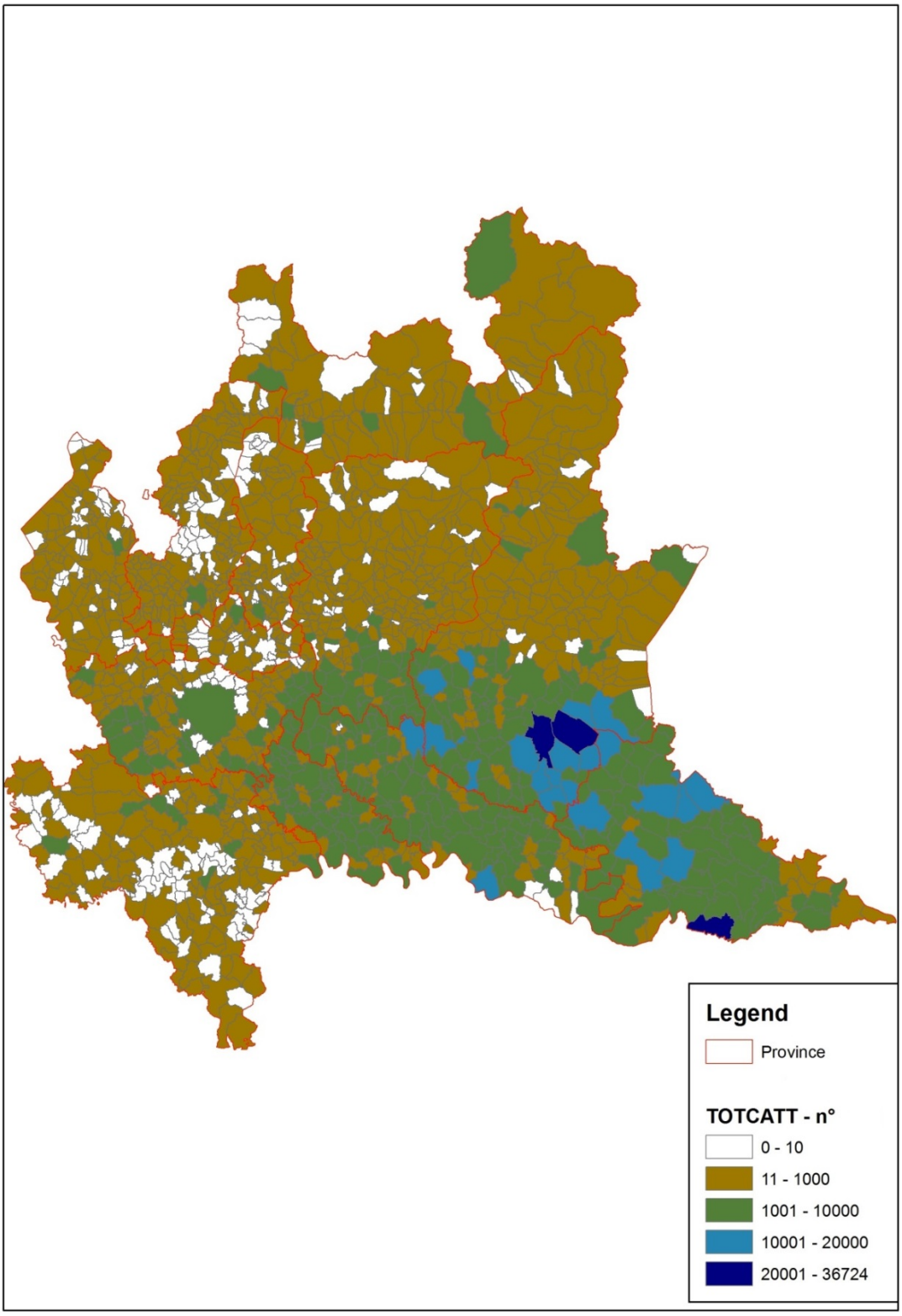


Fig. 24 :Spatial comparison between total and organic cattle farms in Lombardy

24a



Comments: both total and organic cattle farms have a regular distribution in Lombardy; a concentration of cattle farms can be found in the south-eastern part of the region.

24b

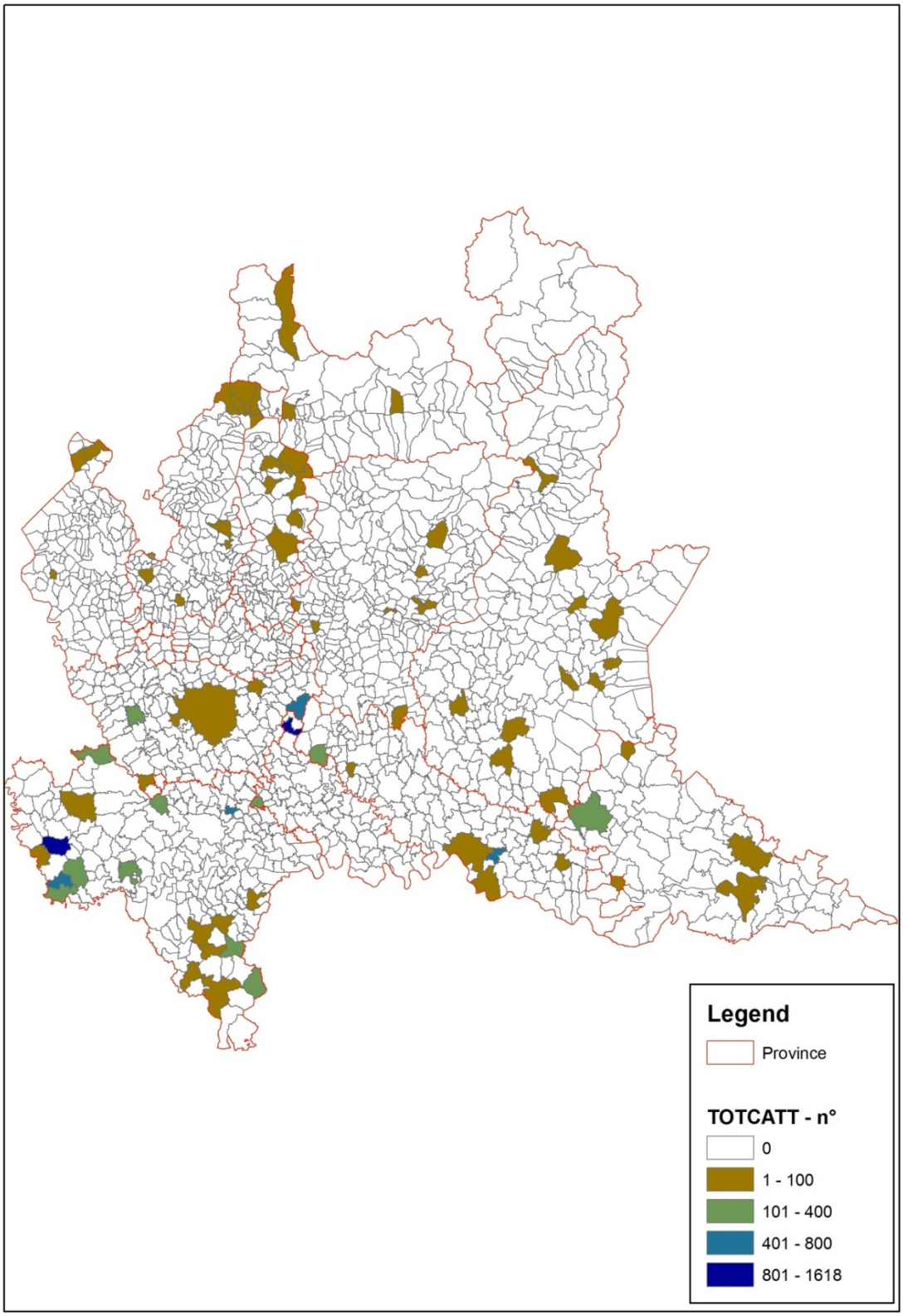
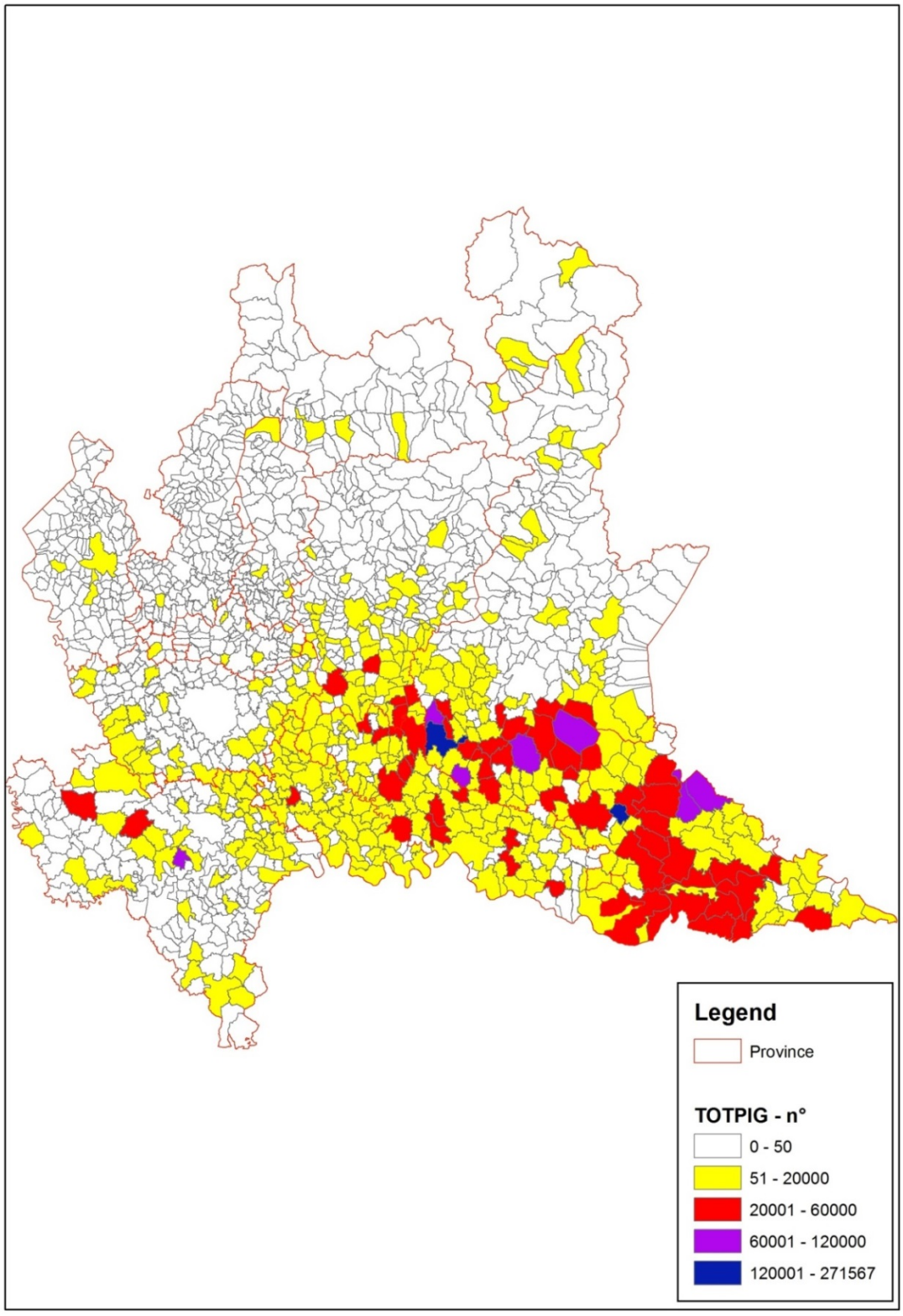


Fig. 25: Spatial comparison between total and organic pig farms in Lombardy

25a



Comments: both total and organic pig farms are concentrated in the south-eastern part of the region>; the organic pig farms in particular in the province of Mantua.

25b

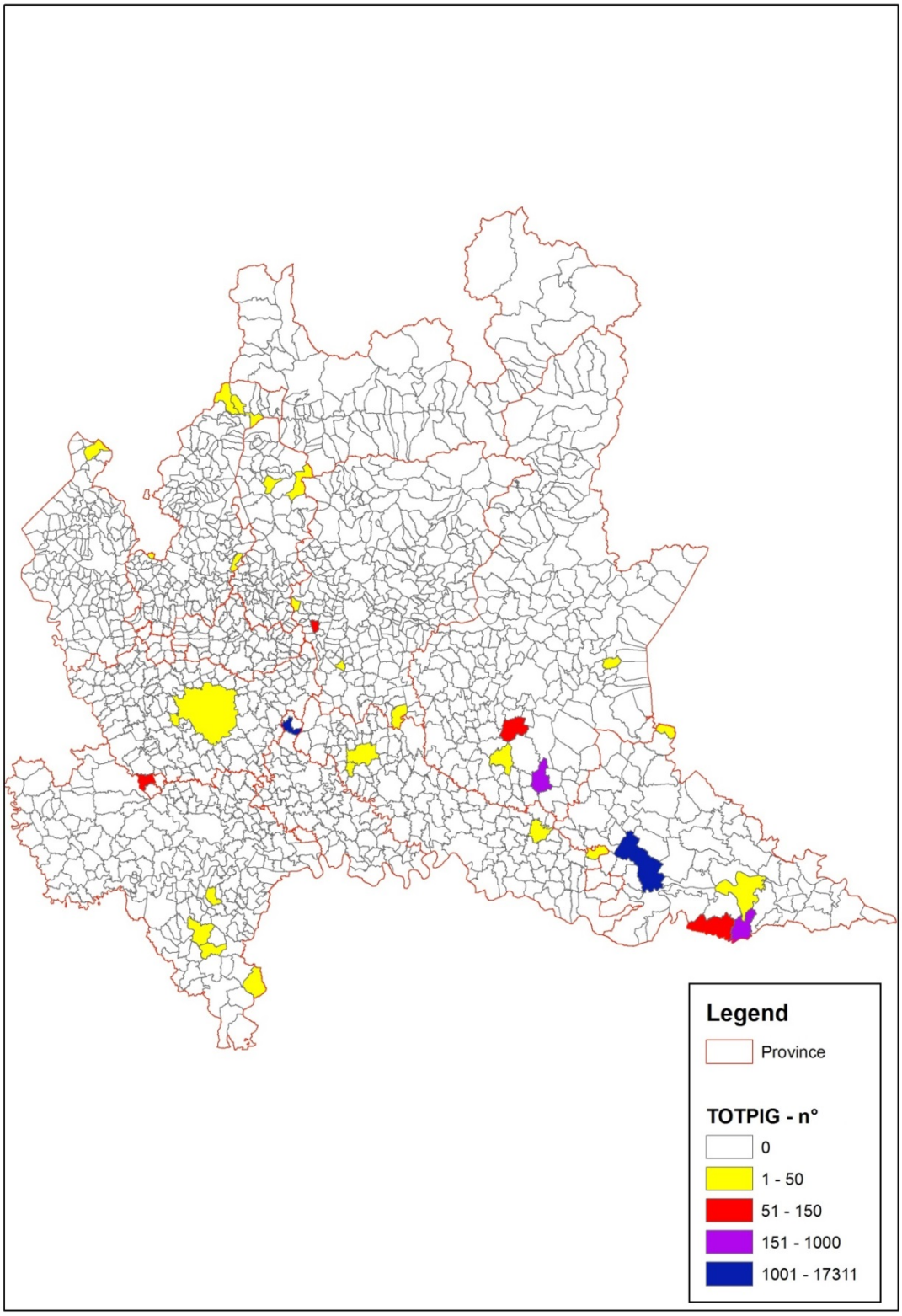
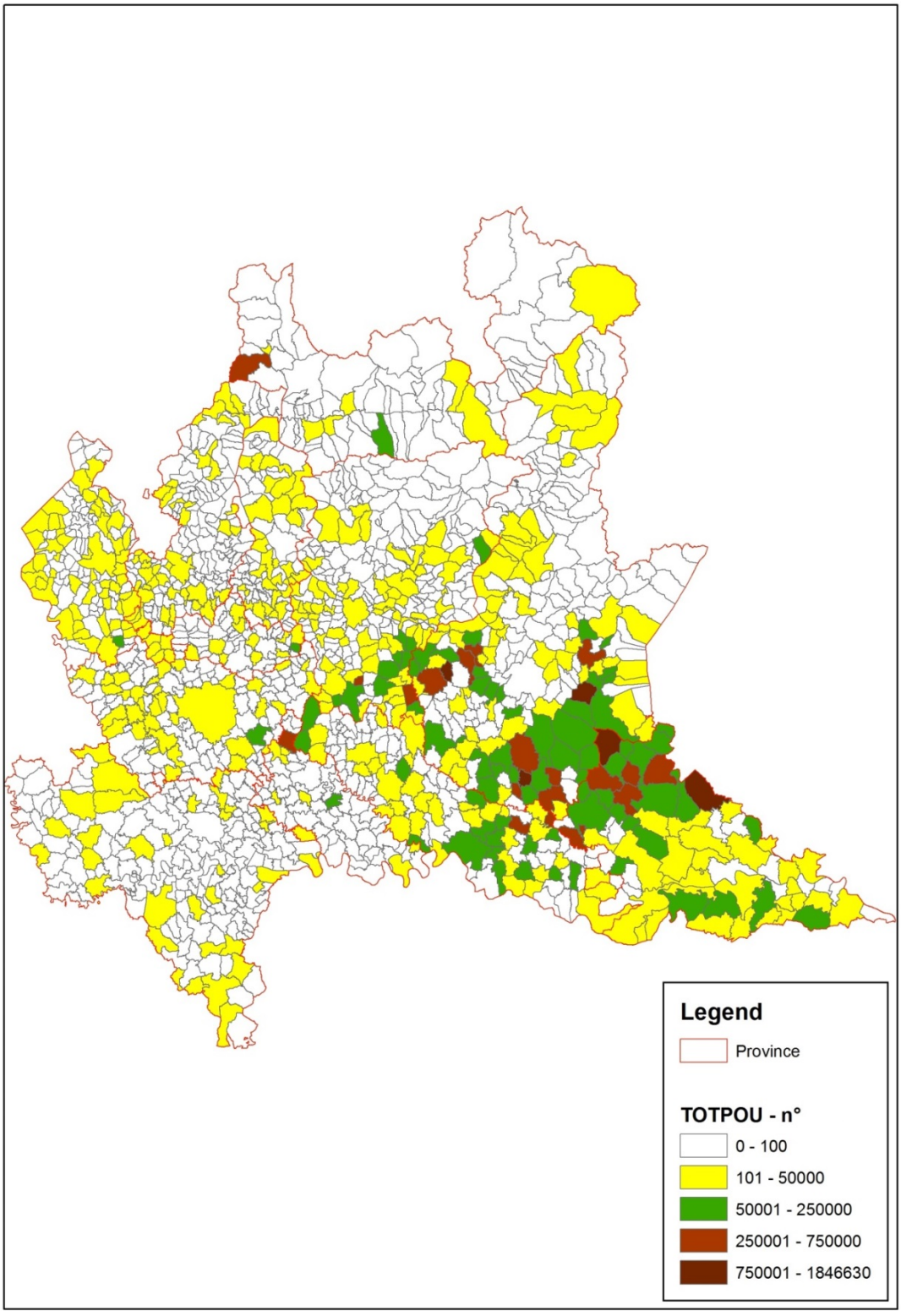


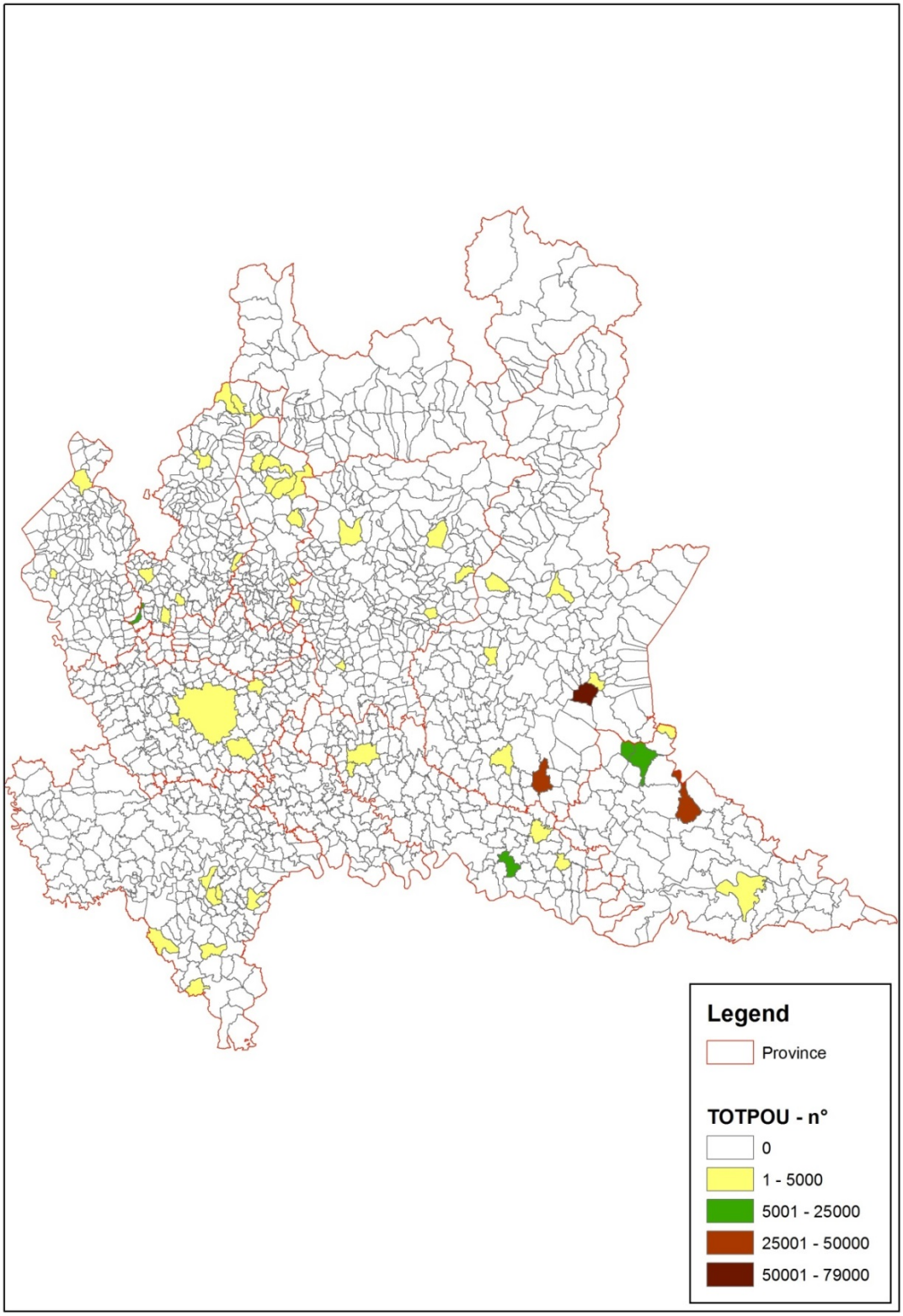
Fig. 26: Spatial comparison between total and organic poultry farms in Lombardy

26a



Comments: both total and organic poultry farms are concentrated in the south-eastern part of the region>; the organic pig farms in particular in the province of Mantua.

26b



5.3. Demand of the main fresh foodstuffs by the school public procurement

5.3.1. Number of questionnaires collected

As described in methodology, a questionnaire containing both qualitative and quantitative question items was submitted to all municipalities of the Lombardy region (in total 1,546)

The responses obtained have gone far beyond expectations: 597 municipalities have posted the required data, thanks to the collaboration of ANCITel Lombardy. ANCITel is the main company of ANCI - National Association of Italian Municipalities - that supports local authorities in the management of all the processes of innovation.

Even after removing those who said they do not provide the service (28 cases) since they don't have schools in their territory, as many as 572 municipalities have responded by completing the questionnaire. This allowed us to collect a huge quantity of data.

The final sample represents 37,00% in the number of municipalities, but 72,55% of the total population, due to the fact that the municipalities with the highest number of residents have responded massively to the questionnaire (100% of those with a population greater than 30,000 inhabitants).

To this regard, it should be pointed out that as many as 631 municipalities (40.81% of the total) have less than 2,000 inhabitants (Class 7 - see Methodology): many of these municipalities don't provide school catering service because sometimes they haven't schools on their boundaries.

The list in Table 11 shows all the municipalities that says that they don't perform the school catering service. All these municipalities, except 2 of them have less than 2,000 inhabitants.

Table 11: List of the municipalities of Lombardy which says to not perform the school catering service

Prov.	Municipality
BG	Berzo San Fermo
BG	Clusone
BG	Costa Valle Imagna
BG	Grassobbio
BG	Isso
BG	Oltressenda Alta
BG	Onore
BG	Selvino
BG	Valsecca
BS	Fiesse
BS	Losine
BS	Marone
BS	Ome
BS	Vione
CO	Cavallasca
CO	Fenegrò
CO	Stazzona
CR	Cappella de' Picenardi
CR	Torlino Vimercati
CR	Volongo
PV	Campospinoso
PV	Mezzanino
PV	Semiana
SO	Menarola
SO	Tovo di Sant'Agata
VA	Barasso
VA	Bregano
VA	Brissago-Valtravaglia
	28

5.3.2. Number of meals per year (question 1)

The first and fundamental result of the data collection is the quantification of the importance of the school mass catering in Lombardy. As shown in Table 13 every year more than 85.5 million of meals are served in the nursery, primary and lower secondary schools in Lombardy. The data in the table have been calculated from those of the sample (Table 12), taking into account that it represents 72,55% of the total population.

Table 12: Number of meals per year of the sample (572 municipalities), subdivided by province

prov.	munic.	population	surface	mealnur	mealpri	mealsec	mealtot
BG	**84**	605.610	868.210.000	1.240.346	2.401.378	229.533	**3.871.257**
BS	**65**	716.621	1.544.730.000	1.689.932	2.463.433	138.786	**4.292.151**
CO	**38**	306.751	354.340.000	719.946	1.377.643	116.788	**2.214.377**
CR	**25**	189.208	485.280.000	353.020	753.255	490.913	**1.597.188**
LC	**36**	210.113	328.960.000	399.131	1.239.478	157.667	**1.796.276**
LO	**33**	161.634	480.770.000	445.138	1.137.705	48.026	**1.630.869**
MB	**42**	766.268	340.490.000	1.909.407	5.459.716	796.581	**8.165.704**
MI	**92**	2.861.216	1.191.000.000	8.967.132	17.663.256	2.203.298	**28.833.686**
MN	**43**	298.797	1.576.150.000	817.304	722.732	176.501	**1.716.536**
PV	**48**	348.435	1.002.310.000	870.960	1.471.375	482.964	**2.825.299**
SO	**22**	100.691	807.040.000	593.670	234.389	6.507	**834.566**
VA	**44**	563.386	510.780.000	1.358.817	2.696.186	461.050	**4.516.053**
Tot.	**572**	7.128.730	9.490.060.000	19.364.802	37.620.546	5.308.614	**62.293.962**

Table 13: Number of meals per year estimated in the Lombardy region, subdivided by province

prov.	munic.	population	surface	mealnur	mealpri	mealsec	mealtot
BG	**244**	1.087.204	868.210.000	1.709.675	3.310.026	316.385	**5.336.086**
BS	**206**	1.242.923	1.544.730.000	2.329.378	3.395.561	191.301	**5.916.240**
CO	**162**	590.050	354.340.000	992.363	1.898.924	160.979	**3.052.266**
CR	**115**	362.061	485.280.000	486.598	1.038.276	676.667	**2.201.541**
LC	**90**	337.912	328.960.000	550.157	1.708.478	217.327	**2.475.962**
LO	**61**	225.825	480.770.000	613.571	1.568.197	66.198	**2.247.967**
MB	**55**	840.711	340.490.000	2.631.900	7.525.595	1.097.996	**11.255.492**
MI	**134**	3.123.205	1.191.000.000	12.360.169	24.346.783	3.036.995	**39.743.947**
MN	**70**	412.606	1.576.150.000	1.126.560	996.203	243.286	**2.366.049**
PV	**190**	544.230	1.002.310.000	1.200.518	2.028.123	665.711	**3.894.353**
SO	**78**	182.709	807.040.000	818.307	323.079	8.969	**1.150.355**
VA	**141**	876.705	510.780.000	1.872.974	3.716.384	635.505	**6.224.864**
Tot	**1.546**	9.826.141	9.490.060.000	26.692.171	51.855.630	7.317.319	**85.865.120**

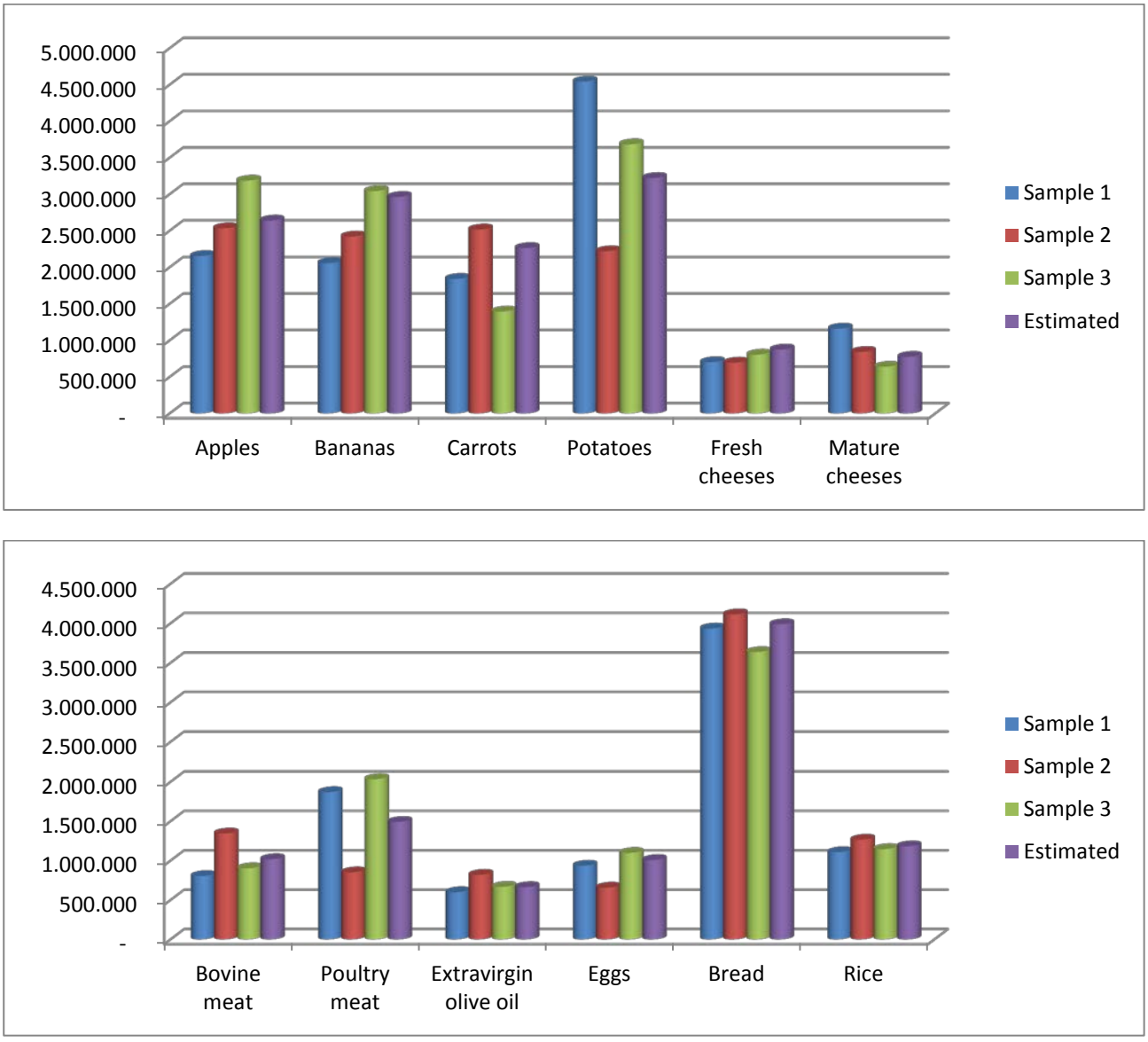
The meals provided in nursery schools (**mealnur** - aged 3-5) represent 31,09% of the total, those provided in primary schools (**mealpri** - aged 6-10) 60,39% and those provided in lower secondary schools 8,52% (**mealsec** –aged 11-13).

