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SUSTAINABLE FOOD SYSTEM: A SHARING RESPONSIBILITY

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Abstract

The food system has slowly passed from a natural process into an industrial one, becoming increasingly affordable and abundant, but more standard and approved. This has modified our relationship with food: we eat more than we need; we buy more than we can consume. These shortcomings lead separating our choices from their effects on health and territory. The purpose of our work is to define how the systemic approach increases the level of resilience of small companies, helping to raise the endogenous processes and the variety within the territory system in order to define an economic potential on a local scale.

Keywords: territory, resilient system, food system, systemic design, sharing responsibility

The paper is organized as follows:

- An overview of the effects of the current consumption model on the food system, underling how the main criticalities are.
- A short description of the systemic design methodology, and the criteria used to analyse our study.
- The last part is dedicated to our project outcome. The project develops through the analysis of the Val Sangone territory and the geographical position of its cultivations as well as its cultural and sociological values. It is followed by the current situation criticalities to conclude with our main results applying the systemic approach.

1. FOOD AND CONSUMPTION

1.1 The effects of the current consumption model on food system

The current model of consumption is the outcome of the development of a industrial centralised system, based not on the welfare of people, but on economic and political values of the market. As any other economic sector, food system has applied the strict laws of supply and demand, with substantial consequences and fallouts on the agri-food industry. The food has gradually transformed into an industrial product, on the one hand becoming increasingly affordable and abundant, but on the other more standardised. [1] The production intensification has made the large-scale use of pesticides and antibiotics necessary, in order to respond to quantitative and aesthetic standards demanded by the market. Through the chemistry introduction, mechanisation and the application of the industrial principles to the agriculture, seeds and local breeds have been gradually supplanted by hybrids more productive and profitable [2]. Modern science was put to use to find ways of producing more food and this revolutionised the way agriculture was done. Intensive breeding and selection led to the development of high-yielding varieties of crops and more productive breeds of livestock. There were also breakthroughs in the development of agri-chemicals, like pesticides and fertilisers. And to bring the revolution directly to farmers' fields, governments supported producers with encouragements to use these new farming techniques and technologies. Initially, the revolution was seen as a tremendous success. As populations grew and demand for food increased, so did the food supply. Food prices remained stable. Industrial agriculture was not longer able to create a virtuous balance between used and released resources, getting an extremely energy-intensive and polluting process. The land has been impoverished and reduced to mere substrate in which to plant seeds, feeding and defending with pesticides and no more with sun, manure, and the crop rotation, but with chemical fertilisers;

these changes have altered the soil fertility, distorting the natural nitrogen cycle. According to the FAO [3], 60% percentage of the world's ecosystems would become degraded or used in an unsustainable manner; since 1990 we have lost about 75% percentage of the genetic diversity of agricultural crops, and three-quarters of global nutrition depend on only 12 species of plants and 5 breeds of animals. This loss of diversity is called "genetic erosion", and also in Italy has caused an extreme simplification of farming systems, from the detriment of the sustainability to the crop security. Concepts such as seasonality and typical food have been altered: inducing consumers to dispose of any product anywhere and at any time. Adding to this the policy of lower prices, implemented by the large-scale retail trade to respond to the competitive logic of the market, we see a clear separation between the sale price and the actual value of the product. Therefore the cheapness and convenience behind our purchases hide different consequences. Primarily on the relationship that we have with food: in the last few years, we have left the natural world behind, altering our natural rhythms and losing our material culture. The loss of knowledge combined with the wide choice available leads to waste an enormous amount of edible food, and to dissociate the impact of purchasing decisions from the caused effect on land and health [4].

The listed data represent the magnitude of the problems arisen by the food industrialization. The consequences in terms of social, cultural and environmental costs are clearly visible throughout the production chain, from the transformation of peasants into "workers", to the loss of biodiversity; from the dependence on oil to the intermediaries' number increase, from waste to health damage. Nevertheless, parallel to the burgeoning agricultural industrialization, numerous realities have sprouted up, breaking away from the centralized economic system, have autonomously and consciously tried to interpret a different food system. The promoting protagonist of the projects, are vary in nature from small producers as purchasing group and food communities, to the transition towns. As the variety of proposed solutions, some explore the relationship between producer and consumer, others bring to centre the environmental and energy problem, another ones the fosterage of community and local culture. In all cases it is clear, however, a strong need for change able to re-establishing the natural relationship with food and nutrition.