5.4. Amount of foodstuffs provided by school public procurement (question 10)

5.4.1. Adequacy test

By the analysis of the consumption data of 3 municipalities of Lombardy region (Pavia, Cremona and Varese), the average consumption, referred to a single meal, were calculated for the most representative food, 2 for each of the 6 categories (12 in total); the average consumption of these 3 cases, of each of the 3 municipalities was multiplied by the total number of meals estimated provided in all schools of Lombardy.

Fig. 27: Results of the adequacy test



The results of the research, expressed in terms of all meals estimated to be provided every year in Lombardy, were placed in any case tested within the range of minimum and maximum values found in the 3 municipalities chosen for comparison.

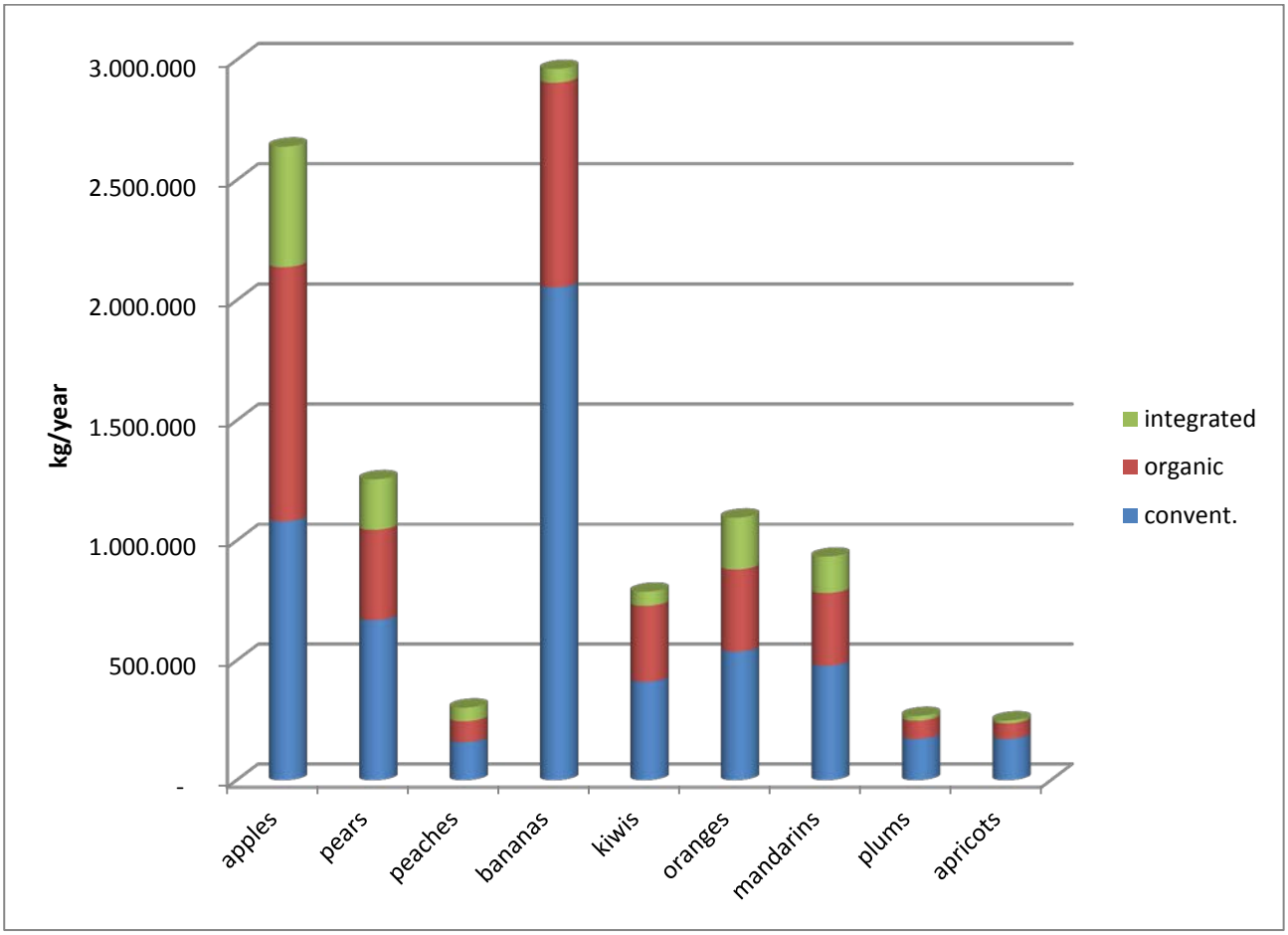
5.4.2. Fruits

Within the category **fruit**, which potential demand amounts about to 10,500 t/year, bananas (28,23%) and apples (25.15%) are those required in greater quantities, followed, in order, from pears (11.96%), oranges (10.45%), mandarins (8.89%) and kiwis (7.50%). The consumption of summer fruits (peaches, plums and apricots) is lower, due to the fact that during the summer months the school catering service is not provided.

Considering the total demand of fruits, that coming from conventional farming represents 54.62% of the total, while that coming from organic and integrated agriculture are, respectively, 33.14% and 12.24% of the total requirement.

Regarding the demand as organic fruit, kiwis and apples (both >40%), followed by mandarins, oranges and pears (>30%), are those that have the highest percentage of the total.

Fig. 28: demand of fruit in kg/year



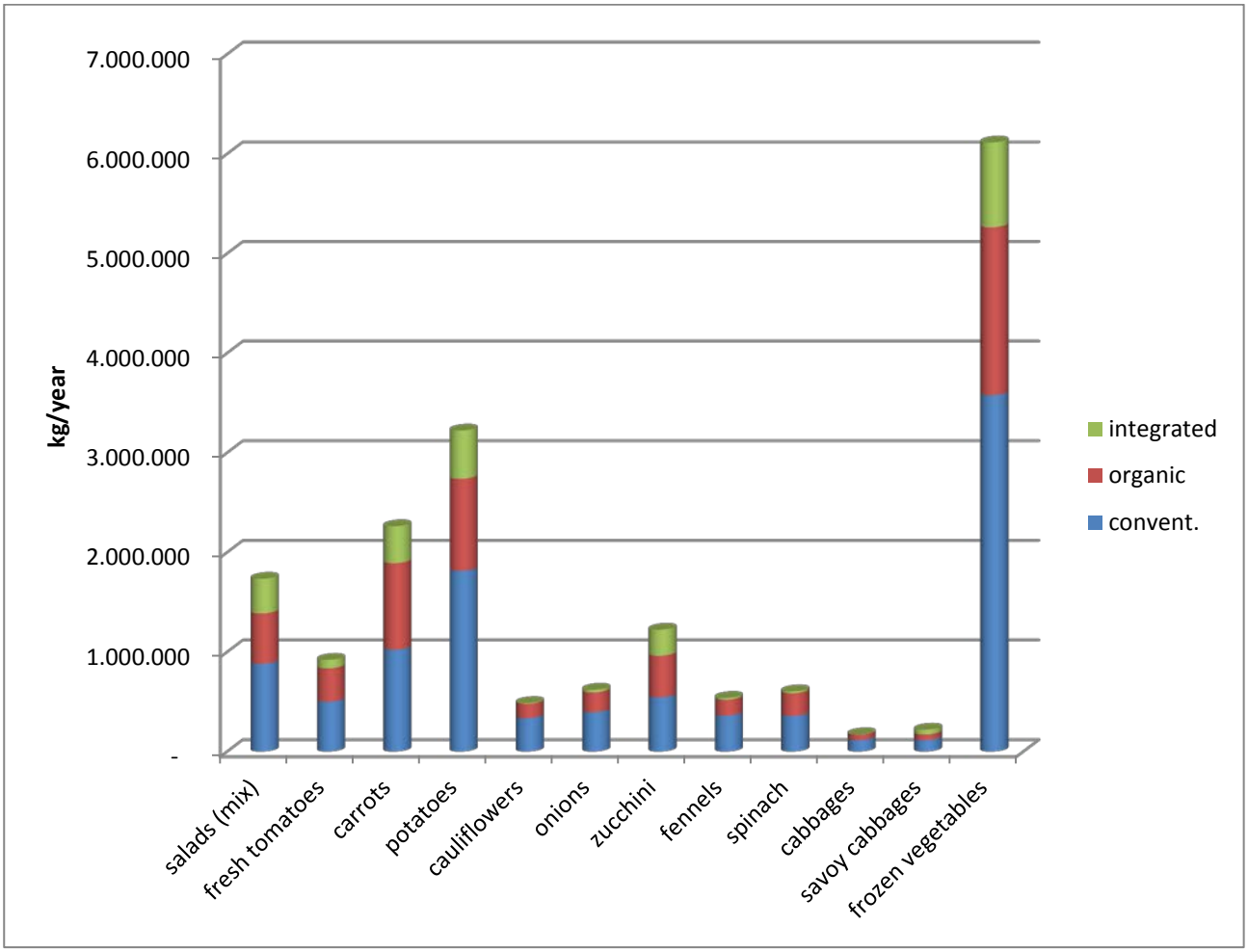
5.4.3. Vegetables

Within the category **vegetables**, which potential demand amounts to over 18,100 t/year, frozen vegetables (33.75%) are those required in greater quantities, followed, in order, from potatoes (17.78%), carrots (12.48%), and salads (9.75%).

Considering the total demand of vegetables, that coming from conventional farming represents 55.25% of the total, while that coming from organic and integrated agriculture are, respectively, 30.83% and 13.92% of the total requirement.

Regarding the demand as organic vegetables, carrots, spinach and fresh tomatoes (>35%), followed by zucchini, cabbages and onions (>30%), are those that have the highest percentage of the total.

Fig. 29: demand of vegetables in kg/year



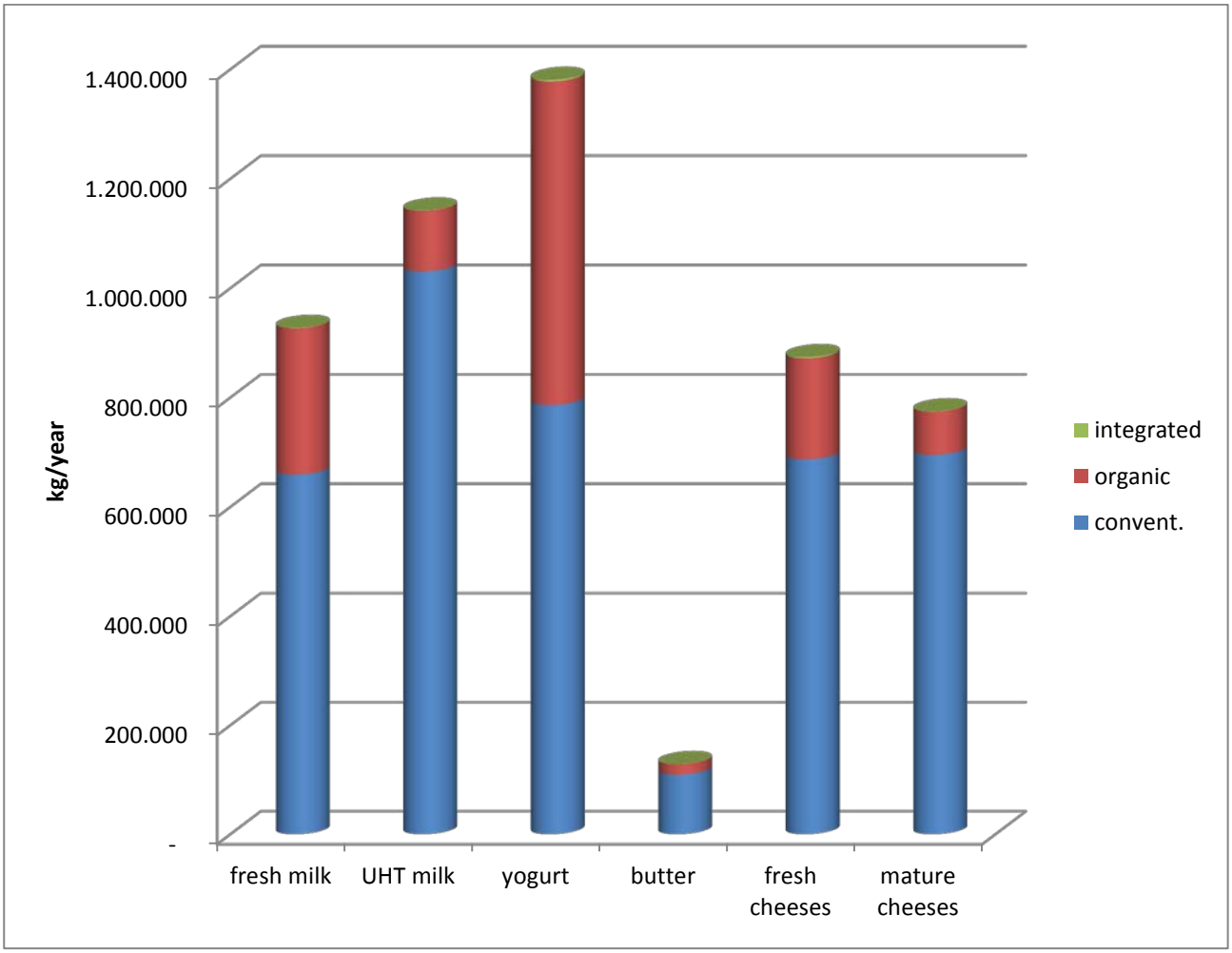
5.4.4. Milk and byproducts

Within the category **milk and byproducts**, which potential demand amounts to over 5,200 t/year, yogurt (26.42%) and UHT milk (2.84%) are those required in greatest amounts, followed, in order, from fresh milk (17.74%), fresh cheeses (16.72%), and mature cheeses (14.82%).

Considering the total demand of milk and byproducts, that coming from conventional farming represents 75.86% of the total, while that coming from organic and integrated agriculture are, respectively, 24.00% and 0.14% of the total requirement.

Regarding the demand as organic products in this category of foodstuffs, yogurt (more than 42%) is the most important, followed by fresh milk and fresh cheeses (both > 20%).

Fig. 30: demand of milk and byproducts in kg/year



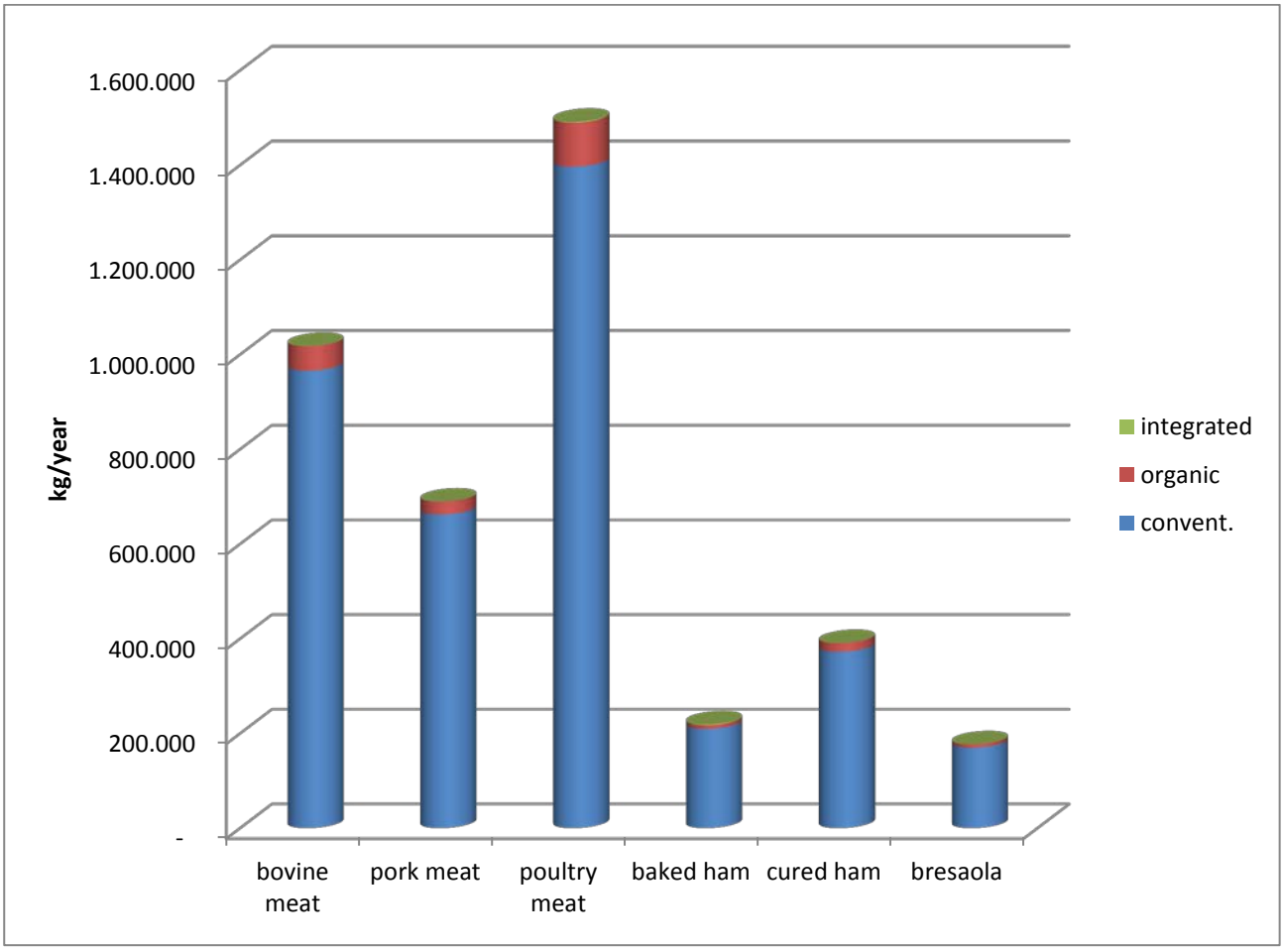
5.4.5. Meat and byproducts

Within the category **meat and byproducts**, which potential demand amounts at nearly4,000 t/year, poultry meat (37.43%) and bovine meat (25.54%) are those required in greatest amounts, followed, in order, from pork meat (17.30%) and cured ham (9.80%).

Considering the total demand of meat and byproducts, that coming from conventional farming represents 94.74% of the total, while that coming from organic and integrated agriculture are, respectively, 5,16% and 0.10% of the total requirement.

Regarding the demand as organic products in this category of foodstuffs, it is quite limited: only poultry and bovine meat overcome 5% of the total requirement.

Fig. 31: demand of meat and byproducts in kg/year



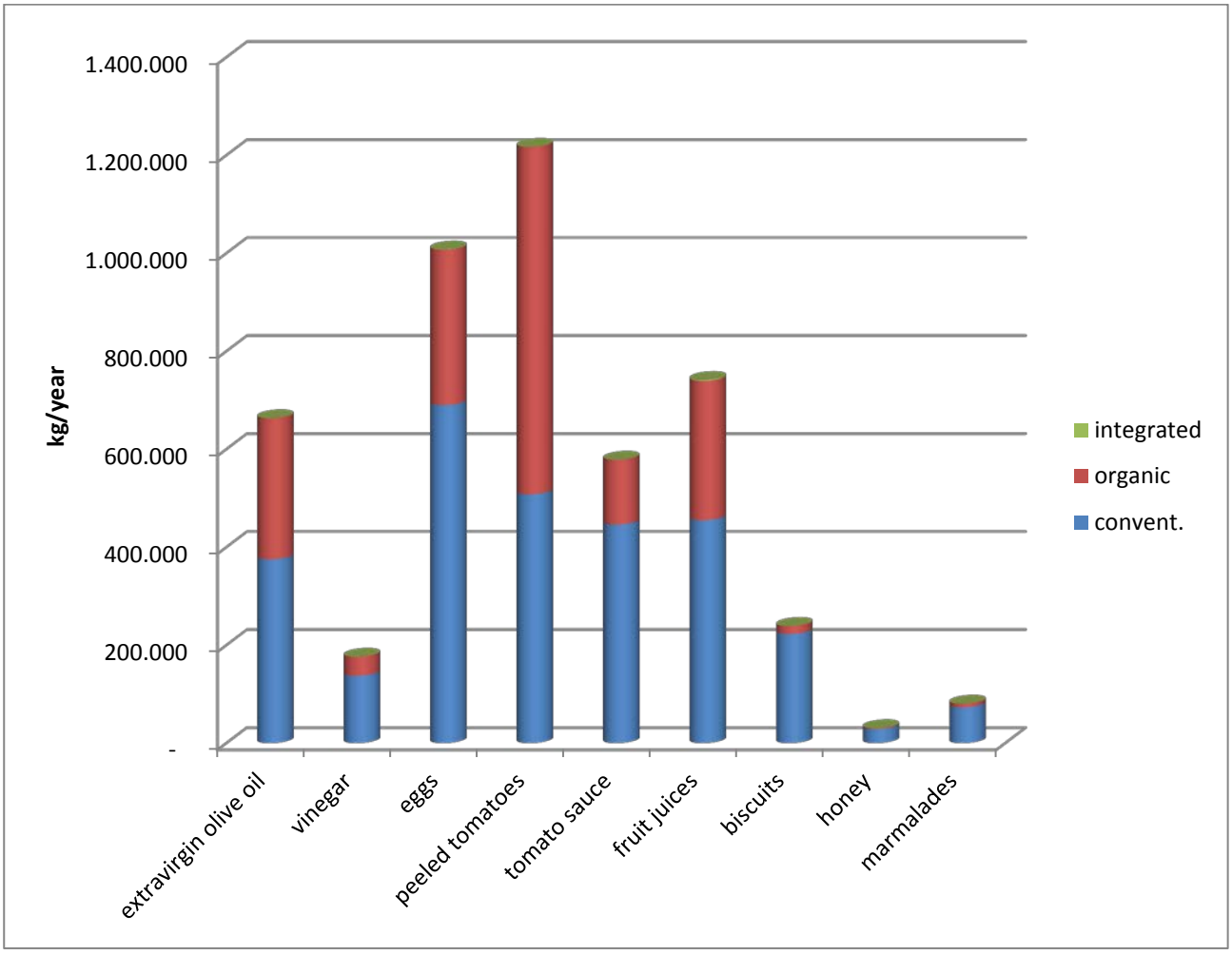
5.4.6. Miscellaneous products

Within the category **miscellaneous products**, which potential demand amounts to over 5,200 t/year, peeled tomatoes (23.19%) and eggs (19.20%) are those required in greatest amounts, followed, in order, from fruit juices (14.12%), vinegar (13.14%), extra virgin olive oil (12.64%) and tomato sauce (11.02%).

Considering the total demand of miscellaneous products, that coming from conventional farming represents 55.925% of the total, while that coming from organic and integrated agriculture are, respectively, 34.25% and 0.05% of the total requirement.

Regarding the demand as organic products in this category of foodstuffs, peeled tomatoes (more than 58%) and extra virgin olive oil (more than 43%) are the most important, followed by fruit juices and eggs (both >30%) and tomato sauce (>20%).

Fig. 32: demand of miscellaneous products in kg/year



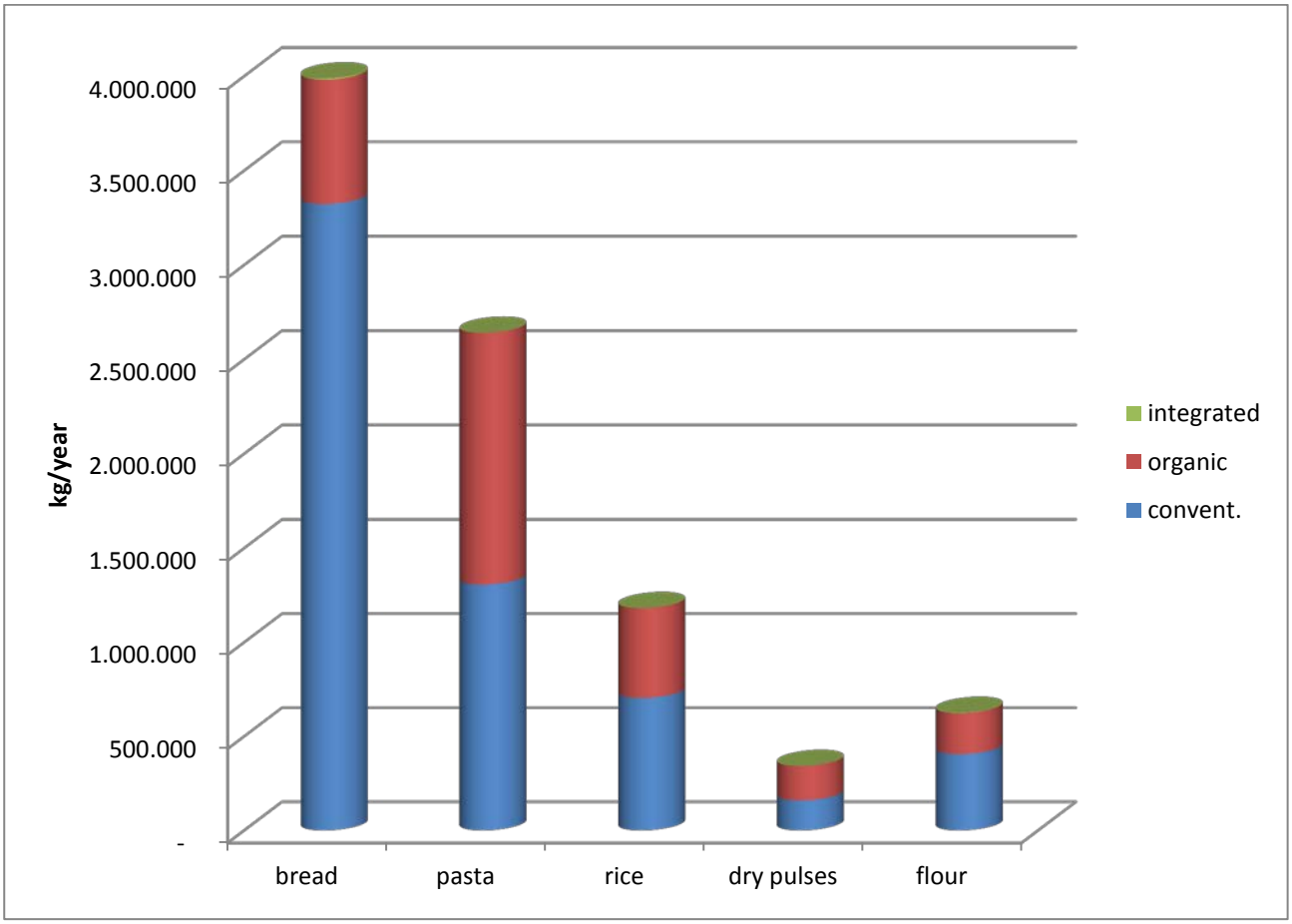
5.4.7. Dry pulses, cereals and byproducts

Within the category **dry pulses, cereals and byproducts**, which potential demand amounts to over 8,700 t/year, bread (45.43%) and pasta (30.08%) are those required in greatest amounts, followed, in order, from rice (13.47%) and flour (7.12%).

Considering the total demand of milk and byproducts, that coming from conventional farming represents 67.19% of the total, while that coming from organic and integrated agriculture are, respectively, 32.73% and 0.09% of the total requirement.

Regarding the demand as organic products in this category of foodstuffs, dry pulses and pasta (both>50%) are the most important, followed by rice (> 40%) and flour (≈35%).

Fig. 33: demand of dry pulses, cereals and byproducts in kg/year



5.5. Comparison between products consumed in the school catering system

Table 14: ranking of the first 20 products per amount of total consumption (data in kg/year)

ranking	products	convent.	organic	integrated	Total	% organic
1	frozen vegetables	3.575.875	1.686.382	851.360	**6.113.617**	27,58%
2	bread	3.322.905	659.319	5.873	**3.988.097**	16,53%
3	potatoes	1.813.620	923.742	484.482	**3.221.843**	28,67%
4	bananas	2.054.187	850.920	56.803	**2.961.911**	28,73%
5	pasta	1.307.070	1.333.574	31	**2.640.675**	50,50%
6	apples	1.080.207	1.057.645	501.072	**2.638.923**	40,08%
7	carrots	1.021.787	868.673	371.237	**2.261.698**	38,41%
8	salads (mix)	879.697	506.786	347.406	**1.733.889**	29,23%
9	poultry meat	1.396.346	93.046	1.747	**1.491.139**	6,24%
10	yogurt	785.942	591.956	3.067	**1.380.964**	42,87%
11	pears	668.574	376.626	210.004	**1.255.204**	30,01%
12	zucchini	543.360	418.417	260.702	**1.222.478**	34,23%
13	peeled tomatoes	507.656	709.598	30	**1.217.283**	58,29%
14	rice	703.736	478.117	260	**1.182.113**	40,45%
15	UHT milk	1.030.352	111.209	423	**1.141.984**	9,74%
16	oranges	536.669	342.952	216.268	**1.095.889**	31,29%
17	bovine meat	965.592	51.990	182	**1.017.763**	5,11%
18	eggs	689.658	317.554	499	**1.007.711**	31,51%
19	mandarins	477.221	303.906	152.111	**933.238**	32,56%
20	fresh milk	658.698	268.031	662	**927.391**	28,90%

Table 15: ranking of the first 20 products per amount of organic consumption (data in kg/year)

ranking	products	convent.	organic	integrated	Total	% organic
1	frozen vegetables	3.575.875	1.686.382	851.360	**6.113.617**	27,58%
2	pasta	1.307.070	1.333.574	31	**2.640.675**	50,50%
3	apples	1.080.207	1.057.645	501.072	**2.638.923**	40,08%
4	potatoes	1.813.620	923.742	484.482	**3.221.843**	28,67%
5	carrots	1.021.787	868.673	371.237	**2.261.698**	38,41%
6	bananas	2.054.187	850.920	56.803	**2.961.911**	28,73%
7	peeled tomatoes	507.656	709.598	30	**1.217.283**	58,29%
8	bread	3.322.905	659.319	5.873	**3.988.097**	16,53%
9	yogurt	785.942	591.956	3.067	**1.380.964**	42,87%
10	salads (mix)	879.697	506.786	347.406	**1.733.889**	29,23%
11	rice	703.736	478.117	260	**1.182.113**	40,45%
12	zucchini	543.360	418.417	260.702	**1.222.478**	34,23%
13	pears	668.574	376.626	210.004	**1.255.204**	30,01%
14	oranges	536.669	342.952	216.268	**1.095.889**	31,29%
15	fresh tomatoes	499.472	335.916	84.642	**920.030**	36,51%
16	eggs	689.658	317.554	499	**1.007.711**	31,51%
17	kiwis	410.517	317.109	59.239	**786.864**	40,30%
18	mandarins	477.221	303.906	152.111	**933.238**	32,56%
19	extravirgin olive oil	375.160	288.071	95	**663.326**	43,43%
20	fruit juices	454.918	284.512	1.773	**741.203**	38,39%

Table 16: ranking of the first 20 products per % of organic consumption on total (data in kg/year)

ranking	products	convent.	organic	integrated	Total	% organic
1	**peeled tomatoes**	507.656	709.598	30	**1.217.283**	58,29%
2	**dry pulses**	159.109	183.267	52	**342.427**	53,52%
3	**pasta**	1.307.070	1.333.574	31	**2.640.675**	50,50%
4	**extravirgin olive oil**	375.160	288.071	95	**663.326**	43,43%
5	**yogurt**	785.942	591.956	3.067	**1.380.964**	42,87%
6	**rice**	703.736	478.117	260	**1.182.113**	40,45%
7	**kiwis**	410.517	317.109	59.239	**786.864**	40,30%
8	**apples**	1.080.207	1.057.645	501.072	**2.638.923**	40,08%
9	**carrots**	1.021.787	868.673	371.237	**2.261.698**	38,41%
10	**fruit juices**	454.918	284.512	1.773	**741.203**	38,39%
11	**spinach**	357.205	227.867	18.910	**603.982**	37,73%
12	**fresh tomatoes**	499.472	335.916	84.642	**920.030**	36,51%
13	**flour**	405.119	218.606	1.276	**625.000**	34,98%
14	**zucchini**	543.360	418.417	260.702	**1.222.478**	34,23%
15	**cabbages**	113.857	56.689	3.080	**173.626**	32,65%
16	**mandarins**	477.221	303.906	152.111	**933.238**	32,56%
17	**onions**	394.038	200.000	26.494	**620.532**	32,23%
18	**eggs**	689.658	317.554	499	**1.007.711**	31,51%
19	**oranges**	536.669	342.952	216.268	**1.095.889**	31,29%
20	**pears**	668.574	376.626	210.004	**1.255.204**	30,01%

Table 17: Total consumption of the different types of products (data in kg/year)

Total products	convent.	organic	integrated	Total	% organic
47	32.313.151	15.192.943	3.828.076	**51.847.454**	29,30%

5.6. Analysis of quantitative data

Table 18: Keys used for the different parameters

Foodstuffs & Categories	Keys	Foodstuffs & Categories	Keys
Fruits	fruit	Meat & byproducts	meat
apples	appl	bovine meat	bovi
pears	pear	pork meat	pork
peaches	peac	poultry meat	poul
bananas	bana	baked ham	bkha
kiwis	kiwi	cured ham	cuha
oranges	oran	bresaola	bres
mandarins & clementines	mand	Miscellaneous products	misc
plums & prunes	plum	extravirgin olive oil	voil
apricots	apri	vinegar	vgar
Vegetables	veget	eggs	eggs
salads (mix)	sala	peeled tomatoes	tpee
fresh tomatoes	toma	tomato sauce	tsau
carrots	carr	fruit juices	frju
potatoes	pata	biscuits	bisc
cauliflowers	caul	honey	hone
onions	onio	marmalades	marm
zucchini	zucc	Dry pulses cereals & byproducts	cerea
fennels	fenn	bread	brea
spinach	spin	pasta	past
cabbages	cabb	rice	rice
savoy cabbages	savo	dry pulses	drpu
frozen vegetables	froz	flour	flou
Milk & byproducts	milk		
fresh milk	frmi	Farming systems	
UHT milk	uhmi	conventional	con
yogurt	yogu	organic	org
butter	butt	integrated	int
fresh cheeses	frch		
mature cheeses	mach		

5.6.1. Analysis of correlations

Correlation between foodstuffs from conventional (CON) farming annually purchased and population of the municipalities (POP)

Table 19: Correlations CON – POP Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	0,03	
pearcon	0,21	**
peaccon	0,18	**
banacon	0,35	**
kiwicon	0,15	**
orancon	0,18	**
mandcon	0,20	**
plumcon	0,16	**
apricon	0,20	**

Vegetables		
keys	ρ	signif
salacon	0,22	**
tomacon	0,21	**
carrcon	0,17	**
patacon	0,29	**
caulcon	0,07	
oniocon	0,16	**
zucccon	0,14	**
fenncon	0,19	**
spincon	0,06	
cabbcon	0,08	*
savocon	0,01	*
frozcon	0,25	**

Milk & byproducts		
keys	ρ	signif
frmicon	0,26	**
uhmicon	0,32	**
yogucon	0,07	
buttcon	0,31	**
frchcon	0,55	**
machcon	0,44	**

Meat & byproducts		
keys	ρ	signif
bovicon	0,74	**
porkcon	0,73	**
poulcon	0,77	**
bkhacon	0,33	**
cuhacon	0,56	**
brescon	0,49	**

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,57	**
pastcon	0,08	*
ricecon	0,18	**
drpucon	0,03	
floucon	0,18	**

Miscellaneous products		
keys	ρ	signif
voilcon	0,14	**
vgarcon	0,29	**
eggscon	0,33	**
tpeecon	0,02	
tsaucon	0,04	
frjucon	0,21	**
bisccon	0,37	**
honecon	0,24	**
marmcon	0,30	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	-0,13	**
vegetcon	-0,15	**
milkcon	0,10	*
meatcon	0,16	**
misccon	-0,05	
cereacon	-0,24	**

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of many products from **conventional farming**, like fruits (except apples), milk and byproducts (except yogurt), miscellaneous products (except peeled tomatoes and tomato sauce) and all those of the category meat and byproducts is highly correlated with the **population** of the municipalities. In the other categories of products the correlation is not always significant. On the contrary, in many cases, the number of foodstuffs acquired for categories is highly inversed correlated with the same parameter.

Correlation between foodstuffs from conventional (CON) farming annually purchased and population density of the municipalities (DEN)

Table 20: Correlations CON - DEN Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	-0,05	
pearcon	0,06	
peaccon	0,09	*
banacon	0,21	**
kiwicon	0,04	
orancon	0,06	
mandcon	0,06	
plumcon	0,11	*
apricon	0,07	

Vegetables		
keys	ρ	signif
salacon	0,11	*
tomacon	0,12	**
carrcon	0,08	*
patacon	0,17	**
caulcon	-0,06	
oniocon	0,09	*
zucccon	0,03	
fenncon	0,08	
spincon	-0,01	
cabbcon	-0,01	
savocon	-0,01	
frozcon	0,13	**

Milk & byproducts		
keys	ρ	signif
frmicon	0,11	**
uhmicon	0,20	**
yogucon	-0,07	
buttcon	0,16	**
frchcon	0,41	**
machcon	0,29	**

Meat & byproducts		
keys	ρ	signif
bovicon	0,53	**
porkcon	0,49	**
poulcon	0,56	**
bkhacon	0,26	**
cuhacon	0,46	**
brescon	0,42	**

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,35	**
pastcon	-0,05	
ricecon	0,01	
drpucon	-0,06	
floucon	0,07	

Miscellaneous products		
keys	ρ	signif
voilcon	-0,01	
vgarcon	0,16	**
eggscon	0,18	**
tpeecon	-0,09	*
tsaucon	-0,02	
frjucon	0,20	**
bisccon	0,20	**
honecon	0,18	**
marmcon	0,17	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	-0,18	**
vegetcon	-0,21	**
milkcon	-0,05	
meatcon	0,13	**
misccon	-0,16	**
cereacon	-0,33	**

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of some products from **conventional farming**, like miscellaneous products (except extra virgin olive oil peeled tomatoes and tomato sauce) and all those of the category meat and byproducts is highly correlated with the **population density** of the municipalities. In the other categories of products the correlation is not significant. On the contrary, in many cases, the number of foodstuffs acquired for categories is highly inversed correlated with the same parameter, except the category meat and byproducts, which shows a high positive correlation.

Correlation between foodstuffs from conventional (CON) farming annually purchased and surface of the municipalities (SUR)

Table 21: Correlations CON - SUR Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	0,07	
pearcon	0,14	**
peaccon	0,09	*
banacon	0,12	**
kiwicon	0,10	*
orancon	0,10	*
mandcon	0,13	**
plumcon	0,04	
apricon	0,13	**

Vegetables		
keys	ρ	signif
salacon	0,09	*
tomacon	0,09	
carrcon	0,04	*
patacon	0,09	*
caulcon	0,13	**
oniocon	0,04	
zucccon	0,10	*
fenncon	0,12	**
spincon	0,04	
cabbcon	0,10	*
savocon	0,12	**
frozcon	0,12	**

Milk & byproducts		
keys	ρ	signif
frmicon	0,14	**
uhmicon	0,14	**
yogucon	0,17	**
buttcon	0,19	**
frchcon	0,10	*
machcon	0,17	**

Meat & byproducts		
keys	ρ	signif
bovicon	0,18	**
porkcon	0,21	**
poulcon	0.163	**
bkhacon	0,05	
cuhacon	0,07	
brescon	0,03	

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,20	**
pastcon	0,14	**
ricecon	0,16	**
drpucon	0,01	*
floucon	0,12	**

Miscellaneous products		
keys	ρ	signif
voilcon	0,15	**
vgarcon	0,15	**
eggscon	0,11	**
tpeecon	0,12	**
tsaucon	0,06	
frjucon	-0,02	
bisccon	0,17	**
honecon	0,06	
marmcon	0,17	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	0,07	
vegetcon	0,08	
milkcon	0,19	**
meatcon	0,00	
misccon	0,16	**
cereacon	0,15	**

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of some products from **conventional farming**, like milk and byproducts (except fresh cheeses), cereals and byproducts and miscellaneous products (except extra virgin olive oil peeled tomatoes and tomato sauce) and all those of the category meat and byproducts is highly correlated with the **surface** of the municipalities. In the other categories of products the correlation is not always significant. The number of foodstuffs acquired for categories is highly correlated with the same parameter in the cases of the categories milk and byproducts, miscellaneous products and dry pulses, cereals and byproducts.

Correlation between foodstuffs from organic (ORG) farming annually purchased and population of the municipalities (POP)

Table 22: Correlations ORG - POP Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,42	**
pearorg	0,29	**
peacorg	0,27	**
banaorg	0,25	**
kiwiorg	0,26	**
oranorg	0,33	**
mandorg	0,33	**
plumorg	0,25	**
apriorg	0,23	**

Vegetables		
keys	ρ	signif
salaorg	0,35	**
tomaorg	0,32	**
carrorg	0,37	**
pataorg	0,27	**
caulorg	0,21	**
onioorg	0,19	**
zuccorg	0,27	**
fennorg	0,31	**
spinorg	0,20	**
cabborg	0,18	**
savoorg	0,15	**
frozorg	0,33	**

Milk & byproducts		
keys	ρ	signif
frmiorg	0,20	**
uhmiorg	0,13	**
yoguorg	0,39	**
buttorg	0,18	**
frchorg	0,23	**
machorg	0,12	**

Meat & byproducts		
keys	ρ	signif
boviorg	0,10	*
porkorg	0,08	
poulorg	0,12	**
bkhaorg	0,06	
cuhaorg	0,09	*
bresorg	0,02	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,14	**
pastorg	0,43	**
riceorg	0,33	**
drpuorg	0,38	**
flouorg	0,26	**

Miscellaneous products		
keys	ρ	signif
voilorg	0,39	**
vgarorg	0,21	**
eggsorg	0,28	**
tpeeorg	0,38	**
tsauorg	0,09	*
frjuorg	0,27	**
biscorg	0,16	**
honeorg	0,12	**
marmorg	0,14	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,29	**
vegetorg	0,30	**
milkorg	0,38	**
meatorg	0,15	**
miscorg	0,38	**
cereaorg	0,34	**

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of almost all products from **organic farming**, except those of the category meat and byproducts (but not for poultry meat) is highly correlated with the **population** of the municipalities. The number of foodstuffs acquired for categories is also highly correlated with the same parameter.

Correlation between foodstuffs from organic (ORG) farming annually purchased and population density of the municipalities (DEN)

Table 23: Correlations ORG - DEN Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,36	**
pearorg	0,27	**
peacorg	0,26	**
banaorg	0,23	**
kiwiorg	0,27	**
oranorg	0,30	**
mandorg	0,30	**
plumorg	0,27	**
apriorg	0,22	**

Vegetables		
keys	ρ	signif
salaorg	0,29	**
tomaorg	0,31	**
carrorg	0,29	**
pataorg	0,24	**
caulorg	0,26	**
onioorg	0,22	**
zuccorg	0,27	**
fennorg	0,26	**
spinorg	0,20	**
cabborg	0,10	*
savoorg	0,12	**
frozorg	0,35	**

Milk & byproducts		
keys	ρ	signif
frmiorg	0,15	**
uhmiorg	0,09	*
yoguorg	0,34	**
buttorg	0,13	**
frchorg	0,21	**
machorg	0,13	**

Meat & byproducts		
keys	ρ	signif
boviorg	0,13	**
porkorg	0,07	
poulorg	0,14	**
bkhaorg	0,05	
cuhaorg	0,10	*
bresorg	0,01	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,23	**
pastorg	0,44	**
riceorg	0,38	**
drpuorg	0,40	**
flouorg	0,25	**

Miscellaneous products		
keys	ρ	signif
voilorg	0,40	**
vgarorg	0,19	**
eggsorg	0,30	**
tpeeorg	0,39	**
tsauorg	0,12	**
frjuorg	0,27	**
biscorg	0,14	**
honeorg	0,12	**
marmorg	0,06	

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,29	**
vegetorg	0,31	**
milkorg	0,37	**
meatorg	0,16	**
miscorg	0,41	**
cereaorg	0,41	**

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of almost all products from **organic farming**, except those of the category meat and byproducts (but not for bovine and poultry meat) is highly correlated with the **population density** of the municipalities. The number of foodstuffs acquired for all categories is also highly correlated with the same parameter.

Correlation between foodstuffs from organic (ORG) farming annually purchased and surface of the municipalities (SUR)

Table 24: Correlations ORG - SUR Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,05	
pearorg	0,00	
peacorg	0,00	
banaorg	0,02	
kiwiorg	-0,01	
oranorg	0,02	
mandorg	0,01	
plumorg	-0,03	
apriorg	0,01	

Vegetables		
keys	ρ	signif
salaorg	0,05	
tomaorg	0,02	
carrorg	0,08	
pataorg	0,03	
caulorg	0,06	
onioorg	-0,02	
zuccorg	0,01	
fennorg	0,05	
spinorg	-0,02	
cabborg	0,10	*
savoorg	0,05	
frozorg	-0,04	

Milk & byproducts		
keys	ρ	signif
frmiorg	0,05	
uhmiorg	0,06	
yoguorg	0,01	
buttorg	0,05	
frchorg	0,02	
machorg	0,01	

Meat & byproducts		
keys	ρ	signif
boviorg	-0,03	
porkorg	0,00	
poulorg	-0,02	
bkhaorg	0,02	
cuhaorg	-0,01	
bresorg	0,03	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	-0,13	**
pastorg	-0,05	
riceorg	-0,08	
drpuorg	-0,05	
flouorg	-0,02	

Miscellaneous products		
keys	ρ	signif
voilorg	-0,03	
vgarorg	0,00	
eggsorg	-0,02	
tpeeorg	-0,04	
tsauorg	-0,06	
frjuorg	0,00	
biscorg	-0,01	
honeorg	-0,01	
marmorg	0,07	

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	-0,02	
vegetorg	-0,05	
milkorg	-0,02	
meatorg	-0,02	
miscorg	-0,09	*
cereaorg	-0,14	**

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all products from **organic farming** shows no correlation with the **surface** of the municipalities, with the only exceptions of bread and of the number of foodstuffs acquired for the category dry pulses, cereals and byproducts, which are highly inversed correlated with the same parameter.

Correlation between foodstuffs from integrated (INT) farming annually purchased and population of the municipalities (POP)

Table 25: Correlations INT - POP Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applint	0,10	*
pearint	0,11	*
peacint	0.106	*
banaint	0,03	
kiwiint	0,09	*
oranint	0,10	*
mandint	0,10	*
plumint	0,12	**
apriint	0,10	*

Vegetables		
keys	ρ	signif
salaint	0,11	*
tomaint	0,04	
carrint	0,05	
pataint	0,10	*
caulint	-0,01	
onioint	0,07	
zuccint	0,03	
fennint	0,07	
spinint	0,05	
cabbint	0,02	
savoint	0,01	
frozint	0,12	**

Milk & byproducts		
keys	ρ	signif
frmiint	-0,07	
uhmiint	-0,12	**
yoguint	-0,09	*
buttint	-0,06	
frchint	-0,01	
machint	-0,01	

Meat & byproducts		
keys	ρ	signif
boviint	-0,10	*
porkint	-0,06	
poulint	-0,09	*
bkhaint	-0,01	
cuhaint	-0,06	
bresint	-0,05	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaint	-0,05	
pastint	-0,07	
riceint	-0,09	*
drpuint	-0,05	
flouint	-0,05	

Miscellaneous products		
keys	ρ	signif
voilint	-0,07	
vgarint		
eggsint	-0,08	
tpeeint	-0,07	
tsauint	-0,07	
frjuint	-0,01	
biscint	-0,07	
honeint		
marmint	-0,06	

N. of foodstuffs acquired		
keys	ρ	signif
fruitint	0,11	*
vegetint	0,32	**
milkint	-0,08	
meatint	-0,06	
miscint	-0,08	
cereaint	-0,01	

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of almost all products from **integrated farming** shows no correlation with the **population** of the municipalities, with few exceptions like plums, frozen vegetables and the number of foodstuffs acquired for the category vegetables, which are highly correlated, and of UHT milk that is highly inversed correlated with the same parameter.

Correlation between foodstuffs from integrated (INT) farming annually purchased and population density of the municipalities (DEN)

Table 26: Correlations INT - DEN Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applint	0,16	**
pearint	0,16	**
peacint	0,16	**
banaint	0,06	
kiwiint	0,11	*
oranint	0,15	**
mandint	0,15	**
plumint	0,16	**
apriint	0,14	**

Vegetables		
keys	ρ	signif
salaint	0,13	**
tomaint	0,09	*
carrint	0,09	*
pataint	0,13	**
caulint	0,03	
onioint	0,07	
zuccint	0,08	*
fennint	0,13	**
spinint	0,08	
cabbint	0,02	
savoint	0,04	
frozint	0,13	**

Milk & byproducts		
keys	ρ	signif
frmiint	-0,05	
uhmiint	-0,14	**
yoguint	-0,13	**
buttint	-0,05	
frchint	-0,02	
machint	-0,02	

Meat & byproducts		
keys	ρ	signif
boviint	-0,10	*
porkint	-0,07	
poulint	-0,03	
bkhaint	-0,03	
cuhaint	-0,05	
bresint	-0,02	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaint	-0,05	
pastint	-0,07	
riceint	-0,07	
drpuint	0,03	
flouint	-0,02	

Miscellaneous products		
keys	ρ	signif
voilint	-0,07	
vgarint		
eggsint	-0,09	*
tpeeint	-0,07	
tsauint	-0,07	
frjuint	0,05	
biscint	-0,07	
honeint		
marmint	-0,07	

N. of foodstuffs acquired		
keys	ρ	signif
fruitint	0,17	**
vegetint	0,29	**
milkint	-0,09	*
meatint	0,00	
miscint	-0,03	
cereaint	-0,02	

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of few products from **integrated farming**, in particular fruits, except bananas and kiwis, and some vegetables like salads, potatoes, fennels and frozen vegetables is highly correlated with the **population density** of the municipalities. On the contrary, UHT milk and yogurt show a highly inversed correlation. The number of foodstuffs acquired for categories is highly correlated with the same parameter only in the cases of fruits and vegetables.

Correlation between foodstuffs from integrated (INT) farming annually purchased and surface of the municipalities (SUR)

Table 27: Correlations INT - SUR Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applint	-0,05	
pearint	-0,03	
peacint	-0,03	
banaint	-0,03	
kiwiint	0,01	
oranint	0,04	
mandint	-0,03	
plumint	-0,04	
apriint	-0,05	

Vegetables		
keys	ρ	signif
salaint	0,01	
tomaint	-0,03	
carrint	-0,02	
pataint	-0,02	
caulint	-0,04	
onioint	-0,01	
zuccint	-0,04	
fennint	-0,06	
spinint	-0,01	
cabbint	0,03	
savoint	0,02	
frozint	0,00	

Milk & byproducts		
keys	ρ	signif
frmiint	0,01	
uhmiint	0,12	**
yoguint	0,11	**
buttint	0,03	
frchint	0,03	
machint	0,03	

Meat & byproducts		
keys	ρ	signif
boviint	0,07	
porkint	0,06	
poulint	-0,04	
bkhaint	0,04	
cuhaint	0,02	
bresint	-0,01	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaint	0,05	
pastint	0,04	
riceint	0,00	
drpuint	0,07	
flouint	0,04	

Miscellaneous products		
keys	ρ	signif
voilint	0,04	
vgarint		
eggsint	0,05	
tpeeint	0,04	
tsauint	0,04	
frjuint	-0,09	*
biscint	0,04	
honeint		
marmint	0,06	

N. of foodstuffs acquired		
keys	ρ	signif
fruitint	-0,05	
vegetint	0,04	
milkint	0,07	
meatint	-0,04	
miscint	-0,02	
cereaint	0,02	

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all products from **integrated farming** shows no correlation with the **surface** of the municipalities, with the only exceptions of UHT milk and yogurt. The number of foodstuffs acquired for all categories has no correlation too with the same parameter.

Correlation between foodstuffs from conventional (CON) farming annually purchased and population of the provinces (POP)

Table 28: Correlations CON - POP Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	0,84	**
pearcon	0,92	**
peaccon	0,78	**
banacon	0,88	**
kiwicon	0,91	**
orancon	0,87	**
mandcon	0,84	**
plumcon	0,62	**
apricon		*

Vegetables		
keys	ρ	signif
salacon	0,77	**
tomacon	0,89	**
carrcon	0,83	**
patacon	0,80	**
caulcon	0,48	
oniocon	0,69	*
zucccon	0,71	*
fenncon	0,60	*
spincon	0,44	
cabbcon	0,62	*
savocon	0,76	**
frozcon	0,73	**

Milk & byproducts		
keys	ρ	signif
frmicon	0,50	
uhmicon	0,79	**
yogucon	0,54	
buttcon	0,48	
frchcon	0,90	**
machcon	0,79	**

Meat & byproducts		
keys	ρ	signif
bovicon	0,97	**
porkcon	0,92	**
poulcon	0,97	**
bkhacon	0,82	**
cuhacon	0,92	**
brescon	0,93	**

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,79	**
pastcon	0,76	**
ricecon	0,80	**
drpucon	0,32	
floucon	0,69	*

Miscellaneous products		
keys	ρ	signif
voilcon	0,92	**
vgarcon	0,87	**
eggscon	0,96	**
tpeecon	0,62	*
tsaucon	0,83	**
frjucon	0,71	*
bisccon	0,78	**
honecon	0,75	**
marmcon	0,88	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	0,81	**
vegetcon	0,71	*
milkcon	0,80	**
meatcon	0,79	**
misccon	0,80	**
cereacon	0,64	*

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of many products from **conventional farming**, like fruits (except apricots), cereals and byproducts (except flour), miscellaneous products (except peeled tomatoes and fruit juice), milk and byproducts (except fresh milk, yogurt and butter) and all those of the category meat and byproducts is highly correlated with the **population** of the provinces. In the category of vegetables the correlation is not always significant. The number of foodstuffs acquired for categories is highly correlated with the same parameter in many cases, except the categories vegetables and dry pulses, cereals and byproducts, for which the correlation is lowly.

Correlation between foodstuffs from conventional (CON) farming annually purchased and population density of the provinces (DEN)

Table 29: Correlations CON - DEN Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	0,43	
pearcon	0,51	
peaccon	0,40	
banacon	0,56	
kiwicon	0,55	
orancon	0,45	
mandcon	0,55	
plumcon	0,50	
apricon	0,48	

Vegetables		
keys	ρ	signif
salacon	0,48	
tomacon	0,46	
carrcon	0,47	
patacon	0,62	*
caulcon	0,40	
oniocon	0,46	
zucccon	0,50	
fenncon	0,48	
spincon	0,31	
cabbcon	0,31	
savocon	0,48	
frozcon	0,62	*

Milk & byproducts		
keys	ρ	signif
frmicon	0,26	
uhmicon	0,49	
yogucon	0,38	
buttcon	0,60	*
frchcon	0,55	
machcon	0,60	*

Meat & byproducts		
keys	ρ	signif
bovicon	0,59	*
porkcon	0,55	
poulcon	0,55	
bkhacon	0,62	*
cuhacon	0,71	**
brescon	0,74	**

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,59	*
pastcon	0,39	
ricecon	0,34	
drpucon	0,57	
floucon	0,46	

Miscellaneous products		
keys	ρ	signif
voilcon	0,52	
vgarcon	0,59	*
eggscon	0,46	*
tpeecon	0,43	
tsaucon	0,43	
frjucon	0,41	
bisccon	0,39	
honecon	0,39	
marmcon	0,50	

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	0,24	
vegetcon	0,19	
milkcon	0,26	
meatcon	0,42	
misccon	0,23	
cereacon	0,07	

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all products from **conventional farming** shows no correlation with the **population density** of the provinces, with the only exceptions of cured ham and bresaola. The number of foodstuffs acquired for all categories has no correlation too with the same parameter.