2. METHODOLOGY: THE SYSTEM DESIGN APPROCH [5-6]

The economic and industrial development have led to a strong decentralization of production and specialization for processing, leading on a side to lower manufacturing costs and higher profits, but on the other side to a production system poor of identity and untied from the territory of origin.

The current productive activities may be identified as linear systems, considered as a sequence of independent actions, that have as priority the product, or a component of it, obtained trough technological innovation and automation. Limiting the focus on the product means, in addition, accepting as normality the presence of waste throughout the production process. At the same time accepting solutions focused on recycling means accepting the waste as a regular part of the process and not as a loss of efficiency, resources, energy and material. The systemic methodology proposes to change this way of acting. In resolving the issues it's necessary to abandon the cause-effect analysis, because the risk is to lose the general vision, in fact systems are entities that cannot be reduced into independent pieces. Essential properties that characterize them arise from the relationship between the parties. By adopting the Systemic Design methodology, the productive systems are observed on the basis of their induced internal and external relations, such as procurement and conversion of the material, management of the output on a territorial level, the use of energy, control of emissions. In this sense industrial activities must reduce the use of no-renewable materials and evolve toward less energivorous processes, making uncontaminated outputs that can be reused for their qualities. Residues contain a significant amount of intrinsic properties and potentials that normally are not considered but dumped or drained off, causing a rise in economic and environmental costs. However, the resources saving, viable through a recovery of by-products, leads to the enrichment and diversification of the industrial apparatus. The output of a system becomes an input for another one. We need to retrieve the cultural and practical capability to delineate and program the flow of material from one system to another in a continuous metabolization that reduces ecological impact and generates a notable economic flow. Systemic methodology proposes a new approach that stimulates people and companies to reduce all forms of waste and helps valorise the remaining outputs by giving them a new economic and legislative value.

3. RESEARCH PROJECT [7-8]

3.1 State of The Art

The focus of our research is the *Val Sangone* (Sangone Valley) and its agricultural economy and production. In particular our interest is on small farms that, for their nature, represent the real fulcrum of this areas richness. The *Val Sangone* lies at the foot of *Alpi Cozie*, on the left site of the *Sangone River* from which it takes its name. Six municipalities define this mountain community; *Giaveno* is the largest and economically important urban centre of the area. The altitude does not exceed 1000 meter above sea level (from a minimum of 340 m to a maximum of 870 m) and the total area is about 16728 hectares.

Nowadays, this mountain area represents interesting peculiarities both from the point of view of the soil and climatic conditions due to the shape and positioning of the territory, and from the economic and social states. In fact, this valley is located not so far from the capital of Piedmont, Turin; just for its position, it has been able protected itself from the deterioration and isolation risks, representing, over the years, an opposite trend compared to other mountain areas. At the end of 2006, 28600 people lived in the area with a high density, at an average of 170 inhabitants per sq. km also with regard to the birth rate, the trend is not so negative. In the period between 1981 and 2006, the population experienced a sharp increase of over 8000 units. The growth was 39%, significantly higher than the upland areas of Turin and the province of Turin in the complex. As it has been mentioned before, the Increase was especially favoured by the position proximity to the metropolitan area of Turin (25 km), which has facilitated the emergence of new residents and commuting phenomena. In recent years, the landscape beauty enhancement and the morphology of area have fostered a growth in the tourism sector. Two main types of tourism distinguish the area: the former is purely related to day-trip and the latter is more residential and stationary, facilitated by the high number of second homes spread across the territory. The soil fertility, combined to the woodland and the water abundance represented an important factor in the local economy development. The widespread presence of water has made this valley green and lush, making it suitable for both cultivation and breeding. With the advent of industrialization, these activities, as it has happened in many upland areas, have lost their importance; for this reason, local political dynamics have encouraged to promote the manufacturing industries development, even if they were actually separated from the context, thereof they have just been used the labour and resources.