Correlation between foodstuffs from conventional (CON) farming annually purchased and surface of the provinces (SUR)

Table 30: Correlations CON - SUR Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	0,41	
pearcon	0,36	
peaccon	0,38	
banacon	0,32	
kiwicon	0,37	
orancon	0,43	
mandcon	0,36	
plumcon	0,35	
apricon	0,13	

Vegetables		
keys	ρ	signif
salacon	0,29	
tomacon	0,38	
carrcon	0,43	
patacon	0,27	
caulcon	0,18	
oniocon	0,26	
zucccon	0,20	
fenncon	0,20	
spincon	0,21	
cabbcon	0,37	
savocon	0,29	
frozcon	0,08	

Milk & byproducts		
keys	ρ	signif
frmicon	0,22	
uhmicon	0,34	
yogucon	0,32	
buttcon	0,01	
frchcon	0,34	
machcon	0,25	

Meat & byproducts		
keys	ρ	signif
bovicon	0,34	
porkcon	0,42	
poulcon	0,39	
bkhacon	0,30	
cuhacon	0,24	
brescon	0,20	

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,20	
pastcon	0,39	
ricecon	0,48	
drpucon	-0,17	
floucon	0,19	

Miscellaneous products		
keys	ρ	signif
voilcon	0,41	
vgarcon	0,30	
eggscon	0,27	
tpeecon	0,37	
tsaucon	0,41	
frjucon	0,27	
bisccon	0,37	
honecon	0,44	
marmcon	0,35	

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	0,66	*
vegetcon	0,69	*
milkcon	0,69	*
meatcon	0,54	
misccon	0,71	*
cereacon	0,74	**

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all products from **conventional farming** shows no correlation with the **surface** of the provinces. The number of foodstuffs acquired for all categories have no correlation too with the same parameter, with the exceptions of dry pulses, cereals and byproducts which is highly correlated with the same parameter, and of the categories of fruits, vegetables, milk and byproducts and miscellaneous products, whose correlation is low.

Correlation between foodstuffs from organic (ORG) farming annually purchased and population of the provinces (POP)

Table 31: Correlations ORG - POP Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,94	**
pearorg	0,97	**
peacorg	0,97	**
banaorg	0,90	**
kiwiorg	0,92	**
oranorg	0,91	**
mandorg	0,94	**
plumorg	0,90	**
apriorg	0,88	**

Vegetables		
keys	ρ	signif
salaorg	0,95	**
tomaorg	0,89	**
carrorg	0,86	**
pataorg	0,82	**
caulorg	0,85	**
onioorg	0,75	**
zuccorg	0,90	**
fennorg	0,93	**
spinorg	0,89	**
cabborg	0,82	**
savoorg	0,77	**
frozorg	0,96	**

Milk & byproducts		
keys	ρ	signif
frmiorg	0,73	**
uhmiorg	0,74	**
yoguorg	0,77	**
buttorg	0,83	**
frchorg	0,71	**
machorg	0,60	*

Meat & byproducts		
keys	ρ	signif
boviorg	0,72	**
porkorg	0,79	**
poulorg	0,80	**
bkhaorg	0,51	
cuhaorg	0,76	**
bresorg	0,56	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,83	**
pastorg	0,86	**
riceorg	0,85	**
drpuorg	0,87	**
flouorg	0,89	**

Miscellaneous products		
keys	ρ	signif
voilorg	0,86	**
vgarorg	0,84	**
eggsorg	0,57	
tpeeorg	0,88	**
tsauorg	0,84	**
frjuorg	0,80	**
biscorg	0,87	**
honeorg	0,64	*
marmorg	0,80	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,76	**
vegetorg	0,79	**
milkorg	0,85	**
meatorg	0,76	**
miscorg	0,86	**
cereaorg	0,80	**

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all products from **organic farming**, except baked ham, bresaola, eggs and honey is highly correlated with the **population** of the provinces. The number of foodstuffs acquired for all categories is also highly correlated with the same parameter.

Correlation between foodstuffs from organic (ORG) farming annually purchased and population density of the provinces (DEN)

Table 32: Correlations ORG - DEN Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,60	*
pearorg	0,71	**
peacorg	0,66	*
banaorg	0,69	*
kiwiorg	0,75	**
oranorg	0,78	**
mandorg	0,71	**
plumorg	0,85	**
apriorg	0,69	*

Vegetables		
keys	ρ	signif
salaorg	0,57	
tomaorg	0,78	**
carrorg	0,55	
pataorg	0,64	*
caulorg	0,59	*
onioorg	0,59	*
zuccorg	0,71	**
fennorg	0,59	*
spinorg	0,79	**
cabborg	0,57	
savoorg	0,79	**
frozorg	0,73	**

Milk & byproducts		
keys	ρ	signif
frmiorg	0,53	
uhmiorg	0,64	*
yoguorg	0,55	
buttorg	0,60	*
frchorg	0,60	*
machorg	0,64	*

Meat & byproducts		
keys	ρ	signif
boviorg	0,53	
porkorg	0,61	*
poulorg	0,56	
bkhaorg	0,56	
cuhaorg	0,59	*
bresorg	0,49	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,75	**
pastorg	0,76	**
riceorg	0,73	**
drpuorg	0,69	*
flouorg	0,66	*

Miscellaneous products		
keys	ρ	signif
voilorg	0,73	**
vgarorg	0,57	
eggsorg	0,65	*
tpeeorg	0,75	**
tsauorg	0,56	
frjuorg	0,71	**
biscorg	0,72	**
honeorg	0,65	*
marmorg	0,34	

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,69	*
vegetorg	0,64	*
milkorg	0,51	
meatorg	0,54	
miscorg	0,73	**
cereaorg	0,79	**

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of nearly 1/3 of all products from **organic farming** (pears, kiwis, oranges, mandarins, plums, tomatoes, zucchini, spinach, savoy cabbages, frozen vegetables, bread, pasta, rice, extra virgin olive oil, peeled tomatoes, fruit juices and biscuits) is highly correlated with the **population density** of the provinces. The number of foodstuffs acquired of the only two categories of miscellaneous products and dry pulses, cereals and byproducts is also highly correlated with the same parameter.

Correlation between foodstuffs from organic (ORG) farming annually purchased and surface of the provinces (SUR)

Table 33: Correlations ORG - SUR Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,31	
pearorg	0,13	
peacorg	0,29	
banaorg	0,09	
kiwiorg	0,06	
oranorg	0,01	
mandorg	0,12	
plumorg	-0,06	
apriorg	0,03	

Vegetables		
keys	ρ	signif
salaorg	0,40	
tomaorg	0,07	
carrorg	0,30	
pataorg	0,13	
caulorg	0,18	
onioorg	0,10	
zuccorg	0,10	
fennorg	0,28	
spinorg	-0,01	
cabborg	0,26	
savoorg	0,04	
frozorg	0,13	

Milk & byproducts		
keys	ρ	signif
frmiorg	0,18	
uhmiorg	0,24	
yoguorg	0,15	
buttorg	0,28	
frchorg	0,15	
machorg	0,04	

Meat & byproducts		
keys	ρ	signif
boviorg	-0,04	
porkorg	0,01	
poulorg	0,20	
bkhaorg	-0,17	
cuhaorg	0,01	
bresorg	-0,14	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,07	
pastorg	0,09	
riceorg	0,06	
drpuorg	0,08	
flouorg	0,23	

Miscellaneous products		
keys	ρ	signif
voilorg	0,03	
vgarorg	0,21	
eggsorg	-0,08	
tpeeorg	0,00	
tsauorg	0,24	
frjuorg	0,00	
biscorg	0,15	
honeorg	-0,11	
marmorg	0,39	

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,03	
vegetorg	0,15	
milkorg	0,29	
meatorg	0,10	
miscorg	0,03	
cereaorg	-0,08	

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all products from **organic farming** shows no correlation with the **surface** of the provinces. The number of foodstuffs acquired for all categories has no correlation too with the same parameter.

Correlation between foodstuffs from integrated (INT) farming annually purchased and population of the provinces (POP)

Table 34: Correlations INT - POP Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applint	0,59	*
pearint	0,61	*
peacint	0,63	*
banaint	0,49	
kiwiint	0,61	*
oranint	0,61	*
mandint	0,65	*
plumint	0,73	**
apriint	0,70	*

Vegetables		
keys	ρ	signif
salaint	0,54	
tomaint	0,80	**
carrint	0,47	
pataint	0,49	
caulint	0,53	
onioint	0,22	
zuccint	0,34	
fennint	0,53	
spinint	0,31	
cabbint	0,63	
savoint	0,67	*
frozint	0,50	

Milk & byproducts		
keys	ρ	signif
frmiint	0,31	
uhmiint	-0,18	
yoguint	-0,59	*
buttint	0,10	
frchint	-0,50	
machint	-0,40	

Meat & byproducts		
keys	ρ	signif
boviint	-0,08	
porkint	-0,48	
poulint	0,03	
bkhaint	0,59	*
cuhaint	-0,22	
bresint	-0,36	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaint	0,18	
pastint	0,31	
riceint	0,31	
drpuint	-0,48	
flouint	0,48	

Miscellaneous products		
keys	ρ	signif
voilint	0,31	
vgarint		
eggsint	-0,05	
tpeeint	0,31	
tsauint	0,31	
frjuint	-0,04	
biscint	0,31	
honeint		
marmint	-0,48	

N. of foodstuffs acquired		
keys	ρ	signif
fruitint	0,70	*
vegetint	0,68	*
milkint	-0,25	
meatint	0,09	
miscint	0,00	
cereaint	0,18	

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of almost all products from **integrated farming** have no correlation with the **population** of the provinces, with the only exceptions of plums and tomatoes which shows a high correlation, and of some fruits, which correlation is low. The number of foodstuffs acquired is lowly correlated with the same parameter only in the cases of fruits and vegetables.

Correlation between foodstuffs from integrated (INT) farming annually purchased and population density of the provinces (DEN)

Table 35: Correlations INT - DEN Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applint	0,69	*
pearint	0,74	**
peacint	0,68	**
banaint	0,39	
kiwiint	0,69	*
oranint	0,67	*
mandint	0,67	*
plumint	0,58	*
apriint	0,56	

Vegetables		
keys	ρ	signif
salaint	0,63	*
tomaint	0,70	*
carrint	0,61	*
pataint	0,54	
caulint	0,32	
onioint	0,30	
zuccint	0,64	*
fennint	0,62	*
spinint	0,36	
cabbint	-0,02	
savoint	0,44	
frozint	0,40	

Milk & byproducts		
keys	ρ	signif
frmiint	0,16	
uhmiint	-0,47	
yoguint	-0,53	
buttint	-0,30	
frchint	-0,36	
machint	-0,26	

Meat & byproducts		
keys	ρ	signif
boviint	-0,43	
porkint	-0,48	
poulint	0,44	
bkhaint	0,31	
cuhaint	-0,08	
bresint	-0,15	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaint	0,15	
pastint	-0,13	
riceint	0,16	
drpuint	-0,48	
flouint	0,39	

Miscellaneous products		
keys	ρ	signif
voilint	-0,13	
vgarint		
eggsint	-0,15	
tpeeint	-0,13	
tsauint	-0,13	
frjuint	0,22	
biscint	-0,13	
honeint		
marmint	-0,48	

N. of foodstuffs acquired		
keys	ρ	signif
fruitint	0,66	*
vegetint	0,62	*
milkint	-0,40	
meatint	0,11	
miscint	-0,08	
cereaint	0,30	

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of almost all products from **integrated farming** have no correlation with the **population density** of the provinces, with the only exceptions of pears and peaches which shows a high correlation, and of some other fruits and vegetables, which correlation is low. The number of foodstuffs acquired is lowly correlated with the same parameter only in the cases of fruits and vegetables.

Correlation between foodstuffs from integrated (INT) farming annually purchased and surface of the provinces (SUR)

Table 36: Correlations INT - POP Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applint	-1,00	
pearint	-0,12	
peacint	-0,07	
banaint	0,13	
kiwiint	-0,01	
oranint	0,01	
mandint	0,04	
plumint	0,14	
apriint	0,05	

Vegetables		
keys	ρ	signif
salaint	0,04	
tomaint	0,07	
carrint	-0,04	
pataint	0,08	
caulint	0,08	
onioint	-0,08	
zuccint	-0,21	
fennint	0,00	
spinint	0,17	
cabbint	0,10	
savoint	-0,43	
frozint	0,06	

Milk & byproducts		
keys	ρ	signif
frmiint	0,23	
uhmiint	0,30	
yoguint	-0,01	
buttint	0,37	
frchint	-0,11	
machint	-0,06	

Meat & byproducts		
keys	ρ	signif
boviint	0,34	
porkint	0,04	
poulint	-0,61	*
bkhaint	0,00	
cuhaint	-0,01	
bresint	-0,22	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaint	-0,11	
pastint	0,39	
riceint	0,23	
drpuint	0,04	
flouint	0,31	

Miscellaneous products		
keys	ρ	signif
voilint	0,39	
vgarint		
eggsint	0,20	
tpeeint	0,39	
tsauint	0,39	
frjuint	-0,31	
biscint	0,39	
honeint		
marmint	0,04	

N. of foodstuffs acquired		
keys	ρ	signif
fruitint	0,05	
vegetint	0,18	
milkint	0,21	
meatint	-0,21	
miscint	0,10	
cereaint	-0,04	

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all products from **integrated farming** have no correlation with the **surface** of the provinces. The number of foodstuffs acquired has no correlation too with the same parameter.

Correlation between foodstuffs from conventional (CON) farming annually purchased divided by the number of meals provided and population of the municipalities (POP)

Table 37: Correlations CON/Meals - POP Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	-0,31	**
pearcon	-0,21	**
peaccon	-0,05	
banacon	-0,24	**
kiwicon	-0,14	**
orancon	-0,21	**
mandcon	-0,25	**
plumcon	-0,04	
apricon	0,00	

Vegetables		
keys	ρ	signif
salacon	-0,20	**
tomacon	-0,13	**
carrcon	-0,30	**
patacon	-0,16	**
caulcon	-0,07	
oniocon	0,10	*
zucccon	-0,14	**
fenncon	-0,14	**
spincon	-0,17	**
cabbcon	0,01	
savocon	0,05	
frozcon	0,03	

Milk & byproducts		
keys	ρ	signif
frmicon	0,23	**
uhmicon	0,09	*
yogucon	-0,17	**
buttcon	0,18	**
frchcon	-0,07	
machcon	0,09	*

Meat & byproducts		
keys	ρ	signif
bovicon	0,13	**
porkcon	0,09	*
poulcon	0,02	
bkhacon	0,12	**
cuhacon	0,15	**
brescon	0,16	**

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	-0,15	**
pastcon	-0,25	**
ricecon	-0,20	**
drpucon	-0,25	**
floucon	0,02	

Miscellaneous products		
keys	ρ	signif
voilcon	-0,14	**
vgarcon	0,02	
eggscon	-0,22	**
tpeecon	-0,17	**
tsaucon	-0,06	
frjucon	0,10	*
bisccon	0,26	**
honecon	0,22	**
marmcon	0,21	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	-0,13	**
vegetcon	-0,15	**
milkcon	0,10	*
meatcon	0,16	**
misccon	-0,05	
cereacon	-0,24	**

ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of many products from **conventional farming**, like some fruits and vegetables, dry pulses, cereals and byproducts and few miscellaneous products, divided by the number of meals provided, is highly inversed correlated with the **population** of the municipalities. On the contrary, other products like fresh milk, yogurt, biscuits, honey, marmalade and most of those belonging to the category meat and byproducts are highly positively correlated with the same parameter. and byproducts (except flour), miscellaneous products (except peeled tomatoes and fruit juice), milk and byproducts (except fresh milk, yogurt and butter) and all those of the category meat and byproducts is highly correlated. In the category of vegetables the correlation is not always significant. The number of foodstuffs acquired for categories is highly inversed correlated, in half of the cases, with the same parameter, except the category of meat and byproducts, which is on the contrary highly positively correlated.

Correlation between foodstuffs from conventional (CON) farming annually purchased divided by the number of meals provided and population density of the municipalities (DEN)

Table 38: Correlations CON/Meals - DEN Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	-0,05	
pearcon	0,06	*
peaccon	0,09	**
banacon	0,21	**
kiwicon	0,04	
orancon	0,06	
mandcon	0,06	
plumcon	0,11	*
apricon	0,07	

Vegetables		
keys	ρ	signif
salacon	0,11	*
tomacon	0,12	**
carrcon	0,08	*
patacon	0,17	**
caulcon	-0,06	
oniocon	0,09	*
zucccon	0,03	
fenncon	0,08	
spincon	-0,01	
cabbcon	-0,01	
savocon	-0,06	
frozcon	0,13	**

Milk & byproducts		
keys	ρ	signif
frmicon	0,11	**
uhmicon	0,20	**
yogucon	-0,07	
buttcon	0,16	**
frchcon	0,41	**
machcon	0,29	**

Meat & byproducts		
keys	ρ	signif
bovicon	0,53	**
porkcon	0,49	**
poulcon	0,56	**
bkhacon	0,26	**
cuhacon	0,46	**
brescon	0,42	**

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,35	**
pastcon	-0,05	
ricecon	0,01	
drpucon	-0,06	
floucon	0,07	

Miscellaneous products		
keys	ρ	signif
voilcon	-0,01	
vgarcon	0,16	**
eggscon	0,18	**
tpeecon	-0,09	*
tsaucon	-0,02	
frjucon	0,20	**
bisccon	0,20	**
honecon	0,18	**
marmcon	0,17	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	-0,18	**
vegetcon	-0,21	**
milkcon	-0,05	
meatcon	0,13	**
misccon	-0,16	**
cereacon	-0,33	**

ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of many products from **conventional farming**, like peaches, bananas, tomatoes, potatoes, frozen vegetables, bread, most of those belonging to the categories of milk and byproducts and miscellaneous products and all meta and byproducts, divided by the number of meals provided, is highly correlated with the **population density** of the municipalities. The number of foodstuffs acquired for most categories (fruits, vegetables, miscellaneous products, dry pulses, cereals and byproducts) is highly inversed correlated with the same parameter, with the only exception of the category of meat and byproducts, which is on the contrary highly positively correlated.

Correlation between foodstuffs from organic (ORG) farming annually purchased divided by the number of meals provided and population of the municipalities (POP)

Table 39: Correlations ORG/Meals - POP Municipalities

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,31	**
pearorg	0,21	**
peacorg	0,23	**
banaorg	0,18	**
kiwiorg	0,20	**
oranorg	0,24	**
mandorg	0,26	**
plumorg	0,21	**
apriorg	0,20	**

Vegetables		
keys	ρ	signif
salaorg	0,30	**
tomaorg	0,28	**
carrorg	0,31	**
pataorg	0,23	**
caulorg	0,19	**
onioorg	0,17	**
zuccorg	0,24	**
fennorg	0,28	**
spinorg	0,18	**
cabborg	0,17	**
savoorg	0,14	**
frozorg	0,27	**

Milk & byproducts		
keys	ρ	signif
frmiorg	0,20	**
uhmiorg	0,13	**
yoguorg	0,29	**
buttorg	0,17	**
frchorg	0,21	**
machorg	0,11	**

Meat & byproducts		
keys	ρ	signif
boviorg	0,10	*
porkorg	0,07	
poulorg	0,11	**
bkhaorg	0,06	
cuhaorg	0,09	*
bresorg	0,02	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,13	**
pastorg	0,31	**
riceorg	0,23	**
drpuorg	0,32	**
flouorg	0,25	**

Miscellaneous products		
keys	ρ	signif
voilorg	0,28	**
vgarorg	0,20	**
eggsorg	0,24	**
tpeeorg	0,28	**
tsauorg	0,06	
frjuorg	0,27	**
biscorg	0,16	**
honeorg	0,12	**
marmorg	0,38	**

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,29	**
vegetorg	0,30	**
milkorg	0,38	**
meatorg	0,15	**
miscorg	0,38	**
cereaorg	0,34	**

n=572	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of almost all the products from **organic farming**, divided by the number of meals provided, is highly correlated with the **population** of the municipalities, with few exceptions concentrated in the category of meat and byproducts (but not for poultry meat). The number of foodstuffs acquired for all categories is highly correlated too with the same parameter.

Correlation between foodstuffs from organic (ORG) farming annually purchased divided by the number of meals provided and population density of the municipalities (DEN)

Table 40: Correlations ORG/Meals - DEN Municipalities

Non-parametric correlation table - abstract of the first line

Fruits

keys	ρ	signif
applorg	0,27	**
pearorg	0,22	**
peacorg	0,22	**
banaorg	0,17	**
kiwiorg	0,23	**
oranorg	0,24	**
mandorg	0,25	**
plumorg	0,24	**
apriorg	0,19	**

Vegetables

keys	ρ	signif
salaorg	0,25	**
tomaorg	0,27	**
carrorg	0,24	**
pataorg	0,21	**
caulorg	0,15	**
onioorg	0,21	**
zuccorg	0,26	**
fennorg	0,23	**
spinorg	0,19	**
cabborg	0,09	*
savoorg	0,12	**
frozorg	0,32	**

Milk & byproducts

keys	ρ	signif
frmiorg	0,15	**
uhmiorg	0,09	*
yoguorg	0,26	**
buttorg	0,13	**
frchorg	0,19	**
machorg	0,13	**

Meat & byproducts

keys	ρ	signif
boviorg	0,13	**
porkorg	0,07	
poulorg	0,14	**
bkhaorg	0,05	
cuhaorg	0,10	*
bresorg	0,01	

Dry pulses cereals & bypr.

keys	ρ	signif
breaorg	0,22	**
pastorg	0,35	**
riceorg	0,32	**
drpuorg	0,35	**
flouorg	0,24	**

Miscellaneous products

keys	ρ	signif
voilorg	0,34	**
vgarorg	0,18	**
eggsorg	0,27	**
tpeeorg	0,33	**
tsauorg	0,11	**
frjuorg	0,27	**
biscorg	0,14	**
honeorg	0,12	**
marmorg	0,05	

N. of foodstuffs acquired

keys	ρ	signif
fruitorg	0,29	**
vegetorg	0,31	**
milkorg	0,37	**
meatorg	0,16	**
miscorg	0,41	**
cereaorg	0,41	**

n=572

ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of almost all the products from **organic farming**, divided by the number of meals provided, is highly correlated with the **population density** of the municipalities, with few exceptions concentrated in the category of meat and byproducts (but not for bovine and poultry meat). The number of foodstuffs acquired for all categories is highly correlated too with the same parameter.

Correlation between foodstuffs from conventional (CON) farming annually purchased divided by the number of meals provided and population of the provinces (POP)

Table 41: Correlations CON/Meals - POP Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	0,46	
pearcon	0,55	
peaccon	0,66	*
banacon	0,62	*
kiwicon	0,62	*
orancon	0,69	*
mandcon	0,68	*
plumcon	0,61	*
apricon	0,29	

Vegetables		
keys	ρ	signif
salacon	0,62	*
tomacon	0,59	*
carrcon	0,52	
patacon	0,66	*
caulcon	0,36	
oniocon	0,70	*
zucccon	0,50	
fenncon	0,59	*
spincon	0,50	
cabbcon	0,65	*
savocon	0,92	**
frozcon	0,57	

Milk & byproducts		
keys	ρ	signif
frmicon	0,50	
uhmicon	0,73	**
yogucon	0,02	
buttcon	0,37	
frchcon	0,75	**
machcon	0,65	*

Meat & byproducts		
keys	ρ	signif
bovicon	0,85	**
porkcon	0,63	*
poulcon	0,77	**
bkhacon	0,69	*
cuhacon	0,80	**
brescon	0,59	*

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,83	**
pastcon	0,63	*
ricecon	0,51	
drpucon	0,37	
floucon	0,73	**

Miscellaneous products		
keys	ρ	signif
voilcon	0,61	*
vgarcon	0,70	*
eggscon	0,59	*
tpeecon	0,38	
tsaucon	0,83	**
frjucon	0,49	
bisccon	0,59	*
honecon	0,67	*
marmcon	0,60	*

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	0,81	**
vegetcon	0,71	*
milkcon	0,80	**
meatcon	0,79	**
misccon	0,80	**
cereacon	0,64	*

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of some products from **conventional farming**, like UHT milk, fresh cheeses, bovine and poultry meat, cured ham, bread, flour and tomato sauce, divided by the number of meals provided, is highly correlated with the **population** of the provinces. The number of foodstuffs acquired for categories is highly correlated, in most cases, with the same parameter; the categories of vegetables and of dry pulses, cereals and byproducts, are instead lowly correlated.

Correlation between foodstuffs from conventional (CON) farming annually purchased divided by the number of meals provided and population density of the provinces (DEN)

Table 42: Correlations CON/Meals - DEN Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applcon	-0,28	
pearcon	-0,15	
peaccon	0,06	
banacon	0,01	
kiwicon	0,08	
orancon	0,10	
mandcon	0,05	
plumcon	0,24	
apricon	-0,12	

Vegetables		
keys	ρ	signif
salacon	-0,05	
tomacon	-0,09	
carrcon	-0,15	
patacon	0,15	
caulcon	-0,21	
oniocon	0,46	
zucccon	-0,13	
fenncon	0,01	
spincon	-0,08	
cabbcon	0,08	
savocon	0,52	
frozcon	0,08	

Milk & byproducts		
keys	ρ	signif
frmicon	0,13	
uhmicon	0,18	
yogucon	-0,43	
buttcon	0,34	
frchcon	0,20	
machcon	0,35	

Meat & byproducts		
keys	ρ	signif
bovicon	0,28	
porkcon	0,08	
poulcon	0,16	
bkhacon	0,41	
cuhacon	0,55	
brescon	0,28	

Dry pulses cereals & bypr.		
keys	ρ	signif
breacon	0,24	
pastcon	0,06	
ricecon	-0,03	
drpucon	0,03	
floucon	0,38	

Miscellaneous products		
keys	ρ	signif
voilcon	0,08	
vgarcon	0,26	
eggscon	-0,03	
tpeecon	-0,06	
tsaucon	0,17	
frjucon	0,10	
bisccon	0,08	
honecon	0,36	
marmcon	0,08	

N. of foodstuffs acquired		
keys	ρ	signif
fruitcon	0,23	
vegetcon	0,19	
milkcon	0,26	
meatcon	0,42	
misccon	0,23	
cereacon	0,07	

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of all the products from **conventional farming**, divided by the number of meals provided, has no correlation with the **population density** of the provinces. The number of foodstuffs acquired for all categories has no correlation too with the same parameter.

Correlation between foodstuffs from organic (ORG) farming annually purchased divided by the number of meals provided and population of the provinces (POP)

Table 43: Correlations ORG/Meals - POP Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,82	**
pearorg	0,78	**
peacorg	0,73	**
banaorg	0,76	**
kiwiorg	0,66	*
oranorg	0,87	**
mandorg	0,90	**
plumorg	0,62	*
apriorg	0,69	*

Vegetables		
keys	ρ	signif
salaorg	0,77	**
tomaorg	0,80	**
carrorg	0,78	**
pataorg	0,69	*
caulorg	0,62	*
onioorg	0,50	
zuccorg	0,82	**
fennorg	0,71	*
spinorg	0,77	**
cabborg	0,76	**
savoorg	0,71	*
frozorg	0,76	**

Milk & byproducts		
keys	ρ	signif
frmiorg	0,68	*
uhmiorg	0,56	
yoguorg	0,72	**
buttorg	0,74	**
frchorg	0,64	*
machorg	0,66	*

Meat & byproducts		
keys	ρ	signif
boviorg	0,74	**
porkorg	0,76	**
poulorg	0,83	**
bkhaorg	0,49	
cuhaorg	0,76	**
bresorg	0,54	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,82	**
pastorg	0,85	**
riceorg	0,80	**
drpuorg	0,73	**
flouorg	0,87	**

Miscellaneous products		
keys	ρ	signif
voilorg	0,81	**
vgarorg	0,86	**
eggsorg	0,74	**
tpeeorg	0,86	**
tsauorg	0,65	*
frjuorg	0,83	**
biscorg	0,87	**
honeorg	0,64	*
marmorg	0,64	*

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,76	**
vegetorg	0,79	**
milkorg	0,85	**
meatorg	0,76	**
miscorg	0,86	**
cereaorg	0,80	**

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of many products from **organic farming**, divided by the number of meals provided, is highly correlated with the **population** of the provinces; furthermore, many other shows a lowly correlation. Only onion, UHT milk, baked ham and bresaola has no correlation with the same parameter. The number of foodstuffs acquired for all categories is highly correlated too with the same parameter.

Correlation between foodstuffs from organic (ORG) farming annually purchased divided by the number of meals provided and population density of the provinces (DEN)

Table 44: Correlations ORG/Meals - DEN Provinces

Non-parametric correlation table - abstract of the first line

Fruits		
keys	ρ	signif
applorg	0,54	
pearorg	0,62	*
peacorg	0,57	
banaorg	0,41	
kiwiorg	0,53	
oranorg	0,60	*
mandorg	0,63	*
plumorg	0,77	**
apriorg	0,57	

Vegetables		
keys	ρ	signif
salaorg	0,48	
tomaorg	0,70	*
carrorg	0,36	
pataorg	0,58	*
caulorg	0,52	
onioorg	0,62	*
zuccorg	0,71	**
fennorg	0,40	
spinorg	0,83	**
cabborg	0,43	
savoorg	0,70	*
frozorg	0,71	**

Milk & byproducts		
keys	ρ	signif
frmiorg	0,45	
uhmiorg	0,35	
yoguorg	0,47	
buttorg	0,46	
frchorg	0,42	
machorg	0,54	

Meat & byproducts		
keys	ρ	signif
boviorg	0,45	
porkorg	0,55	
poulorg	0,58	*
bkhaorg	0,51	
cuhaorg	0,59	*
bresorg	0,28	

Dry pulses cereals & bypr.		
keys	ρ	signif
breaorg	0,73	**
pastorg	0,74	**
riceorg	0,71	*
drpuorg	0,68	*
flouorg	0,71	**

Miscellaneous products		
keys	ρ	signif
voilorg	0,76	**
vgarorg	0,49	
eggsorg	0,57	
tpeeorg	0,72	**
tsauorg	0,53	
frjuorg	0,85	**
biscorg	0,69	*
honeorg	0,65	*
marmorg	0,11	

N. of foodstuffs acquired		
keys	ρ	signif
fruitorg	0,69	*
vegetorg	0,64	*
milkorg	0,51	
meatorg	0,54	
miscorg	0,73	**
cereaorg	0,79	**

n=12	
ρ	*Spearman's rank correlation coefficient*
signif	Signification
**	*Correlation is significant at the 0.01 level*
*	*Correlation is significant at the 0.05 level*
	Correlation is not significant

The consumption of few products from **organic farming**, like plums, zucchini, spinach, frozen vegetables, bread, pasta, flour, extra virgin olive oil, peeled tomatoes and fruit juices, divided by the number of meals provided, is highly correlated with the **population density** of the provinces. The other products shoes a lowly correlation or no correlation with the same parameter. The number of foodstuffs acquired for the only two categories of miscellaneous products and dry pulses, cereals and byproducts is highly correlated with the same parameter; the categories of fruits and vegetables are lowly correlated, while milk and meat and their byproducts shows no correlation.

5.6.2. Cluster analysis

Considering the most significant correlations, that were the ones between foodstuffs from conventional and organic farming annually purchased divided by the number of meals provided and population of the municipalities and of the provinces, a cluster analysis for each of these 4 cases was carried out, in order to identify groups of objects with similar patterns. The results are shown below.

Table 45: Results of the cluster analysis CON/Meals - POP

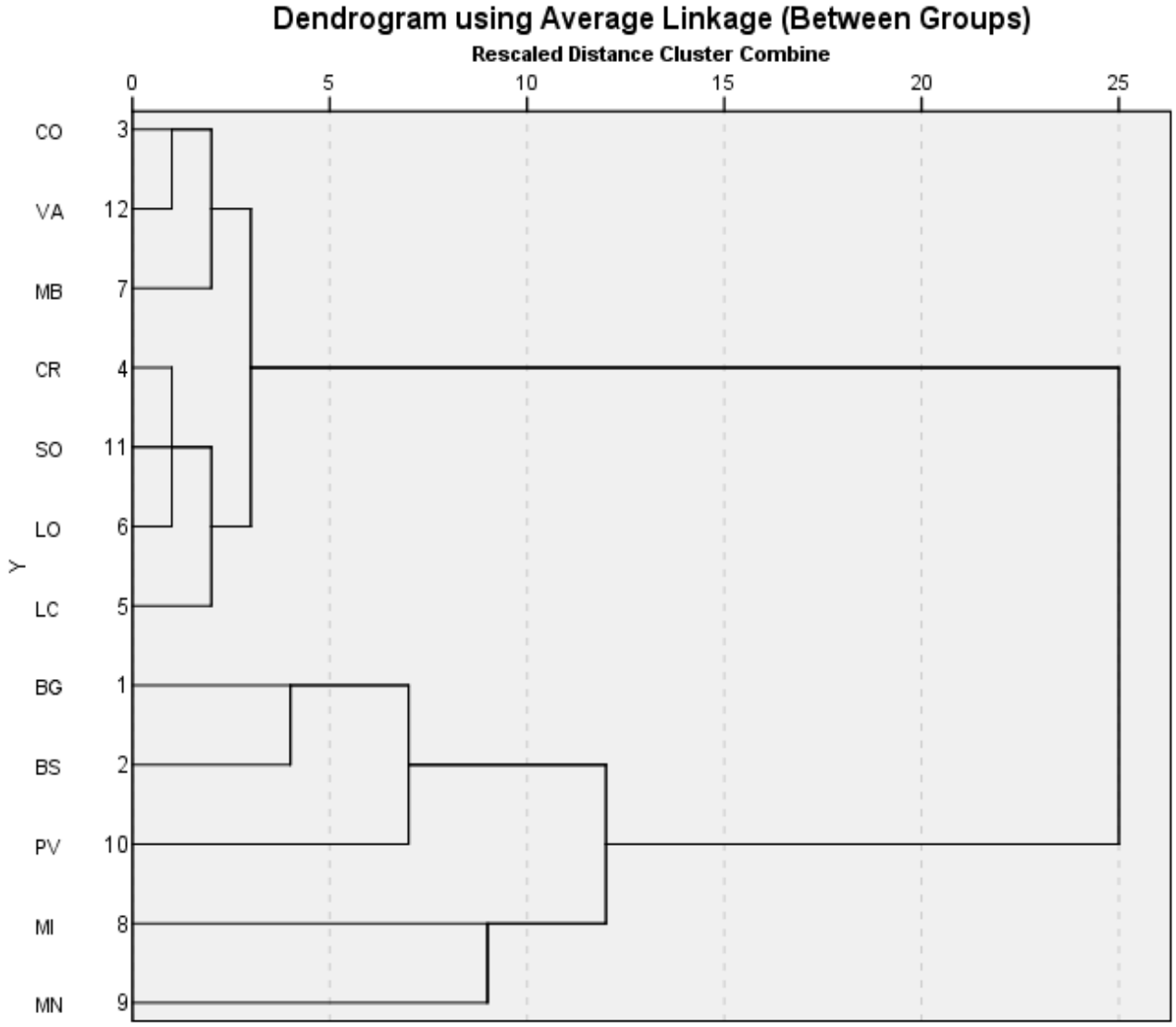
Cluster	n. Munic.	% on tot
1	546	95,45%
2	2	0,35%
3	9	1,57%
4	4	0,70%
5	1	0,17%
6	1	0,17%
7	1	0,17%
8	1	0,17%
9	1	0,17%
10	1	0,17%
11	1	0,17%
12	1	0,17%
13	1	0,17%
14	1	0,17%
15	1	0,17%
Total	572	100,00%

Table 46: Results of the cluster analysis ORG/Meals - POP

Cluster	n. Munic.	% on tot
1	58	10,14%
2	496	86,71%
3	3	0,52%
4	1	0,17%
5	1	0,17%
6	1	0,17%
7	1	0,17%
8	2	0,35%
9	1	0,17%
10	2	0,35%
11	1	0,17%
12	1	0,17%
13	1	0,17%
14	2	0,35%
15	1	0,17%
Total	572	100,00%

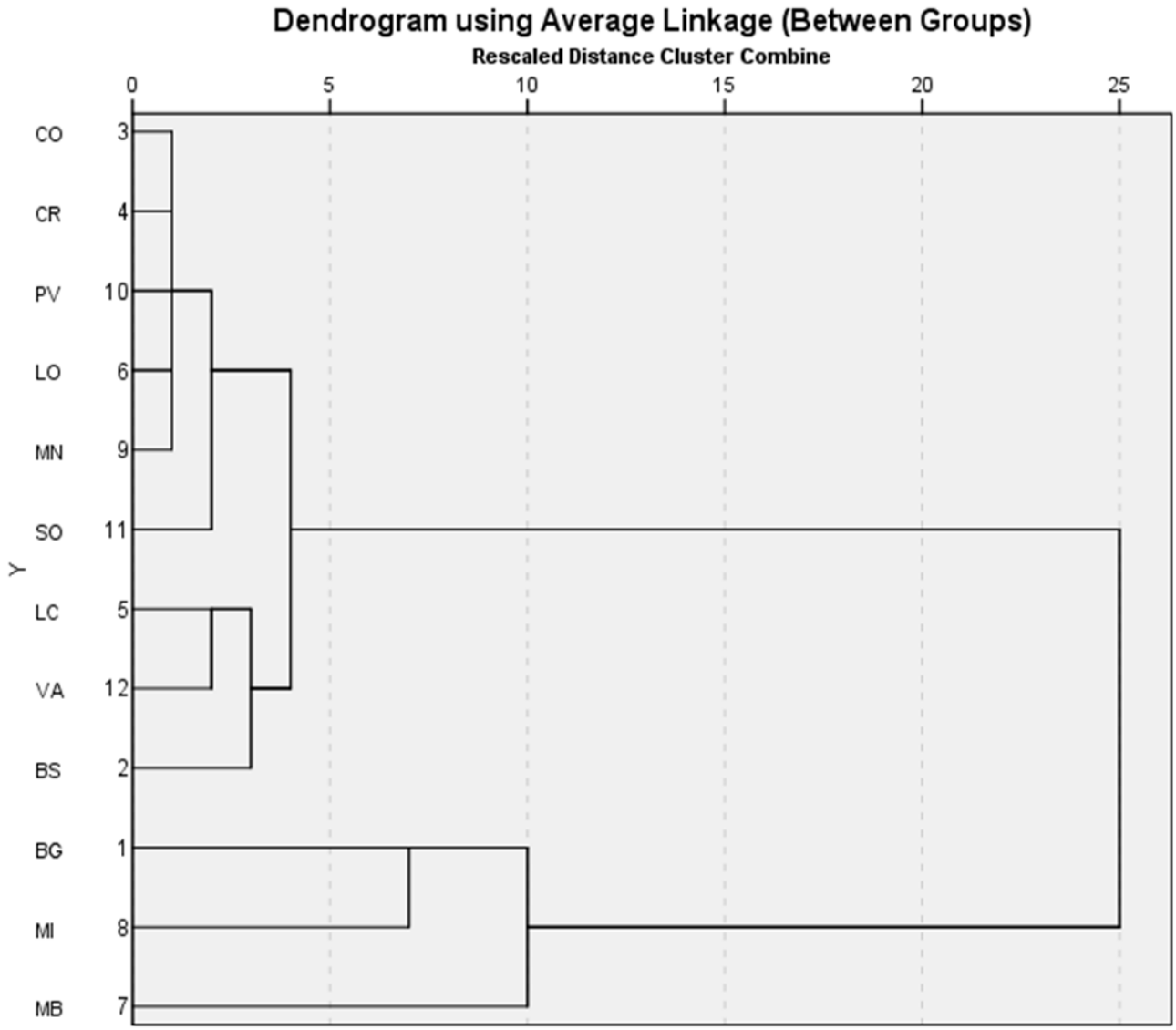
The cluster analysis carried out with the municipalities was carried out limiting the number of clusters that can be formed in a range between 5 and 15, and considering the data in the case of maximum value. The analysis (Tables 45 and 46) shows that in both cases regarding respectively conventional (CON) and organic (ORG) products a very large cluster was formed: analyzing the case of conventional products the cluster 1 groups 568 municipalities (95,45% of the tota)l; in the same way in the analyses of the case of organic products the cluster 2 groups 496 municipalities (86,71% of the total).

Fig. 34: Cluster analysis of the annually purchase of products from conventional (CON) farming divided by the number of meals provided and population of the provinces



The cluster analyses shows that two groups were formed: the most correlated one is composed by the provinces of Mantua, Milan, Pavia, Brescia and Bergamo. The second is formed by all other provinces.

Fig. 35: Cluster analysis of the annually purchase of products from organic (ORG) farming divided by the number of meals provided and population of the provinces

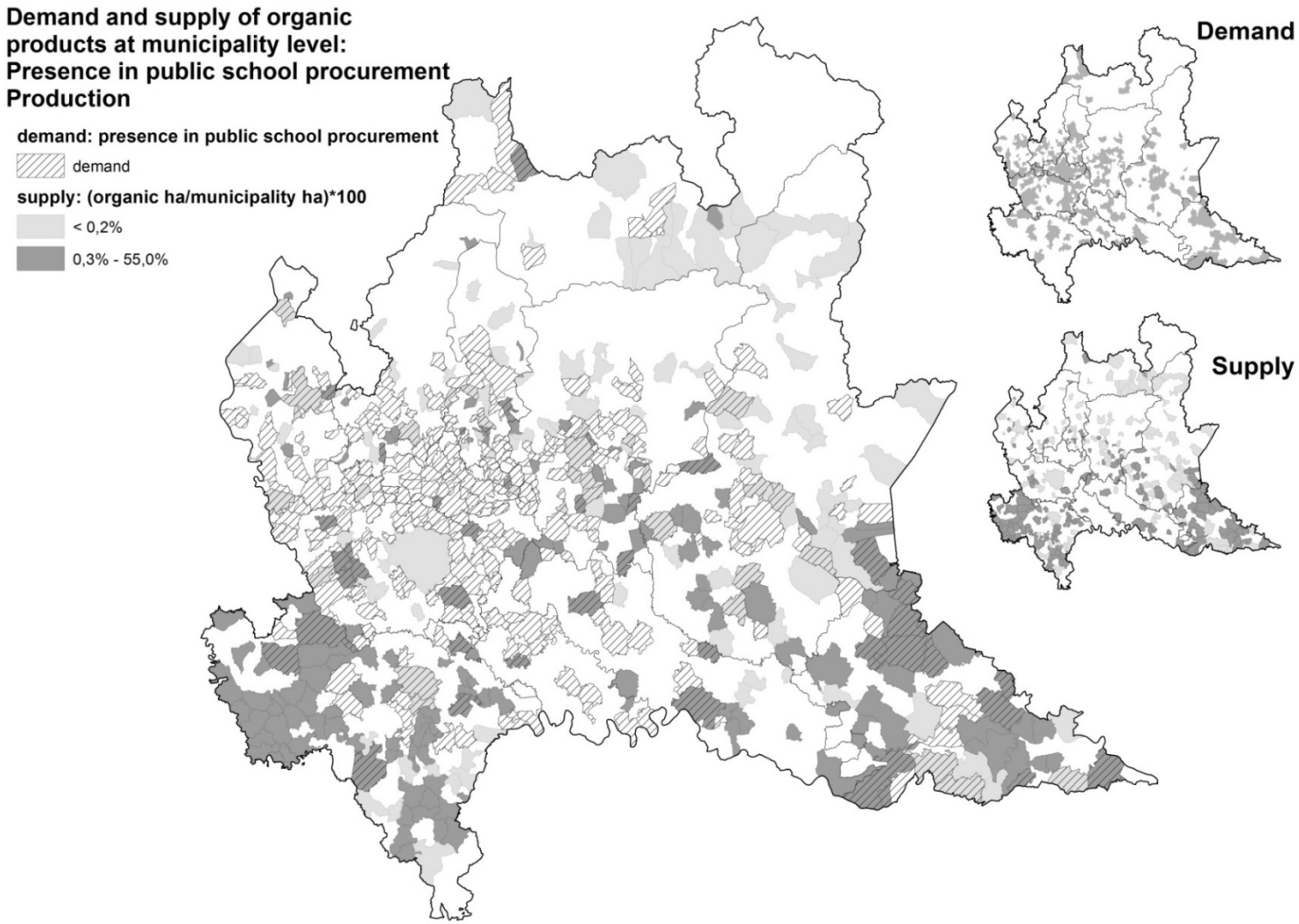


The cluster analyses shows that two groups were formed: the most correlated one is composed by the provinces of Monza-Brianza, Milan and Bergamo. The second is formed by all other provinces.

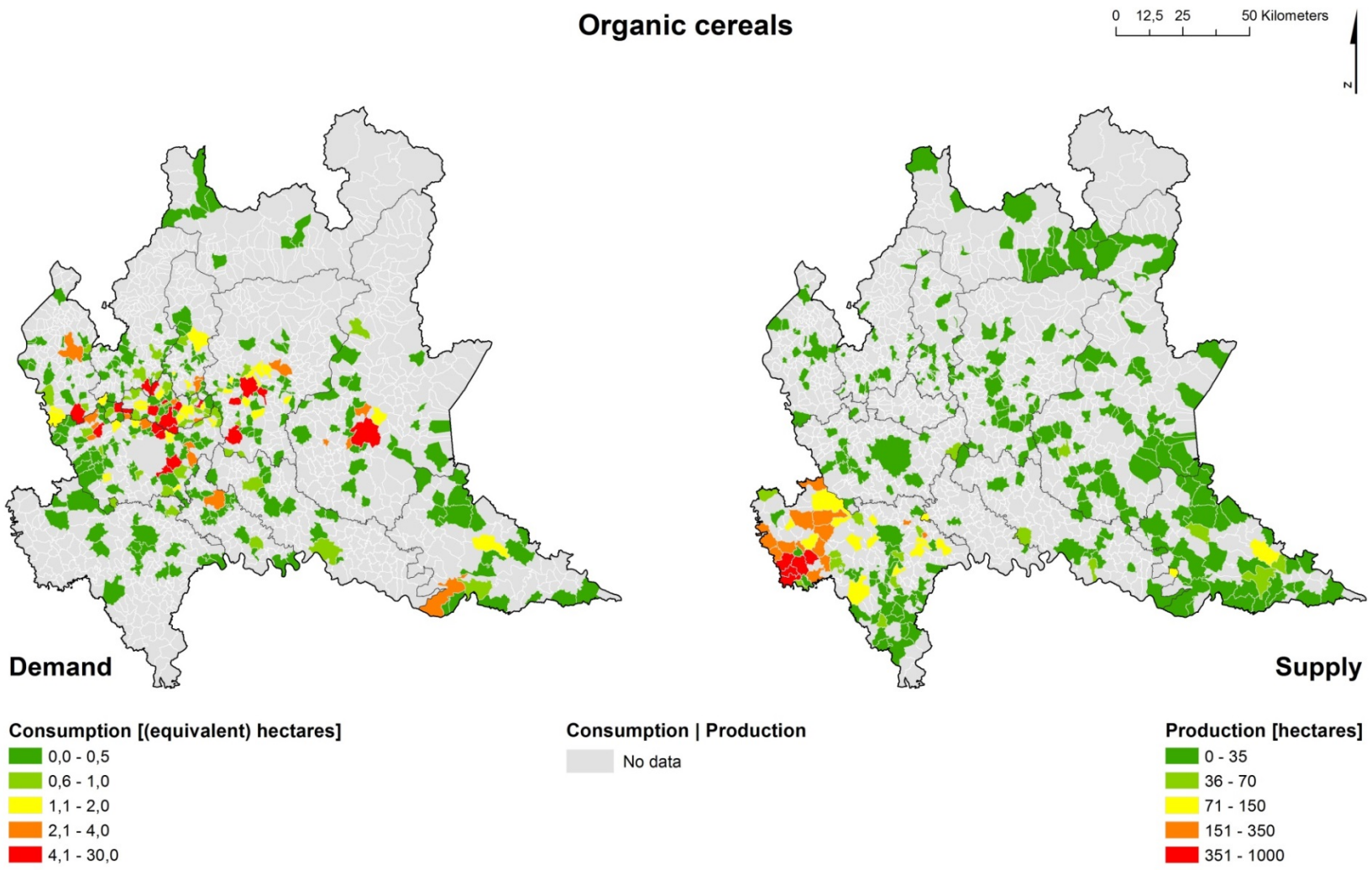
Fig. 36: Spatial analysis of the relationship between demand and supply at municipality level a. global

b. to e - of the most important. organic foodstuffs required by school public procurement

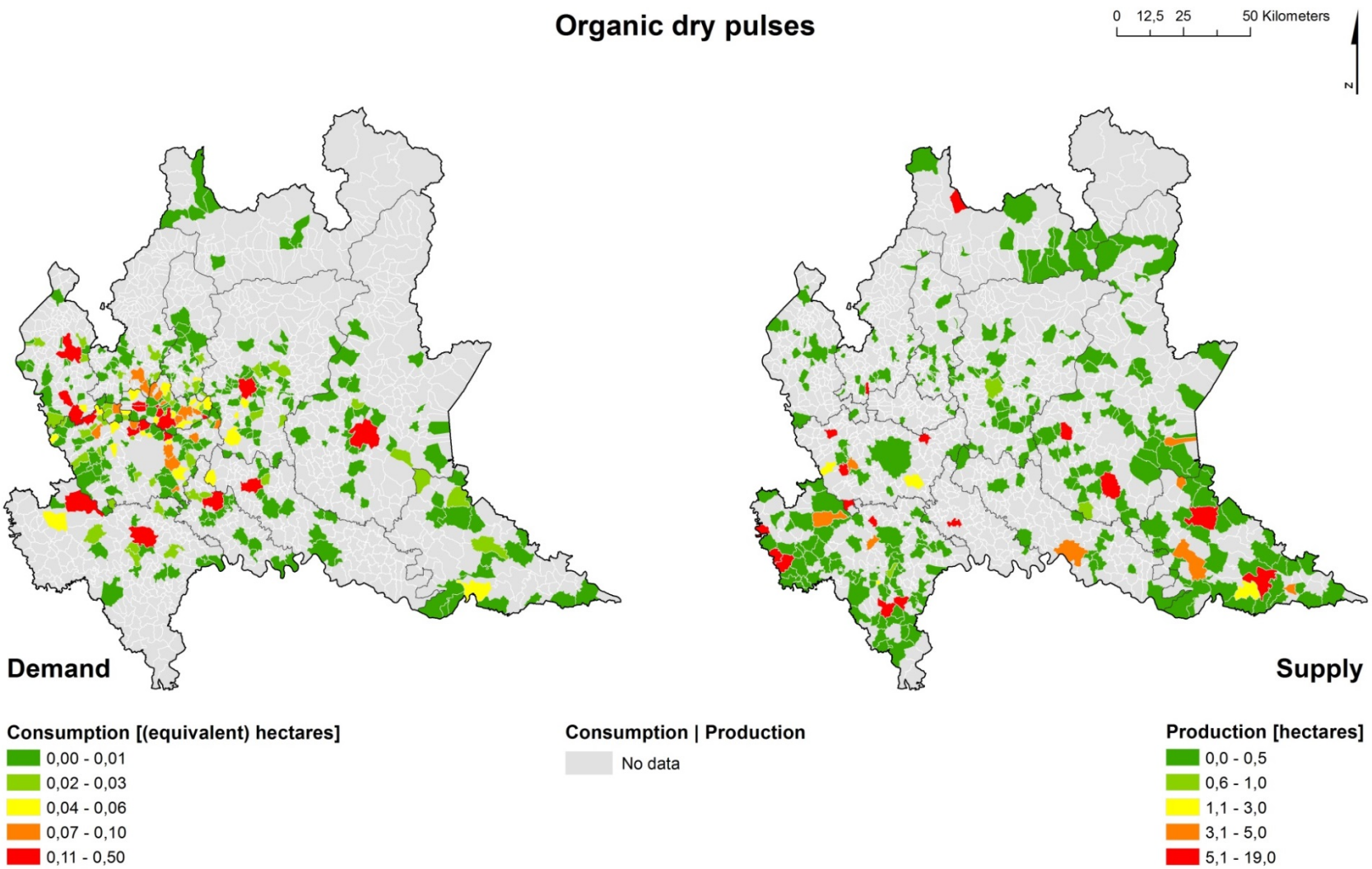
36a.



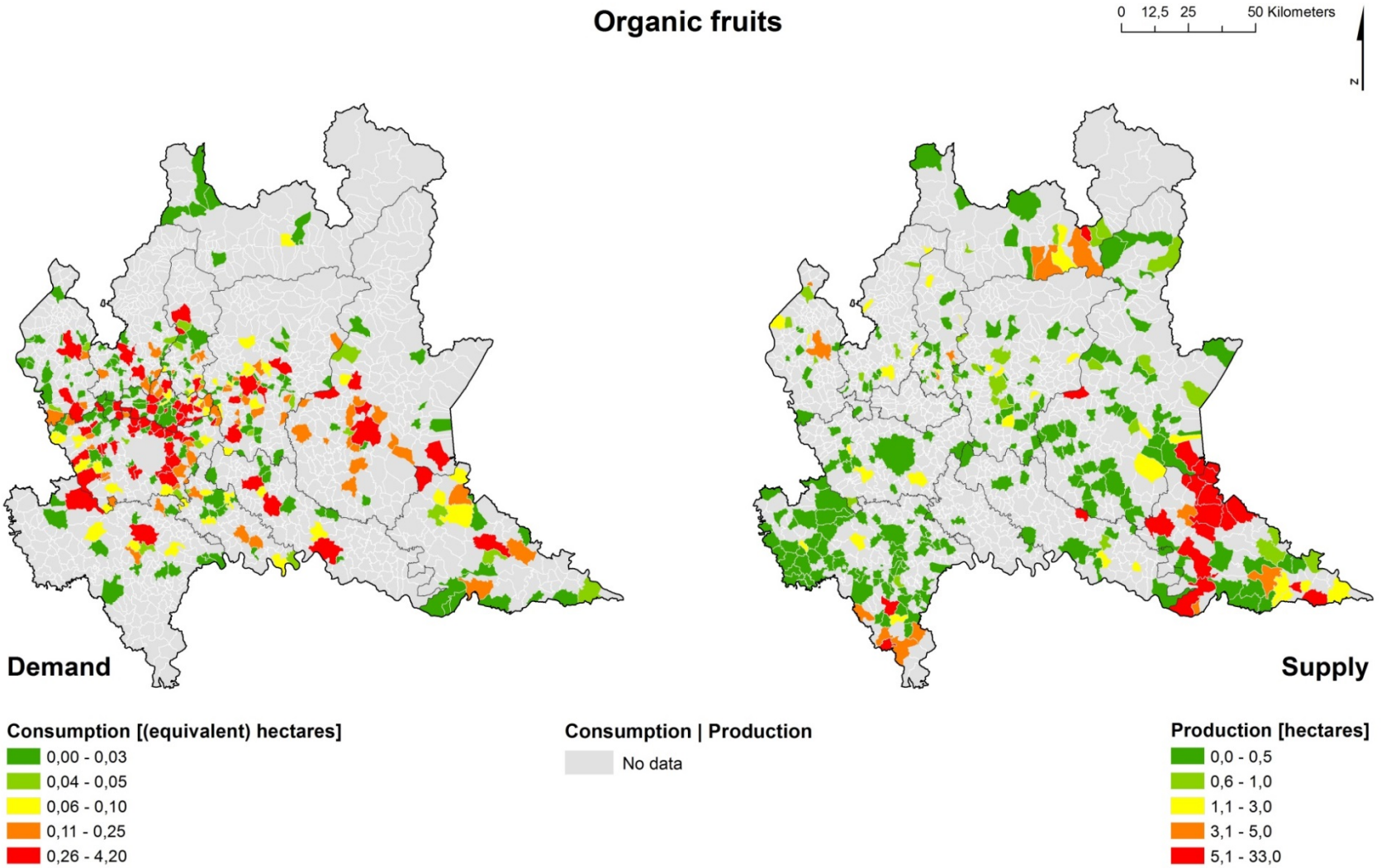
36b.


Organic cereals
0 12,5 25 50 Kilometers
N
Demand
Supply
Consumption [(equivalent) hectares]
0,0 - 0,5
0,6 - 1,0
1,1 - 2,0
2,1 - 4,0
4,1 - 30,0
Consumption | Production
No data
Production [hectares]
0 - 35
36 - 70
71 - 150
151 - 350
351 - 1000

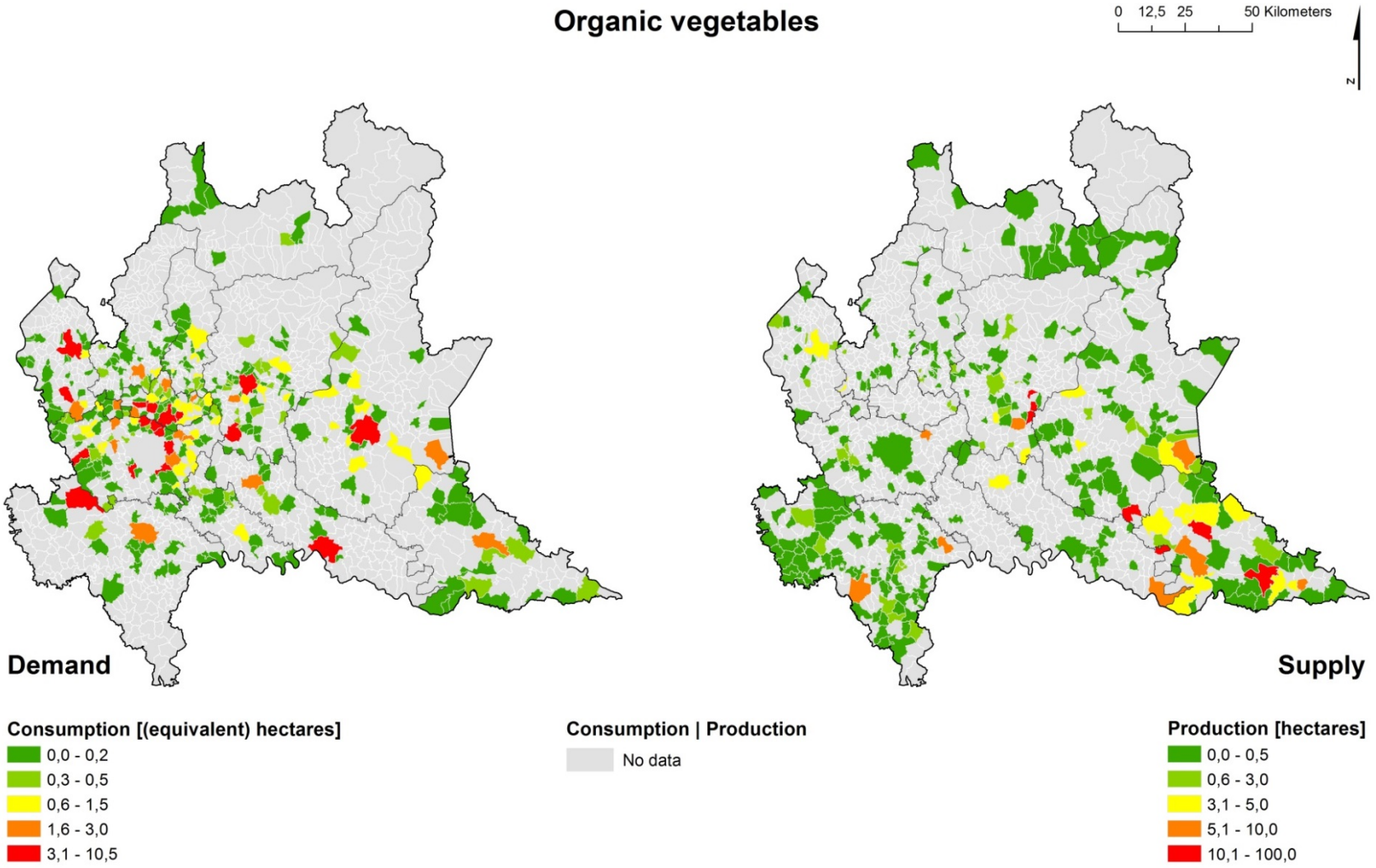
36c.