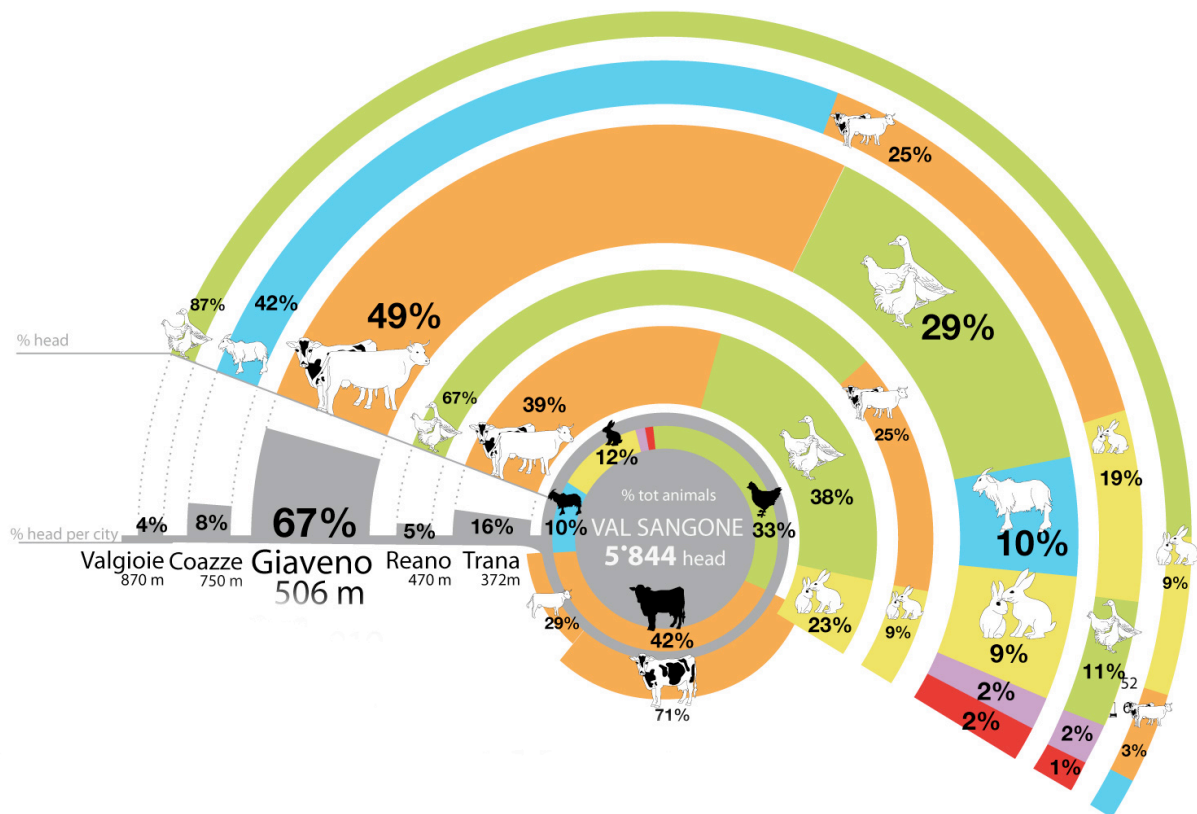


Figure 1– data processing, Sistema Piemonte, 5° Agriculture census

Fortunately, the Val Sangone's identity has preserved the tie-up to one side with the natural products that grow spontaneously by the territory, such as mushrooms, chestnuts and wood, to the other with the

agriculture sector and handicraft realities such as bakery and dairy processing. In fact, although the agricultural sector presents a regressive tendency, thanks to the soil fertility that have encouraged the remain of breeding and farming activities. The predominant production is about cereals, fodder and livestock of cattle. Of the total 5654 acres of agricultural area, grasslands and arable crops cover about 80% and the same land devoted to arable crops, is grown mostly for forage. Analysing the livestock sector, it appears that the number of animals is around 5844 head, of which 42% are bovines, 33% poultry, 12% rabbit, 10% goats, and the remaining percentage includes both sheep and pigs (Figure 1). The cattle sector is one in which a greater spread, with 84 companies around the country and a total of 2478 head. The richness of the flora and climatic conditions of the valley encourage the production of quality honey: honey chestnut, rhododendron, alpine flora and wildflowers.