Organic dry pulses
0 12,5 25 50 Kilometers
N
Demand
Supply
Consumption [(equivalent) hectares]
0,00 - 0,01
0,02 - 0,03
0,04 - 0,06
0,07 - 0,10
0,11 - 0,50
Consumption | Production
No data
Production [hectares]
0,0 - 0,5
0,6 - 1,0
1,1 - 3,0
3,1 - 5,0
5,1 - 19,0

36d.


Organic fruits
0 12,5 25 50 Kilometers
N
Demand
Supply
Consumption [(equivalent) hectares]
0,00 - 0,03
0,04 - 0,05
0,06 - 0,10
0,11 - 0,25
0,26 - 4,20
Consumption | Production
No data
Production [hectares]
0,0 - 0,5
0,6 - 1,0
1,1 - 3,0
3,1 - 5,0
5,1 - 33,0

36e.


Organic vegetables
0 12,5 25 50 Kilometers
N
Demand
Supply
Consumption [(equivalent) hectares]
0,0 - 0,2
0,3 - 0,5
0,6 - 1,5
1,6 - 3,0
3,1 - 10,5
Consumption | Production
No data
Production [hectares]
0,0 - 0,5
0,6 - 3,0
3,1 - 5,0
5,1 - 10,0
10,1 - 100,0

5.6.3. Results of the spatial analysis

All the maps were obtained by processing, at municipal level, the information of the geodatabase.

The first map shows the spatial distribution of demand and supply of organic products. The supply is distributed in many parts of the region, generally far from the areas where the demand is high, while this latter is concentrated in the most populated area . The provinces of Milan and Monza Brianza, which have a total area of about 1,530 km^2 (16,14% of all region), have a population of nearly 4 million inhabitants(40,34% of the region) and provide 51 million meals in school canteens every year (59,39% of all school meals of the region).

The following results were achieved by comparing the demand for organic products, expressed in equivalent hectares, detected in the sample with the total area cultivated with organic methods of the same products in the Lombardy region.

Analyzing the annual demand for cereals-related products the results are: 478 tons of organic bread, 967 tons of organic pasta, 159 tons of organic rice and 12 tons of organic wheat flour. Comparing this results with the total current organic cereals production the acreage appears enough to satisfy the needs. Also this production is concentrated in the province of Pavia.

According to an annual demand of slightly more than 6 tons of organic dried pulses, the organic pulses acreage appears to be far enough to satisfy the needs. Even this production is mainly concentrated in the provinces of Pavia and Mantua.

The annual demand for organic fruit is about 690 tons, of which more than 250 are citrus fruits and bananas, which cannot be cultivated the Region. So the demand to be satisfied is about 440 tons. The area cultivated with organic fruits can currently provide the current needs.

The annual demand for organic vegetables is around 510 tons, of which more than 140 tons consist of frozen vegetables. The area cultivated with organic vegetables can currently provide more than double the requirements. The current organic areas for fruit and vegetable are mainly located in the province of Mantua.

Furthermore, we compare the amount of the annual demand for organic beef and pork meat is quite limited The first amounts to nearly 38 tons, which would require about 130 heads of cattle per year to meet the need. The 8,500 animals actually bred, of which at least 15% are for meat, are more than enough to fill the demand. The pork meat annual demand is about 20 tons, which would require about 220 head of livestock per year to be slaughtered. The 21,000 animals bred are more than enough to fill the needs. The organic pig farms are concentrated in the districts of Brescia and Mantua.

5.7. Analysis of qualitative data

The analysis of the qualitative data was carried out as explained in methodology, considering the 14 questions of the qualitative part of the questionnaire, listed below.

5.7.1. Analysis of the responses to the qualitative questions

A) **School catering service organization**

Question 2: How the catering school service of your municipality is managed?
Question 3: How far the next call for tender will be done?
Question 4: Where is the cooking center for school canteens located?
Question 5: The water provided in school canteens of your municipality is:
Question 6: How are meals served in school canteens of your municipality?

B) **Canteen Committees**

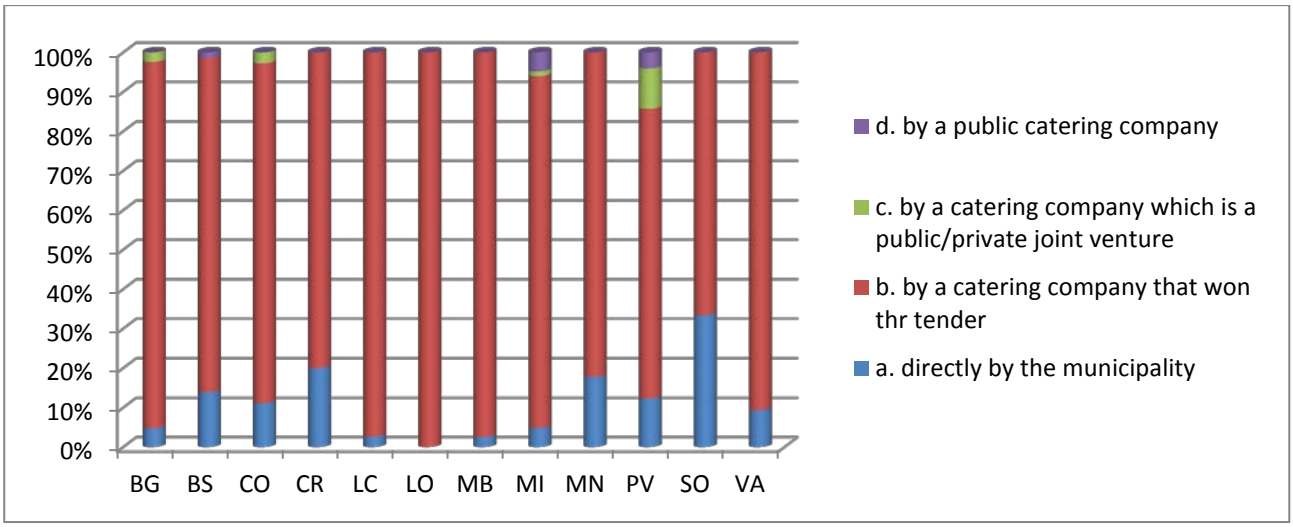
Question 7: Are there Canteen Commissions in your municipality?
Question 8: What persons take part to the Canteen Commissions?
Question 9: What types of checks are carried out by the Canteen Commissions?

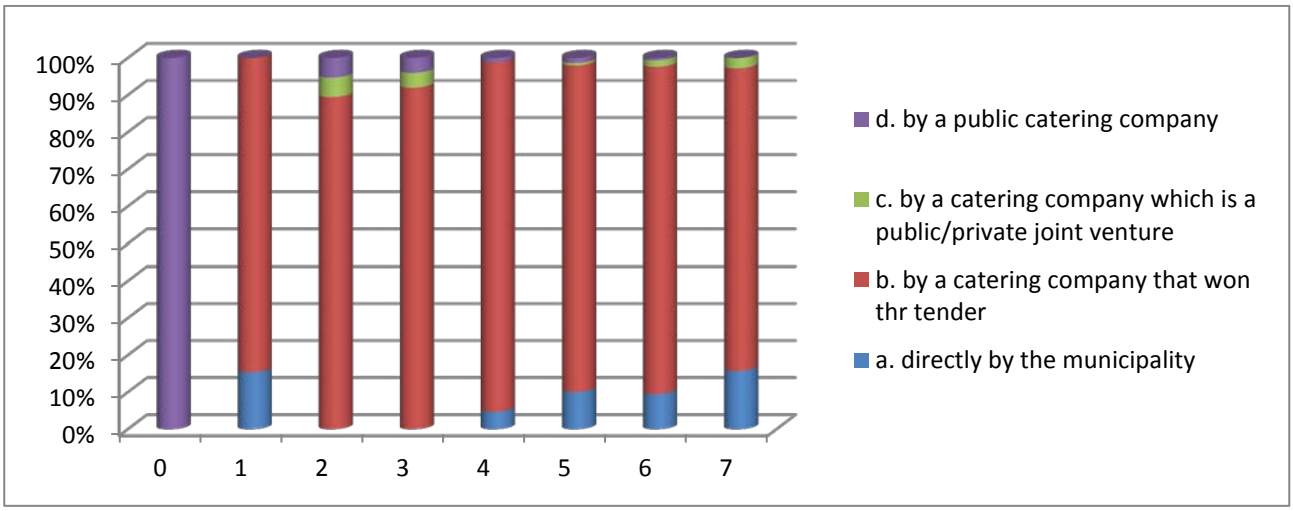
C) **Organic products**

Question 11: What were the reasons of the inclusion of organic products in the menus?
Question 12: Organic products perspective - Regarding the menus of school canteens the future plan of your municipality is to:
Question 13: Local/regional products perspective - Regarding the menus of school canteens the future plan of your municipality is to:
Question 14: In your opinion, what is the additional cost (on average) a meal with 50% organic ingredients compared to a conventional meal without any organic ingredient?
Question 15: What are the main difficulties met in the public procurement of organic products in the school canteens of your municipality?
Question 16: Do you consider useful to create an online information tool for organic and quality products?

Question 2: How the catering school service of your municipality is managed?

Fig. 37: Relative percentages of the different responses to question 2 by province (chart above) and by class of population (chart below)



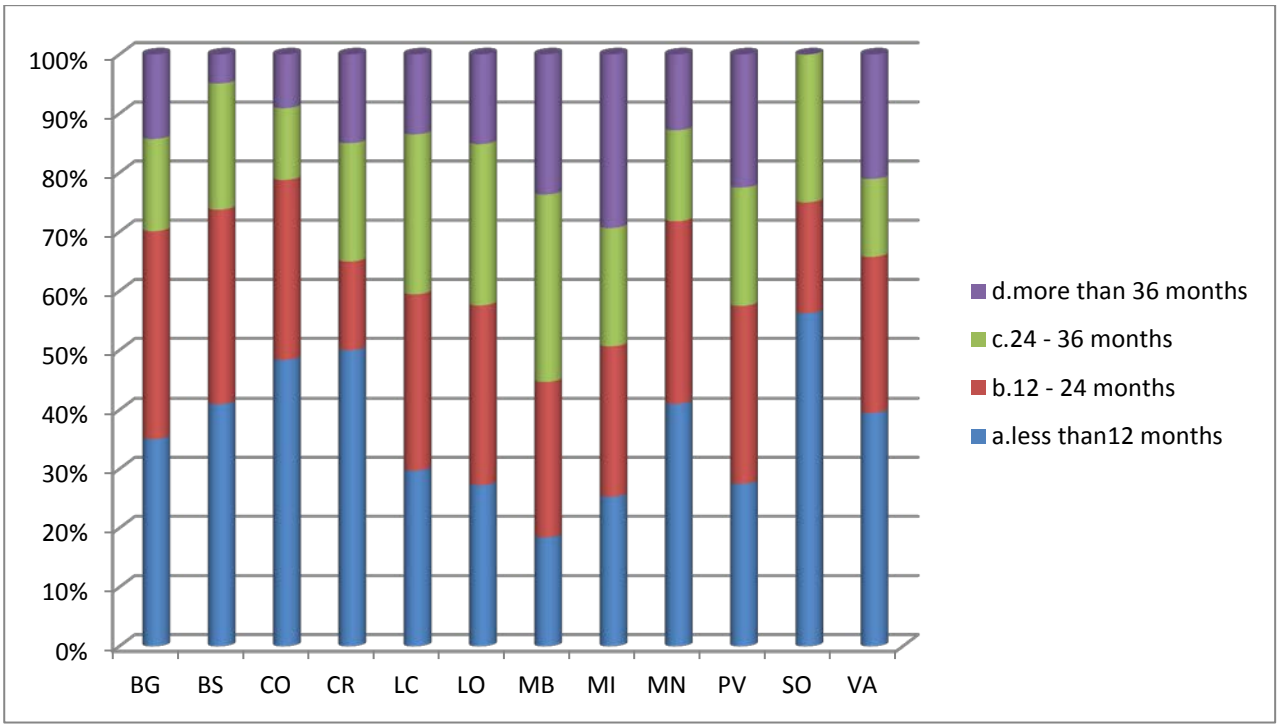


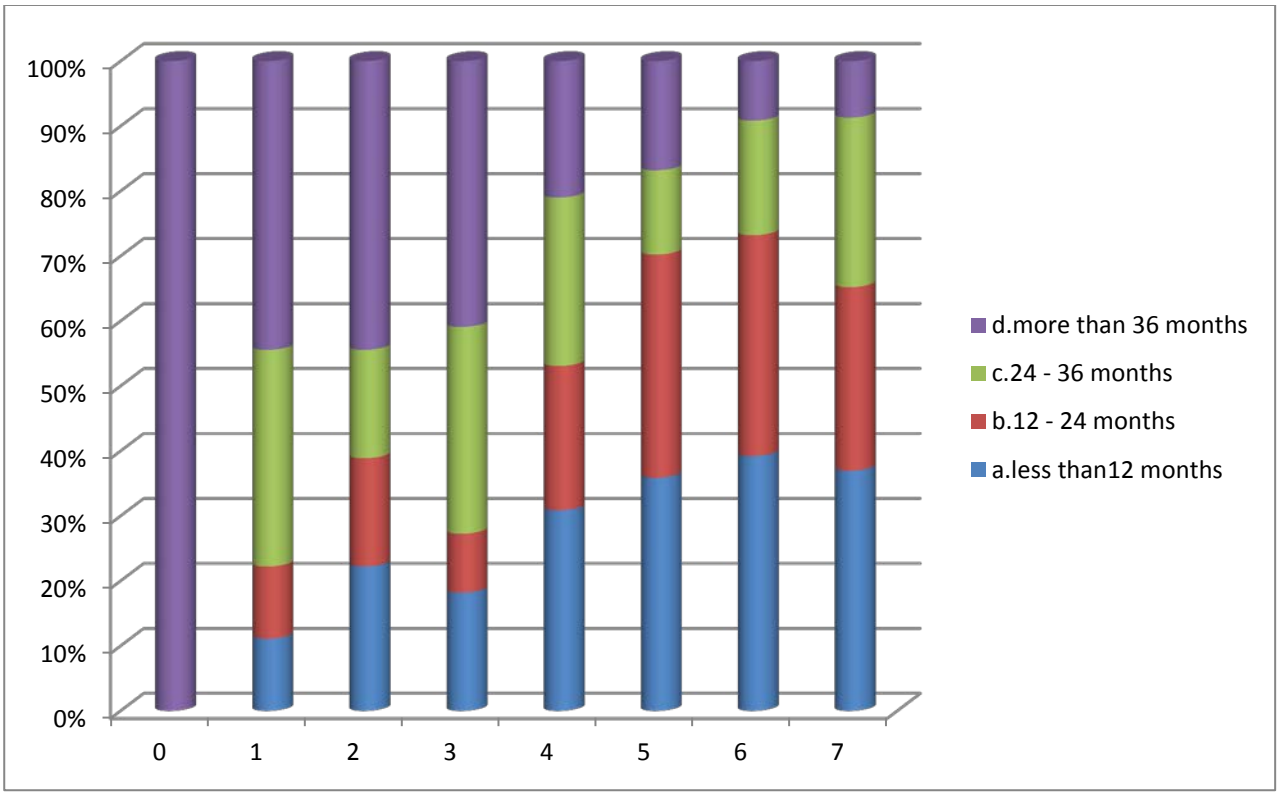
Arrangements for the implementation of the school catering service are different: the municipality can manage it with their employees (direct management), or contract out to a catering company the management of the service. Other arrangements regards the management of the service by public/private joint ventures or public catering companies. In any case, as a general rule, the municipality decides the basic guidelines of the service, both in the case of direct management, or in the case in which the service is contracted out.

The type of service much more frequent in Lombardy is the assignment to a catering company by a tender (87.7%). Less than 10% of the municipalities is under direct management (this case is concentrated in the smaller municipalities), and only 16 rely on the service to public companies or public/private joint venture. Among the public companies Milano Ristorazione, that manages the school catering service in all the city, is the most significant case in Italy, delivering more than 70,000 meals a day, which corresponds to approximately 15% of the total number of school meals provided in the region.

Question 3: How far the next call for tender will be done?

Fig. 38: Relative percentages of the different responses to question 3 by province (chart above) and by class of population (chart below)

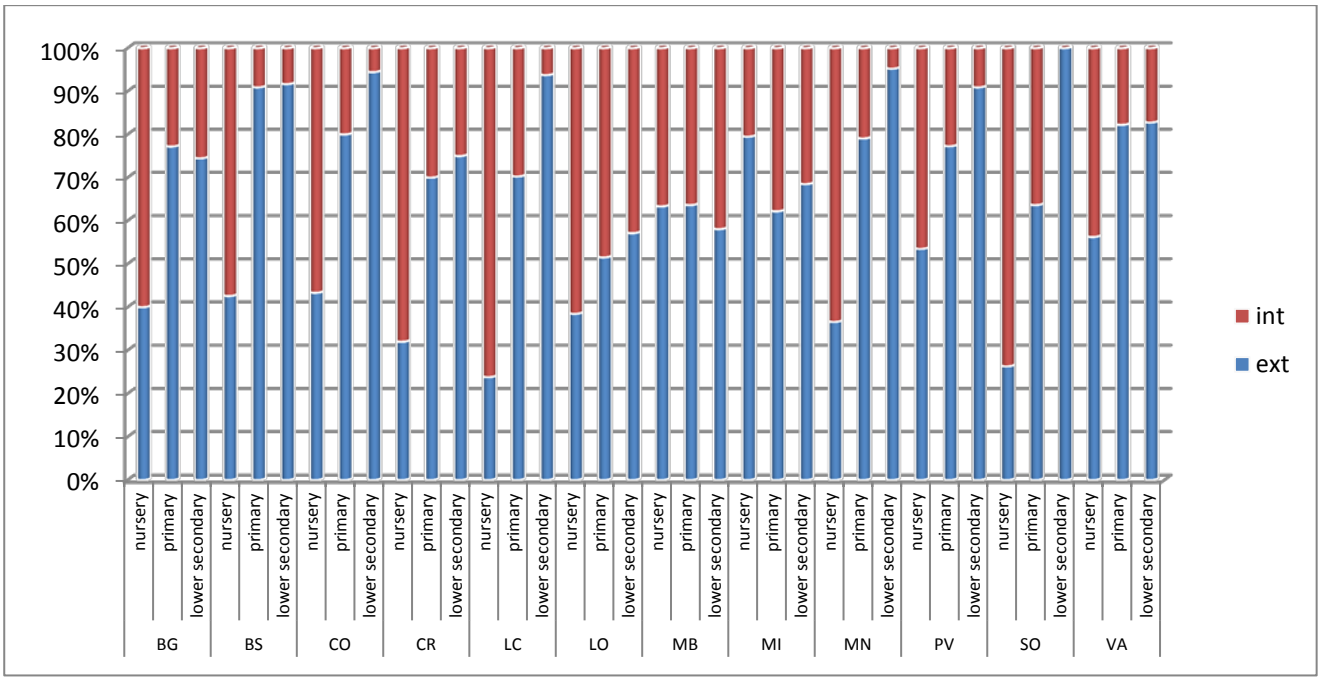


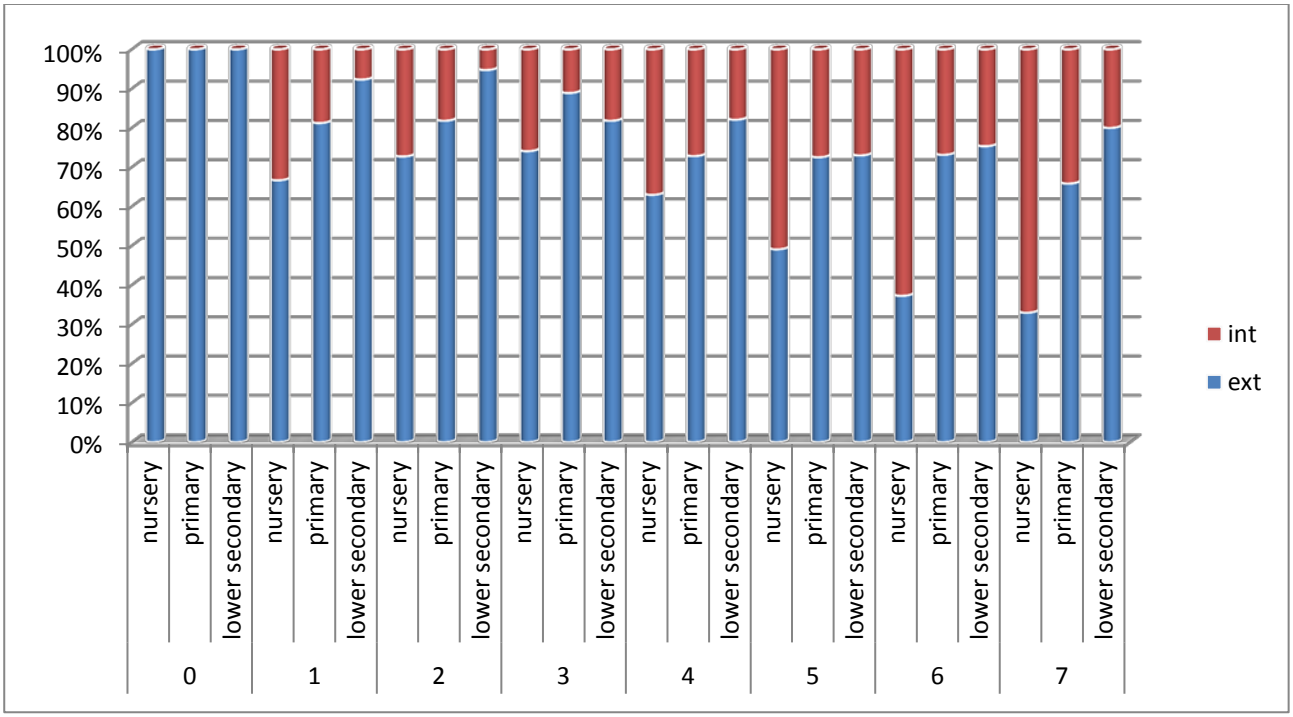


The interval between two successive tenders tends to increase in municipalities with greater population, while the data analyzed by provinces shows an irregular pattern.

Question 4: Where is the cooking center for school canteens located?

Fig. 39: Relative percentages of the different responses to question 4 by province (chart above) and by class of population (chart below)

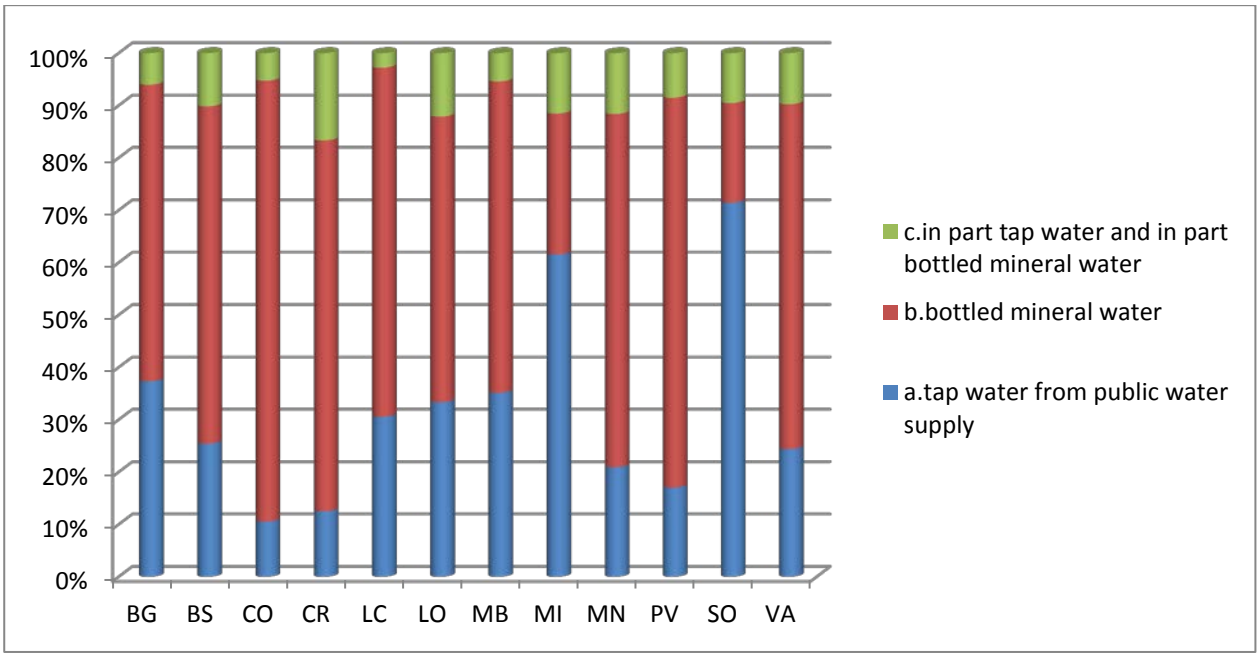


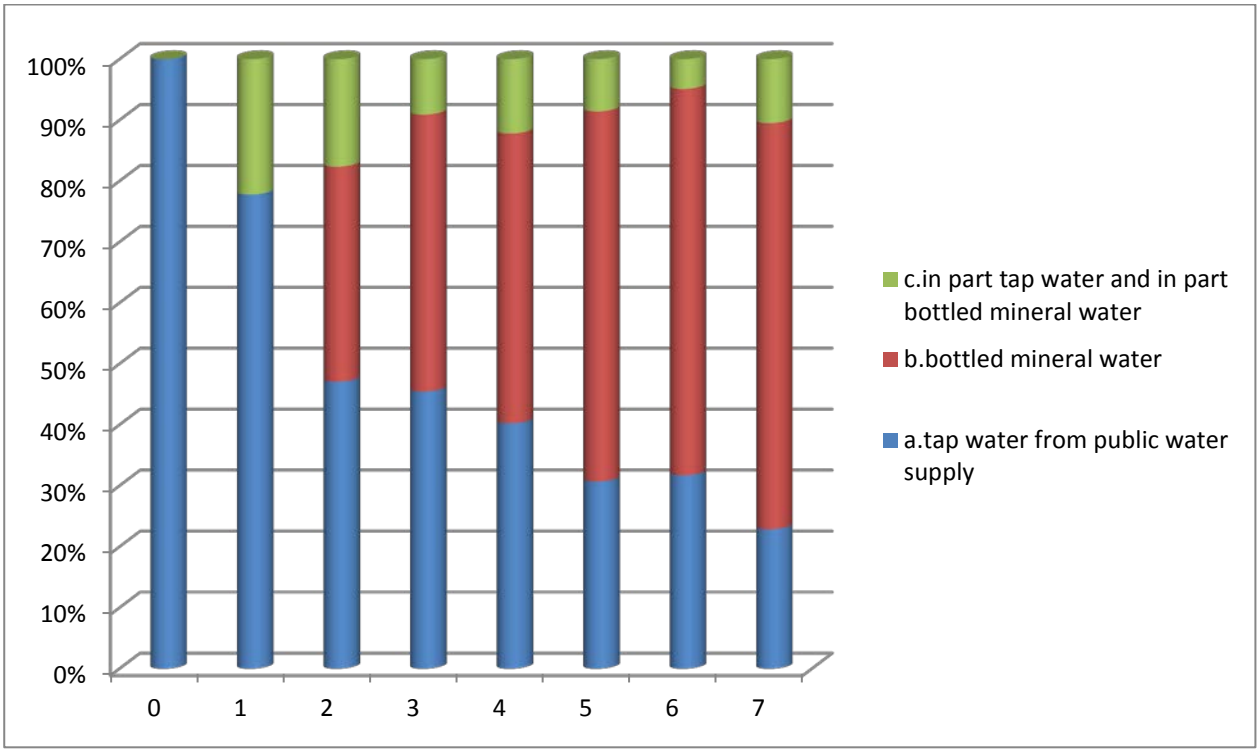


The production of the meals is realized in prevalence in central kitchens, that are located in a different place than where the meals are served. In this case meals are transported in cool boxes to the canteens from the central kitchen. The indoor kitchen is still used in just over half of the municipalities for nursery schools, while in the case of the primary and lower secondary schools significantly prevails the centralized kitchens.