So, why do we choose this area? This area results real interesting both for the peculiar characteristic of the territory morphology and, at the same time, for social and culture conditions. In fact The "closed" shaped of the valley, which can be accessed only by one side, on the one hand has increased the isolation of the small local businesses, on the other has represented a promoter of change, enabling the development of economic dynamics disconnected from the industrial system of the nearby Turin. Breeders and farmers, on the ropes by an economic system that favours large producers, have endeavoured to put in place their wits looking for a no longer confrontation with the homologated economy but with the local area. The identity of the valley is therefore bounded to the products and knowledge of its community.

3.2 Current Situation Vs System View

Based on the carried out analysis, it is decided to restrict the project area to the city of Gavi, however without losing the overview of the whole valley.

The collected data also showed how certain types of cultivation and breeding are more present than others and how different sectors, even though marginal, have relevant potential, if they are related to the characteristics of the territory. These considerations have led to summarize, just for this paper, the field of action. Bearing in mind the overview of current small companies, different areas are identified: breeding, dairy cattle and agriculture. The local market is taken as reference for the sale section, and it represents, as we will see later, the fulcrum of the system (Figure 2).



Figure 2 – current data situation: the four macro-areas analysed

According to the systemic design methodology, the research project is conducted by analysing the various productive sectors:

- holistic analysis: a the description of the state-of-art of the analysed territory
- quantitative and qualitative data collection
- criticality analysis
- output and input definition
- definition of the systemic view: thought it is possible to visualize the complexity of the whole system.

The single fields are analysed individually and then connected, focusing on a specific field and in a second moment on the whole system, since every area thanks to the input-output relations connects to another thus creating a complex system. Below we present the individual areas of analysis.

3.3 Weaving factories analysis

Meat bovine fattening breeding

One of the other food production systems analysed is the beef meat production. Giaveno includes about 35 breeding farms for a total of 1289 head. The types of bred animals are mainly two:

- *Piemontese breed*, a breed that has a high yield for butchering (68%): a single head produces around 400 kg of meat;
- *Blonde d'Aquitaine*, it is not a native breed characterized by a hard meat and a lower amount of protein than the *Piemontese* breed. The meat is distributed through the large-scale Retail trade.

The current system's analysis shows numerous criticalities about the quality and the quantity of the material and energy inputs and consequently about the output processes.

In short, the critical points can be summarized as follows:

- transport: due to the import of straw and fodder; the long distances to reach the slaughterhouse and the import of animals not native;
- feeding: high levels of consumption relative to feed production, basically corn silage;
- resources: use of drinking water where not required, non-biodegradable detergents, energy dependence;
- manure: the quantity and quality of the nitrate in the dropping are not related to the territory capability; high production of greenhouse gases;
- slaughter excessive concentration of animals, dependence on the large-scale retail trade;
- quality: meat with a high fat content; the presence of pesticides and fertilizers; contamination caused by transportation.

It follows that the linear system needs to import cereals for feeding the livestock, because the local resources are not sufficient to provide the territory needs; moreover products coming from small farms are devalued, because they are not fully supported by a local land short large retailers sell them without any indication about their provenance and peculiarity. In addition, all weaving factories have natural outputs, considered as wastes. To determine the appropriate number of animals in *Giaveno*, we start calculating the right food needs of people who live in this district: from the current number of 35 farms, the project passes to 11 farms in which there are 600 head.

In addition, the project includes the breeding breeds typical of the area, associating the *Piemontese* breed to the *Pezzata rossa* breed, that produces tender and lean meat. The main objective that we would like to pursue with our projects are, the attention to the quality of the products from the production through the transformation until the sale in order to shorten the weaving factory; promoting the biodiversity as a solution to the exploitation of the soil and the one-crop solutions and the importance of local varieties as characteristic of a territory and its products: the reduction of pollution thanks to the centralization of the productions and the draw up of raw materials and products exchange.