Question 5: The water provided in school canteens of your municipality is:

Fig. 40: Relative percentages of the different responses to question 5 by province (chart above) and by class of population (chart below)



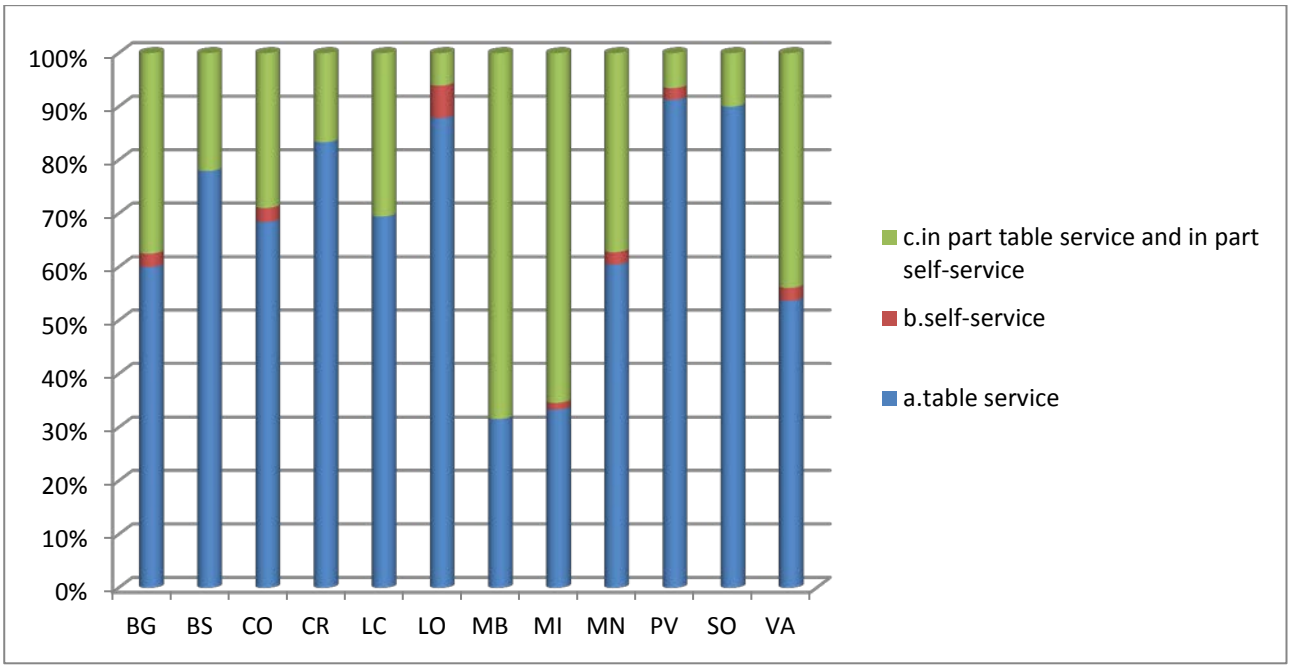


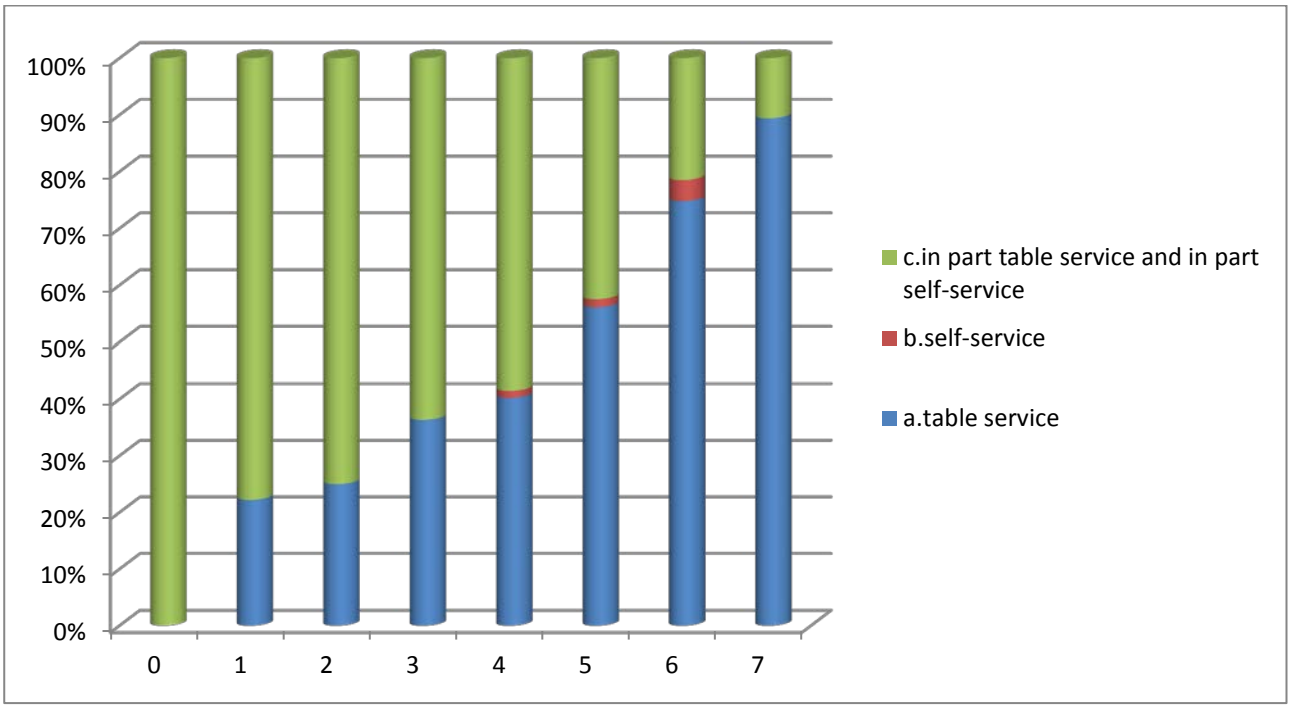
In Lombardy, the use of bottled mineral water is still widely and prevails over the tap water from public water supply, with the exception of the provinces of Milan and Sondrio.

Analyzing the data by classes of the population we can see how the use of bottled mineral water increases gradually with the decrease of the population of municipalities.

Question 6: How are meals served in school canteens of your municipality?

Fig. 41: Relative percentages of the different responses to question 6 by province (chart above) and by class of population (chart below)

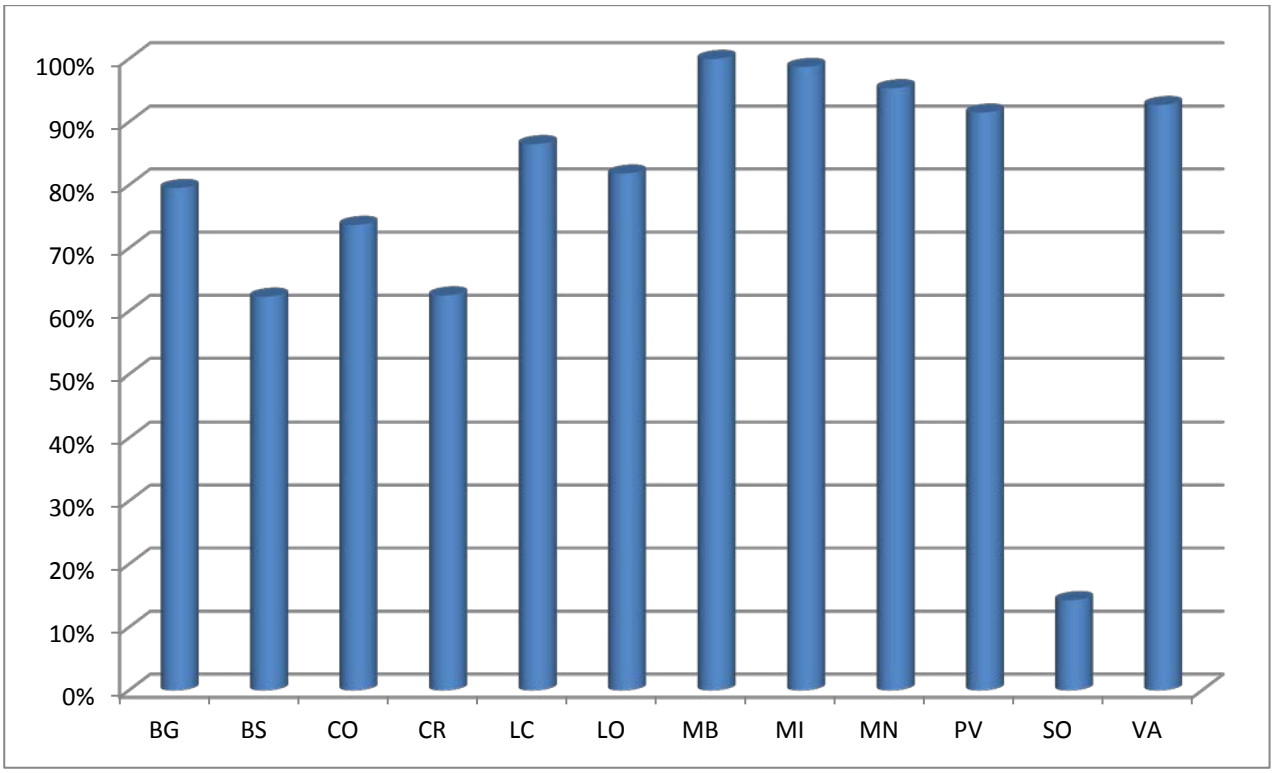


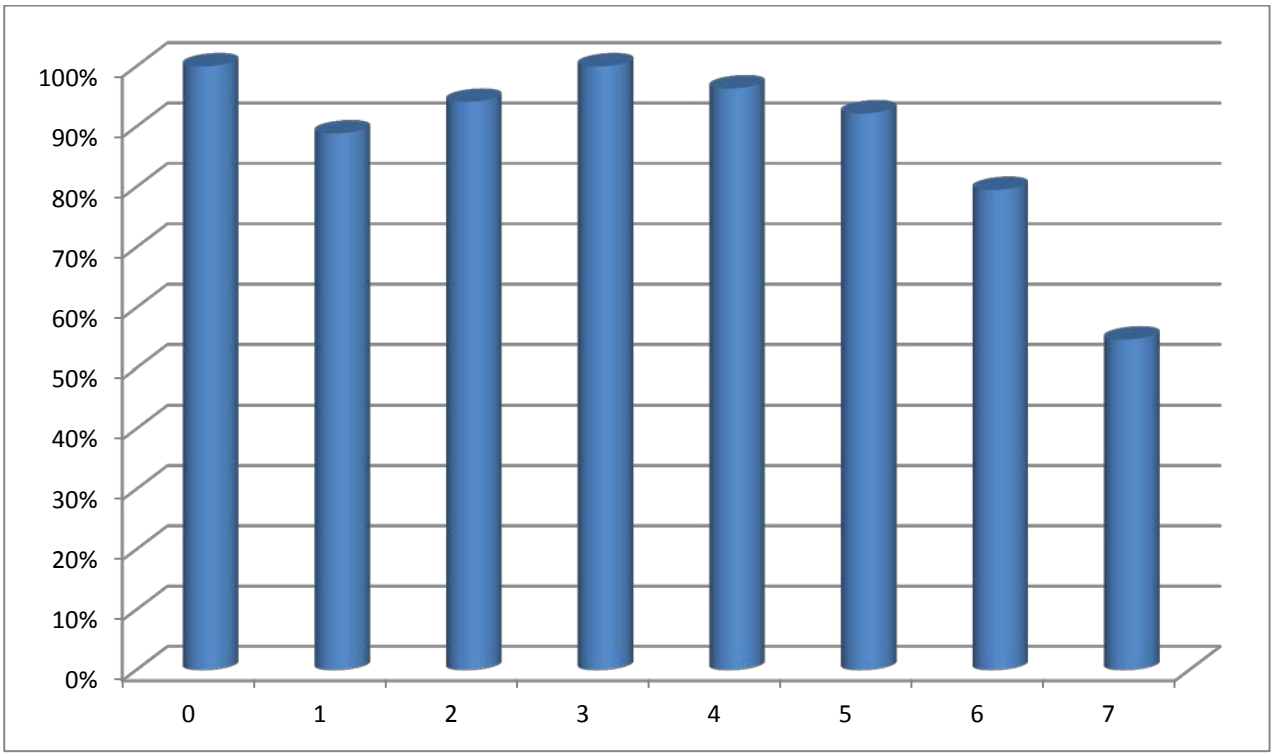


The use of self-service in school canteens of Lombardy region is still almost non-existent; about one-third of the municipalities claims to use both the types of service, the latter is probably used for elder kids. Analyzing the data by classes of the population we can see as the table service increases gradually with the decrease of the population of the municipalities, while, on the contrary, the self-service is used in a proportion slightly higher in larger municipalities.

Question 7: Are there Canteen Commissions in your municipality?

Fig. 42: Relative percentages of the different responses to question 7 by province (chart above) and by class of population (chart below)

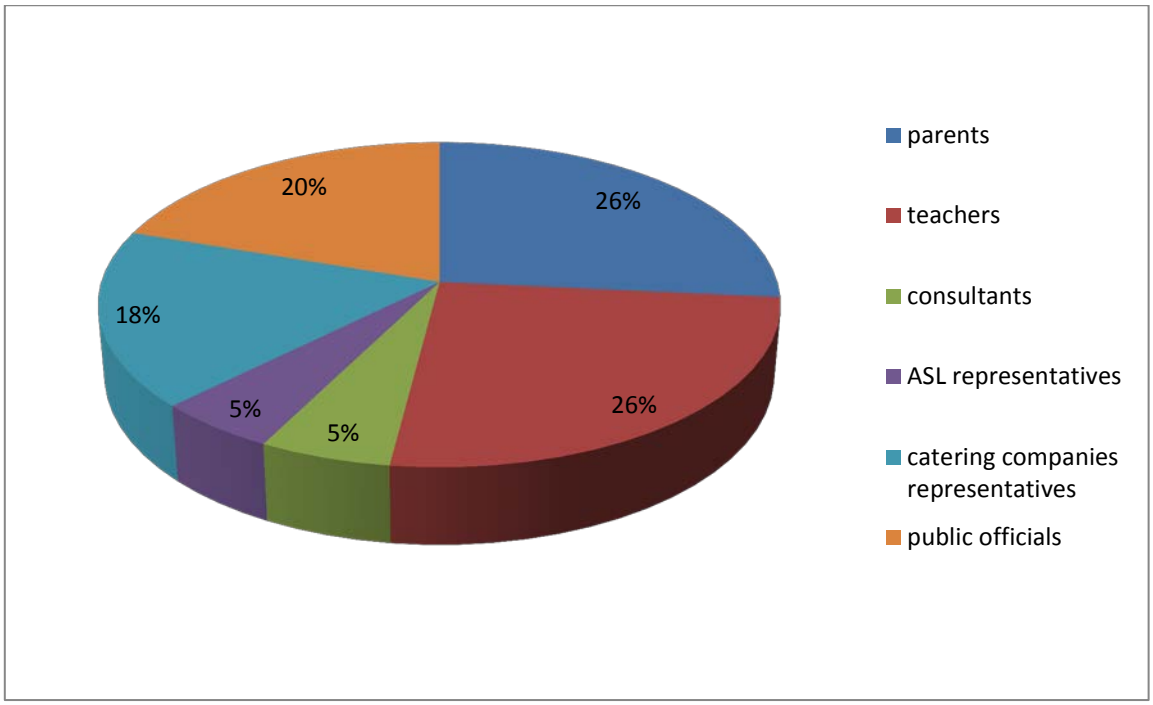




Canteens Commissions are present in Lombardy in 82.1% of the municipalities. In the provinces of Milan and Monza Brianza are present in almost all cases, follow Mantua and Varese.

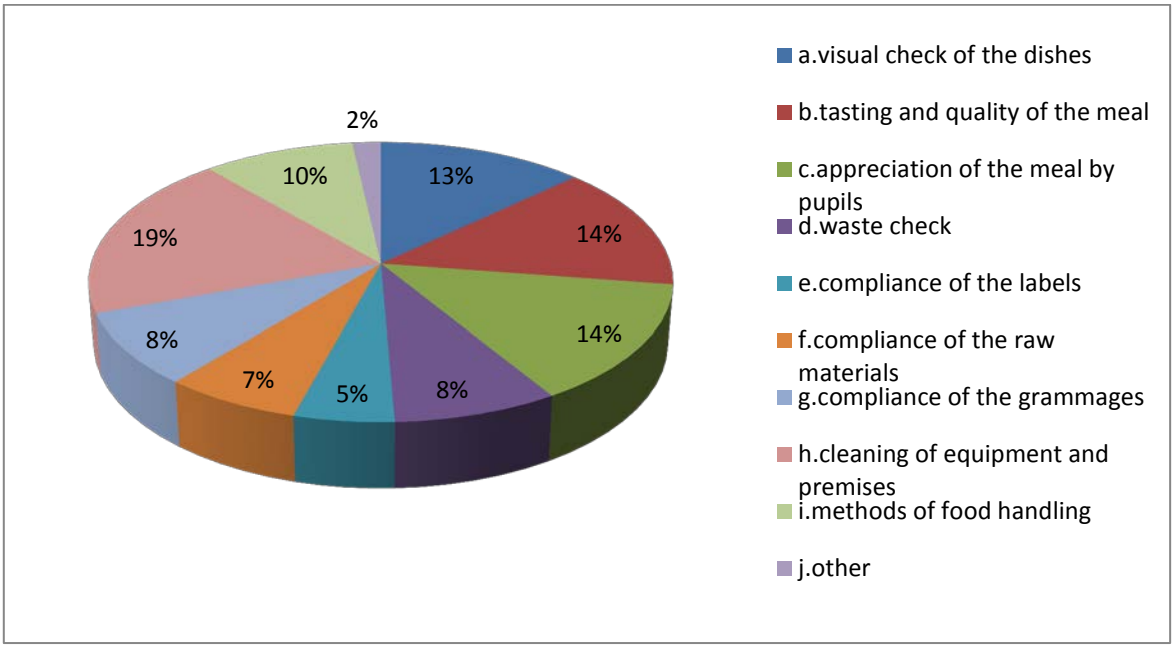
Question 8: What persons take part to the Canteen Commissions?

Fig. 43: Relative percentages of the different responses to question 8



Question 9: What types of checks are carried out by the Canteen Commissions?

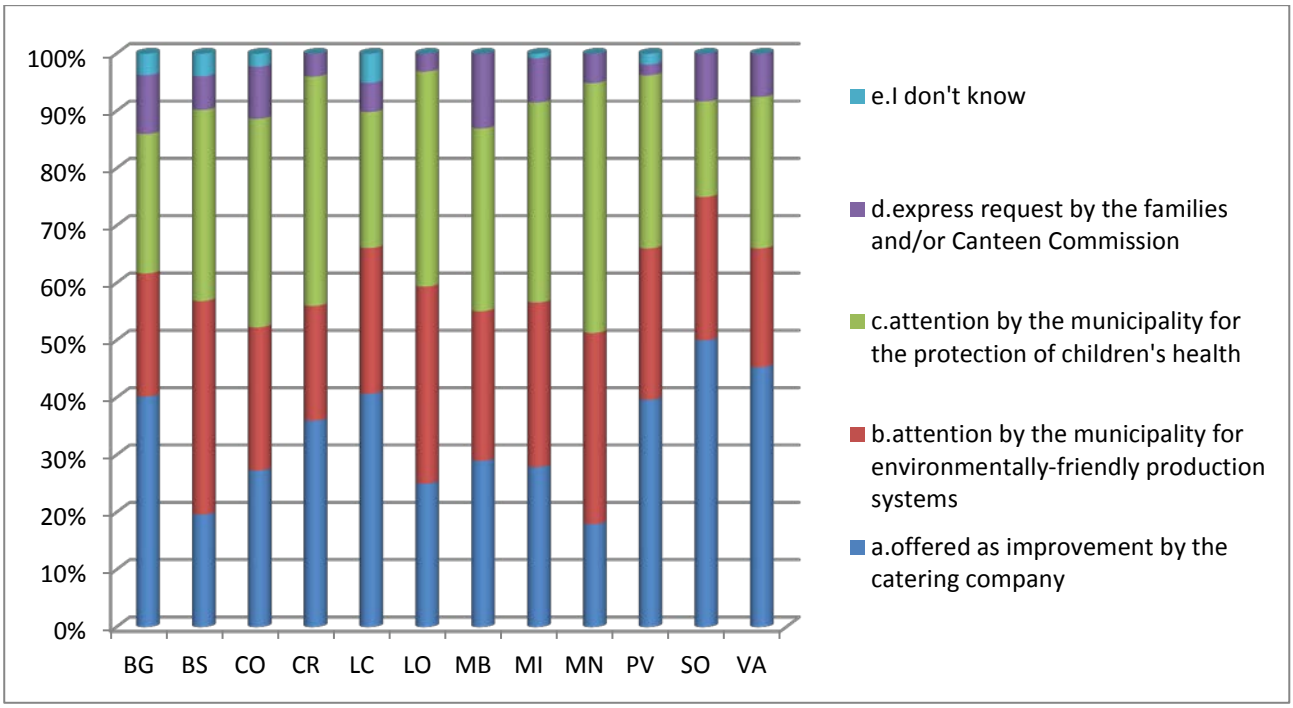
Fig. 44: Relative percentages of the different responses to question 9

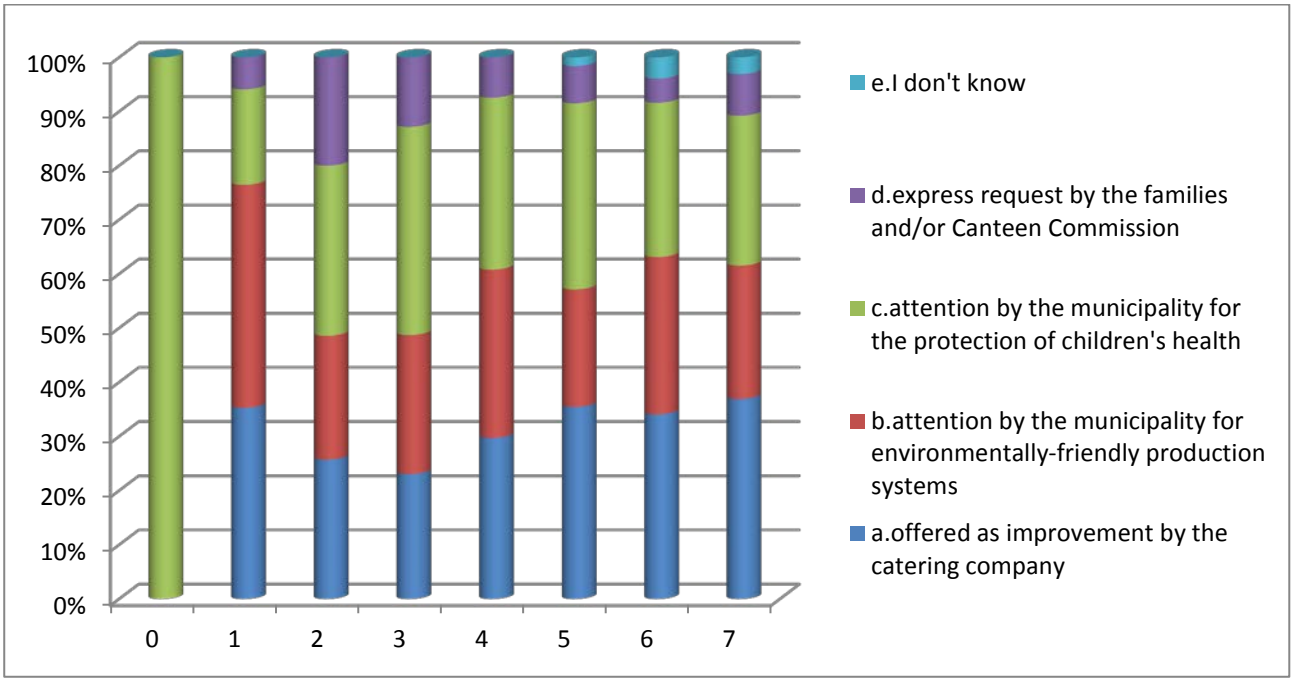


In Canteen Commissions parents and teachers, followed by public officials play an important role in the control of the quality of meals and of the service. The checks carried out are various, first of all the cleaning of equipment and premises, followed by tasting and quality of meals and by appreciation of the meals by the pupils.

Question 11: What were the reasons of the inclusion of organic products in the menus?

Fig. 45: Relative percentages of the different responses to question 11 by province (chart above) and by class of population (chart below)

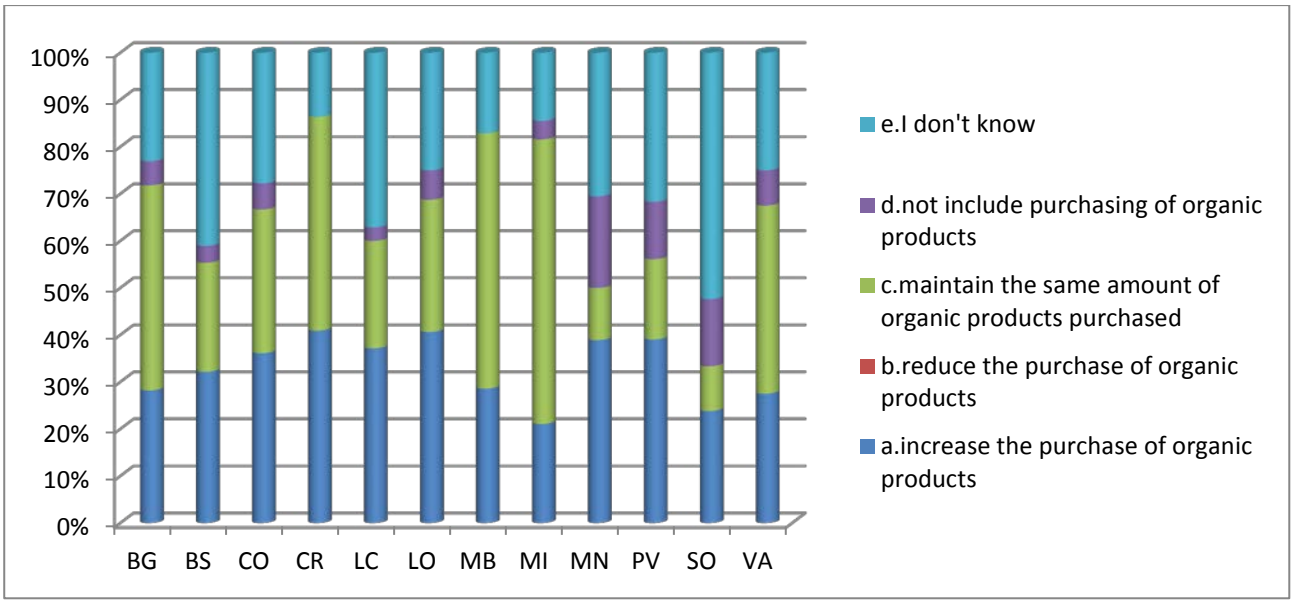


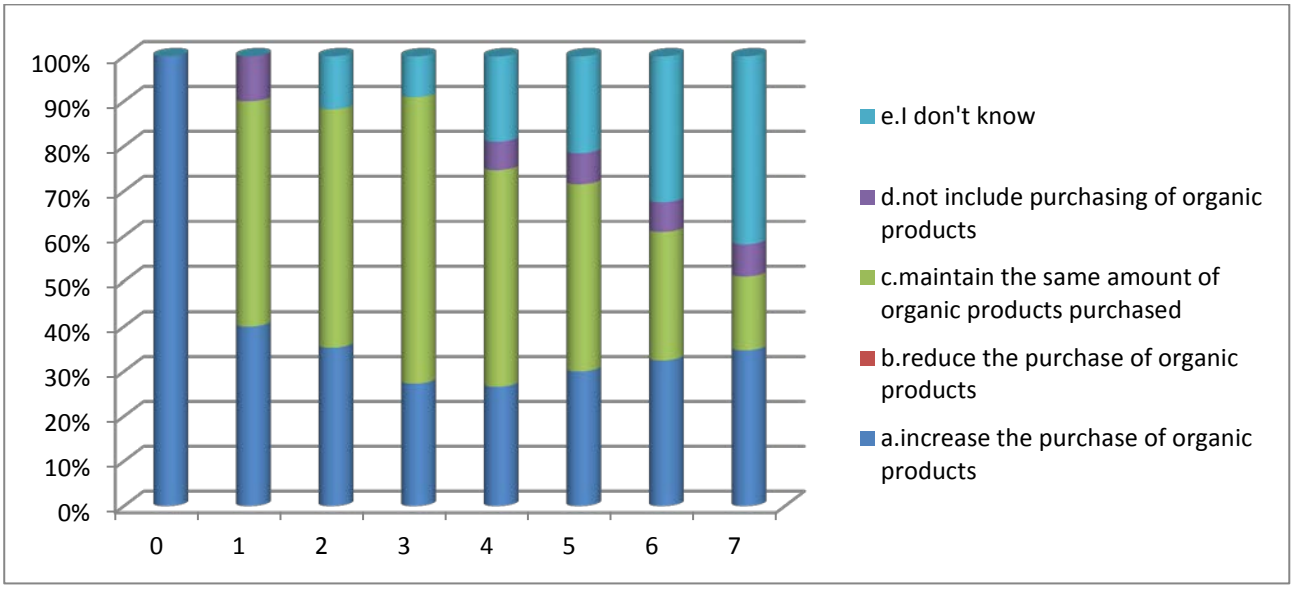


The analysis of the research data shows that the prevailing reasons for the inclusion of organic products in the menus are the cases when they are offered as improvements by the catering companies and the attention paid by the municipalities for the protection of children's health, which prevails slightly on the attention towards the environmentally friendly production systems. Far less important is the express request by the families and/ or Canteen Commissions.

Question 12: Organic products perspective - Regarding the menus of school canteens the future plan of your municipality is to:

Fig. 46: Relative percentages of the different responses to question 12 by province (chart above) and by class of population (chart below)

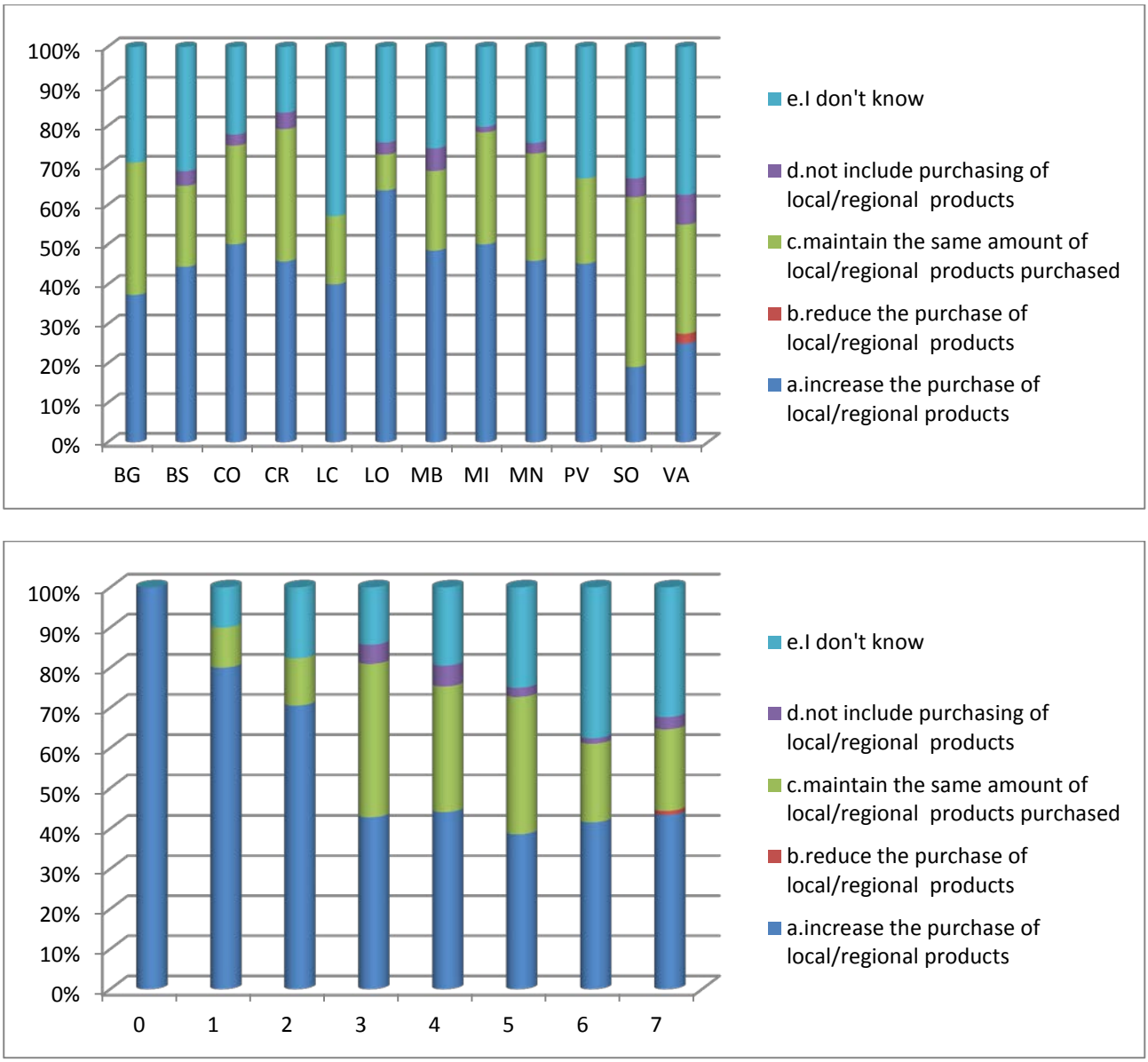




Two thirds of the municipalities that responded to the questionnaire say they intend to increase or maintain unchanged the amount of organic products bought. No one claims to want them to fall. Only 6.2% say they do not involve the purchase of organic products,% much lower than that for municipalities which currently do not have this type of product in the menu. This means that several municipalities that do not require organic products now are thinking about introducing them in the menus in the future. Analyzing the data by classes of the population we can see as the sum of the items a. and c. (increase and maintain the purchase of organic products) is over 85% in the municipalities more populated, and decrease in the smallest ones, while, with decreasing population, the % of "I don't know" is increasing.

Question 13: Local/regional products perspective - Regarding the menus of school canteens the future plan of your municipality is to:

Fig. 47: Relative percentages of the different responses to question 13 by province (chart above) and by class of population (chart below)

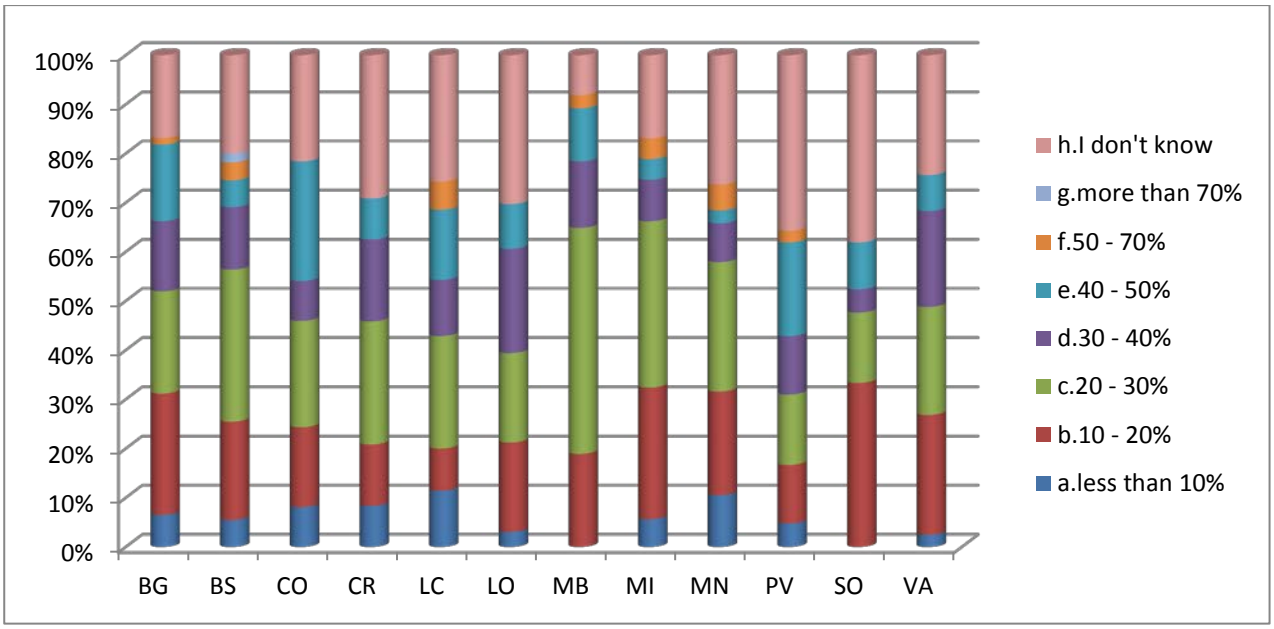


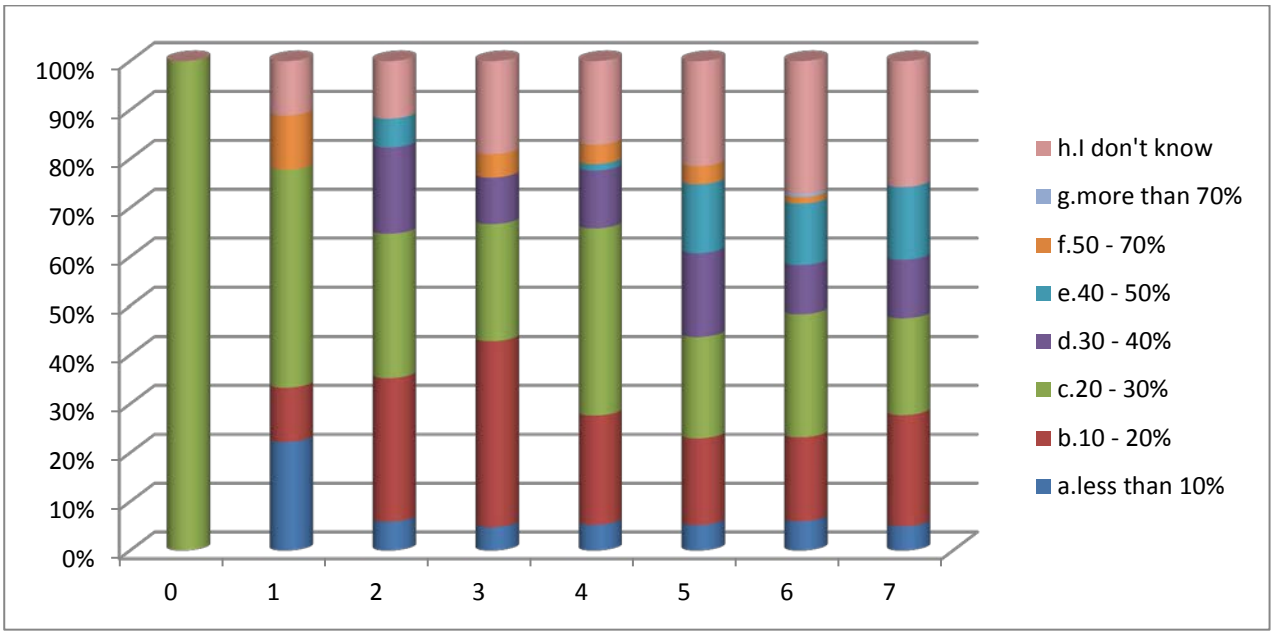
Data from the research on school canteens in Lombardy, shows that over two thirds of the municipalities (68.7%) who responded to this question say they intend to increase or maintain unchanged the amount of regional and / or local purchase. Only one claims to want them to fall.

Only 2.5% say they do not involve the purchase of regional and/or local products, a percentage much lower than that for municipalities which currently do not have this type of product in the menu. This means that almost all the municipalities that do not now require regional and/or local authorities are planning to introduce it in the menu in the future. Analyzing the data by classes of the population, known as the sum of the responses to "increase" and "maintain" decreases with the decrease of the population, while the% of "I don't know" is increasing.

Question 14: In your opinion, what is the additional cost (on average) a meal with 50% organic ingredients compared to a conventional meal without any organic ingredient?

Fig. 48: Relative percentages of the different responses to question 14 by province (chart above) and by class of population (chart below)

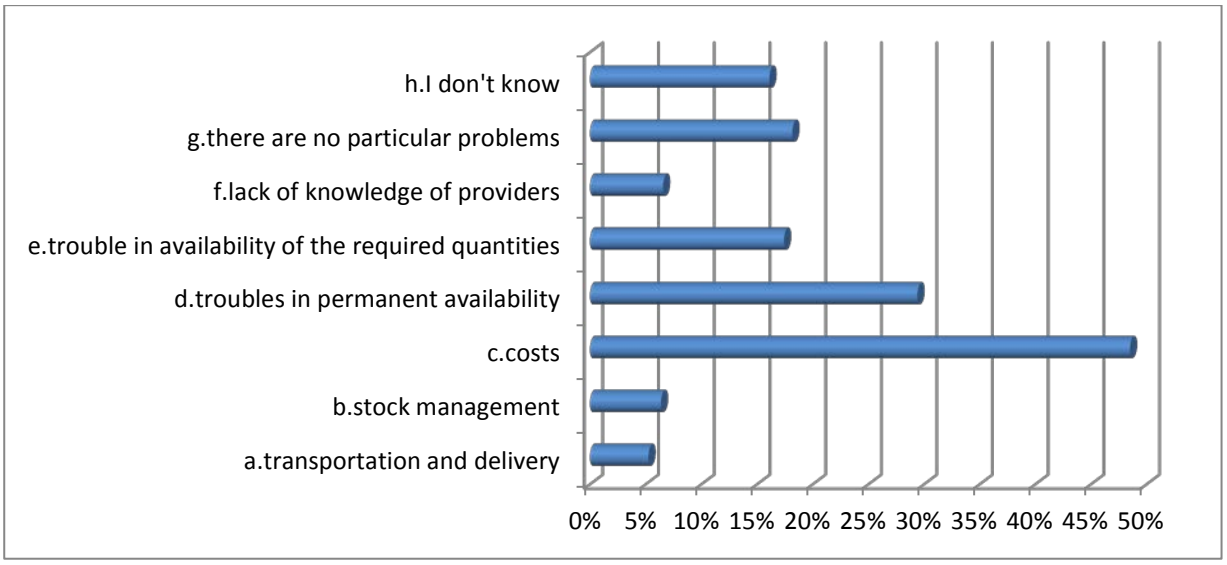




The replies to the questionnaire show that the perception concerning the actual cost of the organic does not deviate much from reality. In fact, for most of the Lombard municipalities the cost of extra food a meal with 50% of organic products compared to a conventional meal without organic ingredients, at around 20%. This figure is very closer to reality, which means that the municipalities of Lombardy have a fairly realistic perception of the costs of organic products and their difference in price compared to conventional products. Once again the answer are more homogeneous when analyzed by class of population.

Question 15: What are the main difficulties met in the public procurement of organic products in the school canteens of your municipality?

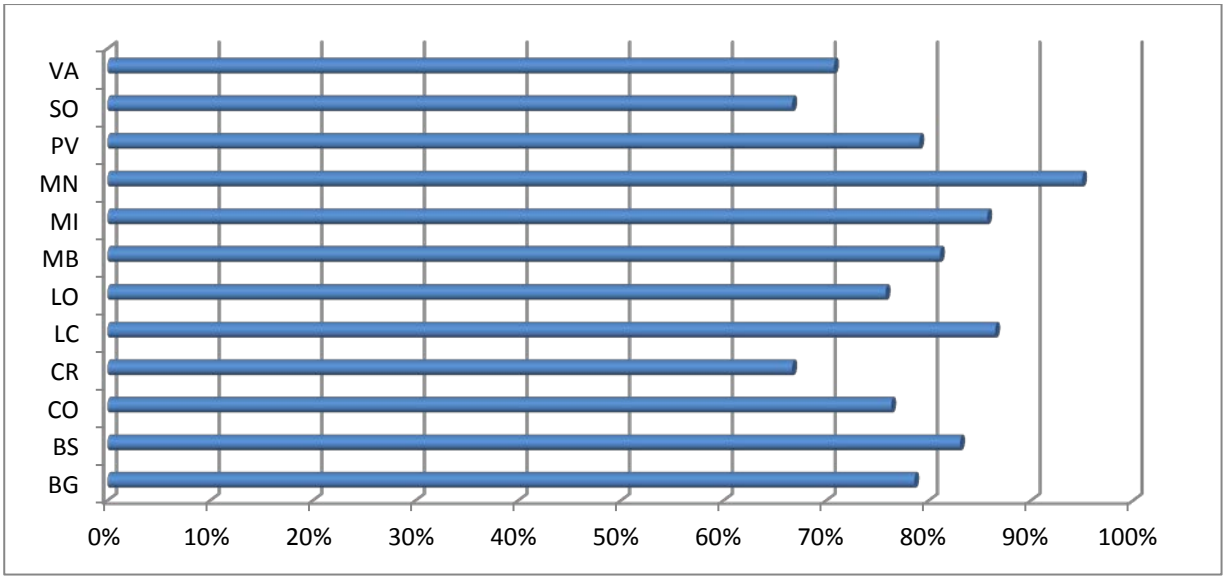
Fig. 49: Relative percentages of the different responses to question 15



The most frequent reply to this question, related to the main difficulties encountered in the insertion of organic food in school canteens, regards costs, followed at a distance by the difficulties of continuous availability. A lesser but significant percentage, however, doesn't consider to have particular difficulty in finding organic products.

Question 16: Do you consider useful to create an online information tool for organic and quality products?

Fig. 50: Relative percentages of the different responses to question 3 by province



By data from the Lombard shows that 80% of the municipalities that responded to this question considered useful to the creation of one-stop online information for organic products and quality.

5.7.2. Analysis of the public calls for tender

54 calls of tender, provided by as many municipalities spread out in the Lombardy region were analyzed.

These information can be found in the tender documents, in which the municipality specify how many products are required as organic, from integrated farming and/or local, PDO, PGI, fair-trade.

The monthly frequency with which every category of products are consumed in school canteens was detected by questionnaires. In this analyses we focused on the means by which the products with specific quality requirements are requested.

The results are the following:

Organic products: in all the tender documents analyzed the demand for organic products is correctly specified, by reference to EC Regulation 834/2007.

PDO and PGI: in all the tender documents analyzed the demand for quality products is correctly specified, by reference to the exact name of the product and demonstrating a good knowledge of their characteristics.

Fair-trade: in this case the demands are not always comply with the international agreements governing the sector.

Products from integrated agriculture: only 40% of the tender documents analyzed, in which this request was displayed refer to the UNI standard 11233 "Integrated production systems in agricultural food chains - General principles for design and implementation in vegetal food chains", the only existing regulation on the sector today.

Local/Regional products: analyzing the tenders document we found a lot of different expressions to describe the products commercialized in the "local markets. These can be grouped into 3 categories:

- **Zero Kilometer**, an expression that normally indicates the shortness of the distance from the place of production to those of consumption.
- **Short chain**: it means reducing the number of steps along the distribution channel, between the producers and the customers, in which case it reduces the number of commercial intermediaries: this allows lowering the cost of distribution and a lower final price; however this expression is often confused with
- **Local products**: in this case the emphasis is often .placed on the characteristics of "food culture" , linked to culinary traditions and local productions.

6. Discussion

6.1. Results of the analysis of quantitative data

The table of correspondence between ISTAT/EUROSTAT and SIARL codes is an important tool that will allow future researcher and the public body to compare properly national and regional data.

The production of cereals in Lombardy (in particular rice) cover a significant quota of national surface(12,43%), while vegetables (5,84%) and potatoes (3,28%), and, above all, fruits (1,39%) and dry pulses (1,12%) cover a small area compared to the national cultivated surface of the different crop groups.

This phenomenon is even more pronounced for organic crops, for which the % of cultivated area for different crop groups considered are much lower compared to the national cultivated surface with organic methods: respectively 4,54% for cereals, 2,29% for vegetables, 1,39% for fruit plants, 0,85% for dry pulses and only 0,52% for potatoes.

Livestock breeding in Lombardy have a great diffusion: in the region, in particular the amount of pig farms (51,00% of IT number of pigs are bred in Lombardy) and of cattle ones (26,55%) enable the Lombardy region to be the leader in IT for the breeding of these animals. Poultry breeding is still substantial (15,83% of IT total).

Regarding organic livestock the percentage of animals bred with this method are much lower compared to the national consistency: the number of organic cattle in Lombardy amounts to only 3,67% of national data, while the organic poultry are 7,52%. Only organic pigs represent an important share of the national data (20,04%).

The distribution of organic farms is not uniform in the region: in the province of Pavia nearly 70% of the regional surface cultivated with organic method can be found. In particular in this province are concentrated the organic cultivation of cereals (in particular rice). The most important area cultivated with organic vegetables and fruits is the province of Mantua, while the leadership for the organic cropping of dry pulses is shared between the provinces of Pavia and Mantua.

The organic livestock of pigs and poultry can be found above all in the province of Mantua, while organic cattle are not particularly concentrated in a specific area.

The collected results show that Lombardy is a very important agricultural region, in which, however, organic farming is not widespread.

On the contrary, the overall results of the research on the school public procurement show that in Lombardy, which, at the time, hasn’t produced its own regional law (as well as other 8 IT regions), but has adopted guidelines on the subject, the quality of service and supply of products ranks at the level of the regions traditionally considered both at national and EU level, as examples to follow, such as Emilia-Romagna.

The amount of organic products required by the regional school canteens, compared with other IT regions is the highest in absolute values; considering relative values (on the basis of the number of population) the Lombardy region is however at the same level of the regions universally considered more "virtuous".

The first analysis of the correlation between relevant quantitative data and parameters such population, population density and surface allow us to exclude the cases with no (or low) signification: all the correlation between foodstuffs annually purchased and surface of the municipalities were excluded from subsequent analysis for this reason, while foodstuffs from integrated agriculture were excluded for lack of a sufficient amount of data.

In the first analysis the parameter used in relation to foodstuffs was the total amount of the foodstuffs annually purchased. Data collected shows some inconsistencies in the correlations between products from conventional agriculture and the population of the municipalities: when was analyzed the quantity of such products purchased annually, many of these were positively correlated with the population, while the correlation was negative when one considered the number of products purchased products.

The same occurred, although to a lesser degree, by analyzing the correlation with the population density of the municipalities.

On the contrary, analyzing the similar correlations between products from organic agriculture and the population of the municipalities don’t show any inconsistencies.

This is most likely due to the fact that the amount of products from conventional agriculture is still high when the number of meals is high, even if the number of products required decreases. To test this hypothesis, in the step of the analysis of the correlations, we decide to use as a parameter the total amount of foodstuffs purchased **divided by the number of meals provided**.

The correlation more significant are those between foodstuffs from organic farming annually purchased divided by the number of meals provided and population of the municipalities, followed by that between the same type of products and the population density of the municipalities. In both cases, high correlation were found for all products, except for those of the category meat and byproducts.

On the contrary, the correlation between foodstuffs from conventional farming annually purchased divided by the number of meals provided and population of the municipalities in many cases is highly inverted, except in the case of the categories of meat and byproducts and of some products of the category milk and byproducts.

The correlation between the parameters of the foodstuffs and the population of the provinces show the same results only in the case of organic foods. This is due to the fact that the most significant result is that relative to the population of the municipalities: within the province there are both common to both large and small as the number of population.

At the end it is possible to state that with the increase of the population of the municipalities and also of their population density, the amount of products from organic agriculture purchased raises, while in the same time the purchase of products from conventional agriculture decreases.

The result of the cluster analysis in the case of municipalities cannot be easily interpreted: in which the municipalities were correlated both with conventional and organic products, highlights the existence of very heterogeneous groups of municipalities, which contain in the first case 86% of the sample, and in the second over 95%.

The cluster analyses of the provinces correlated to conventional products forms two groups of provinces for which, in this moment, we are not able to identify the elements that could give meaning to these groupings.

Instead, the cluster analyses of the provinces correlated to organic products shows as the provinces of Milan, Monza e Brianza and Bergamo form a significant group, due to the fact that the urbanization in these three provinces is very high and both the population of the municipalities and their density are in this area higher than regional average.

6.2. Results of the analysis of qualitative data

In the analysis of qualitative data the trends established in the quantitative analysis are confirmed: the highest consumption of drinking water, the more frequent use of self-service and the greater propensity to purchase organic and/or local products are found in the most populated municipalities, while the analysis made for provinces don’t show homogeneity in the data detected.

Moreover, the spatial analysis carried out with the geodatabase tool shows that the areas where the demand of organic products is highly concentrated (provinces of Milan and Monza-Brianza) are far from those where the same products are cultivated (provinces of Pavia and Mantua).

In the tenders for providing the school catering service issued by the municipalities a high demand of organic and local products was found (sometimes this two requirements are coupled), while the request of products of integrated agriculture is actually limited.

The demand for organic products is formulated clearly referring to the EU standard 834/2007. That of products of integrated agriculture is often referred to UNI standard 11233, following the directions of the UNI standard on the drafting of the tenders for the public procurement and to Minimum Environmental Criteria (in IT CAM) for the public catering of the Ministry of Environment.

The demand for local products, in the absence of an adequate knowledge of the quantity and location of productions, are often disregarded and create big problems for companies in the compliance with contracts.

7. Conclusions

The role of the public catering as an innovative instrument for the local development and an important opportunity for the farms. The results are the first step of the research project Bioregione, which main aim is the development of approaches and tools to design a regional food systems capable of economic self-sustainability and to generate systemic positive effects. Similar processes are undergoing in different areas of the world with the so-called experiences of Local Food Systems (LFS) (Feagan, 2007), according to the US definition, or Local Agrifood Systems (LAS), which instead is the French definition (CIRAD-SAR, 1996).

The demand for local products continued to increase in in recent years. It is expressed in different forms: short chain products, zero km products, local products; expressions which are often used one for the other.

The demand for local products is related to an enhancement of the traditions of the area, linked to the presence in the menu of regional dishes, and therefore has a more specific cultural value.

It is necessary to reach a shared definition of the term *local*, which should be based by default on a distance. However, first of all it is essential defining this distance and if this number can be valid for all products and for all situations.

We try to give a definition of the term *local*, to be included in the drafting of the new standard UNI about the drawing of the menus currently under discussion:

A local product is a food product whose entire production chain, including farming, processing, transportation from production sites to those of consumption is carried out within a predetermined radius of kilometers from the place of consumption.

The number of kilometers to be specified depends on several factors: first of all is necessary to consider:

- the entire route really performed by the food before reaching the consumer's table;
- the total volumes of the request: the quantity and the problems of supply are different for a big town than a small village;
- the number of miles also can/should be differentiated according to the category of products;
- the real availability of the local products required in neighboring areas.

The continuous improvement of the quality of procurement and of mass catering service can be realized by operating several choices which altogether can ensure the achievement of this goal. First of all the development of local and sustainable agri-food systems should be fostered, by coordinating supply with demand: unachievable: citrus fruits, fish and olive oil will always be found outside the region, while, for example, vegetables, rice, meat can reasonably be sourced locally.

In order to increase the percentage of local food in the providing of institutional catering it is necessary to know very well both the demand of mass catering and the supply chain of local products and: in several cases it was shown that the mass catering can be a driving force for the development of local and sustainable agri-food systems.

Furthermore, the catering service is very easily suitable to a share on a territorial basis. It is possible to achieve different forms of integration:

- **horizontal integration**: small-medium sized municipalities may share tender documents, with the goal of making a single tender, as well as share facilities such as cooking centers, that are often underutilized,
- **vertical integration**: is it possible to realize different forms of integration in the same area, between the various sectors of the mass catering: schools, hospitals, day-care institutions for elder people: in this way it is possible to reduce costs and streamline the service.

The development of the integration of services allows streamlining the environmental and economic costs, even by checking the best market conditions and sharing facilities and human resources.

The rationalization of the supply chains of institutional catering, their qualification and improving the sustainability of the system are a significant challenge for public institutions.

The first important result to be achieved is to make possible a new ongoing relationship between the demand of the institutional catering, which requires constant supplies and relevant quantities, and the system of local food production.

The difficulties in satisfying the current demand can be overcome with a higher/better knowledge of territory, production (quantity, quality, spatial distribution, seasonal availability), required quality standards (food safety, etc..) with an aggregation of sales based on local and multi-product platforms and a more efficient organization of supply chains.

In this sense, the provision of a flexible tool such as the geodatabase can allow a friendly and constantly updated access to data by stakeholder data. This would allow:

- producers to orient their production towards a fast-growing market such as the restaurant, public and private;
- buyers of catering companies to satisfy the increasing demand for organic, local and quality products by public bodies;
- technicians of public bodies to draw up more sustainable tender documents.

8. References

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9. List of activities

Participation to the panel discussion "The certification : current status and prospects " inside the Congress of CCPB "The future of organic catering " - MIA Rimini Fair - February 2011

Participation in the conference "Values of Italian fruits and vegetables. Integrated production and food security " - MIA Rimini Fair - February 2011

Report " The school catering in Lombardy : first presentation of research results " - Conference of the Lombardy Region ,"the quality of school meals in Lombardy " - BtoBIO Fiera Rho - Milan - May 2011

Report "Local food systems and regional development. The case of Lombardy " - XXXIII Scientific Conference dell'AISRe (Italian Association of Regional Science) " institutions , regional networks and national economic system : the governance of local relations - national - Rome - September 2012

Report or "Local food systems and regional development " - Conference of the Municipality of Milan " AgriCity - Presentation Cascine Open " - Milan - September 2012

Report " The reconstitution of local markets through mass catering : the Italian case in the European context " within the Conference "The participatory project Bampè , submission guidelines , the comparison with other national experiences " organized by Project Bampè - children and agricultural products of excellence at the Biblioteca Comunale di Sassari - Sassari - October 2012

Report or " local food systems and regional development. The project bioregion " - Meeting of Lombardy as part of Slow Food Salone del Gusto 2012 - Turin - October 2012

Report " Specifications for tender : environmental and economic sustainability " in the workshop "Catering educational and environmental sustainability" organized by the Chamber of Commerce of Turin at the Centro Congressi Torino - Turin - November 2012

Report "The project Bioregione - state of the art , implementation and synergies with local stakeholders " organized by the WG "Towards EXPO 2015" - subgroup " Catering " of the Lombardy Region at the headquarters of the Lombardy Region - Milan - December 2012

Report "The Project bioregion - local food systems and collective consumption " within the Conference " Bio ? Logical ! Organic production as a tool for development ", organized by Coldiretti Oltrepo ' Pavese - Varzi - December 2012

Report "Mass catering and local agrifood systems in Lombardy" - 6th International Scientific Conference Rural development 2013: innovations and sustainability - Kaunas - November 29 – 2013