Dairy Bovine breeding

The dairy cattle breeding cannot be considered too meat production. As in the breeding farms analysed before, the attentions of the producers are mostly oriented at the quantity and at the self-expansion; some of the local breed has been substituted by the most productive and economically advantageous like for example the *Frisona*, due to her high production of milk (almost 25-27 litre per day). Other production as the cereals are not enough compared to the need of the territory especially considering the breeding food requirement, which is mostly imported from other provinces and countries.

Therefore, in the systemic view, one of the first steps is to use the *Piemontese* breed not only for the meat process, but also for the milk production (around 10 litre per day). In fact, this breed is suitable for the both

process. In this way, *Giaveno's* district needs around 1446 head to respond to the real milk needs of the territory that considering the population needs are around 12400 litre per day. The *Piemontese* breed represents the 70% of the raised breed, the *Pezzata rossa* breed, which it produces around 20 litre per day, represents the remaining 30%.

Local production is not limited to the milk, but it expands to other products. In particular we foster the production potential of the small and local cheese factories. The cheese factories are able to maintain and preserve historical process of milk processing, strengthening the local identity of the final products. Moreover, the ability of the local cheese-makers and the quality of the territorial raw materials represent the adding value to the production process.

Another step concerns the cattle health, in particular fertilization and feeding process. In the systemic proposal we choose to consider, both for the dairy and the fattening breeding, the close cycle farming in loose housing system, in order to avoid the calves import.

As regards the bovines feeding, it can not be consider disconnected from the agricultural system. The animals' diet is first analysed and then designed paying attention to the health of leaders. The systemic project outlines a different diet using local products that follow the seasons, such as:

- in autumn and winter : 65% hay 20%, sorghum, 9% barley, 6% pea bean
- in spring and summer: pasture grass.

Agriculture

The *Giaveno's* district extends approximately for 7176 hectares, of which 2842 used for agriculture with 126 farms. The analysed data shows that 95% of the soil (2700 ha) is used for the cultivation of fodder and the remaining 5% (150 ha.) for vegetables, fruits and cereals. Summarizing, the following issues can summarize the main criticality of the current situation:

- even so the agriculture is basically intensive and monoculture, the production does not respond to the food needs of the *Giaveno's* population. Fodder and corn are the bigger cultivation due to its over-exploitation in feeding the animals;
- agricultural areas are not well distributed and fertile soil is not used properly.

The unbalance between the soil possibilities and on the one hand the breeding needs and to the other the food system request is one of the most critical point. So one of the first considerations in the systemic view is putting the agriculture in connection with the meat and milk production processes. This allows helping a balance to the production of forage and cereals in relation to the number of animals raised. The second point is to relate the population needs to the agricultural production. In order to respond to this problematic, in the systemic view the soil used is redesigned as follow:

- 320 ha use for the food system, *Giaveno's* residents needs and local businesses as well (school café, restaurants);
- 1800 ha use to produce forage for local breeding farms: 600 heads for the meat production farms and 1440 head for dairy breeding farms.

Local Market

The *Giaveno's* local market covers an area of 152 stations:

- no-food area (95 seats),
- food area (57 seats).

The critical point related to local market can be summarized as it listed below:

- 90% of products coming from the large-scale distribution, and just the 10% is dedicated to the local products
- long distances, large quantities of packing and related emissions
- no waste collection system
- little knowledge production chains

- consumers are not aware of the choices involved.

The majority of the products that are sold in the local market do not come from the Giaveno's companies and farms. They belong to the large-scale distribution: in this way the local market is not properly defined local but it is more comparable to the supermarket logic. So the identity of the sold products do not belong to the Giaveno territory, but it responds to the globalization one. In this system, also the quality concepts are not related to natural and biologic rhythms but they are related to industrialized needs: they need to be subject to standardization logics; in addition to the aseptic and standardised production context, to the quantity and the wide choice proposed, as well as the competitiveness of the final price [9].

Starting from the current situation problems, the project is structured along three fields: social, productive and economic one. They are different but strictly related. The market, in fact, has the ability to collect all the productive activities of the territory; these are nothing more than economic activities, embedded in a social context and community.

The first goal of the project is the increase of the local products distributed in the market: from the initial percentage of 10% of local products, it goes to a 70%. It is possible just after having analysed the area's resources (meat, milk and agriculture) and have enabled new activities as:

- the increase of the local activities already sold in the market as mushrooms, honey, dairy products, fruit, vegetables and delicatessen;
- the addition of new products coming from the output-input relations between the weaving factories analysed before: cattle breeding and production of meat and milk of the territory; local businesses for the production of chocolate and confectionery products; small firms producing flour, bread and cereals; distillery and beverage companies.

The connection between the different systems meat-milk-agriculture-market creates new productive activities that generate new economies. Considering the social-economic point of view, sharing the outputs allow to create new activities like mushroom green houses, anaerobic digester, distillery, brewery, bakery, fish farming and other activities related to the water treatment (Figure 3).

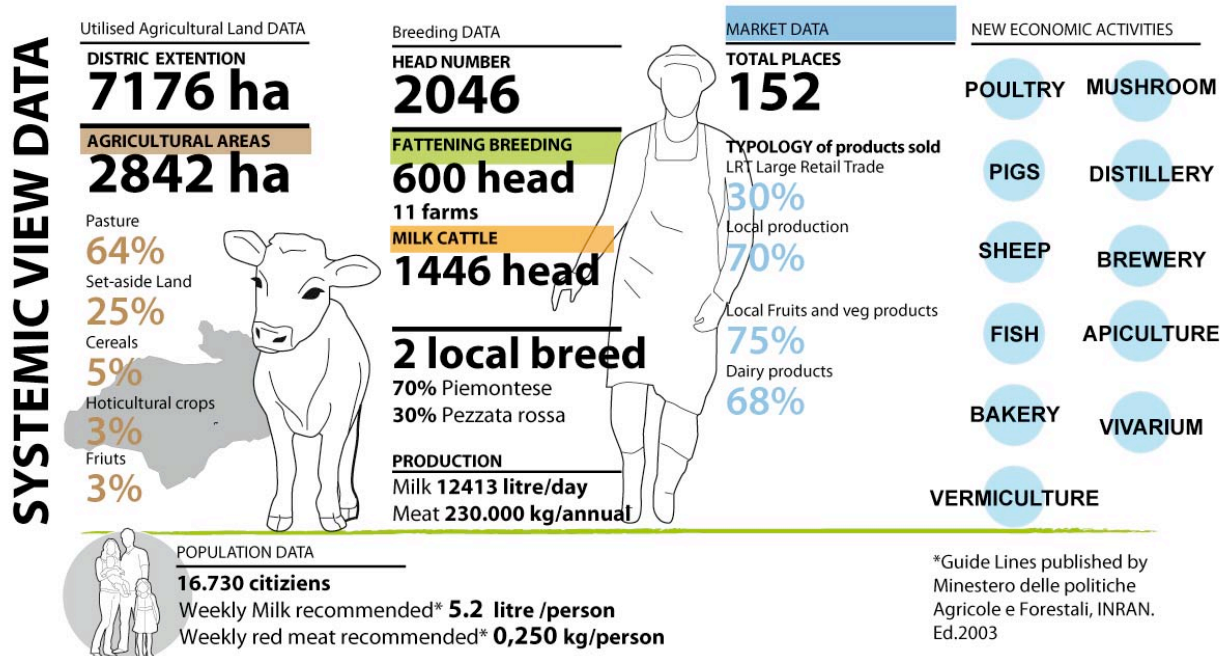


Figure 3– systemic system: the weaving factories are strictly connected: material, energy, knowledge exchanges create a sharing responsibility.

New activities mean new opportunities of jobs and consequently the chance to revalue areas that are now risking to be abandoned. An example of the new activity coming from the output-input valorisation it's the use of the organic waste recovered from the meat processing and used for the production of larvae. The larvae are used for breeding quails, which are sold in response to the local market. In this way you connect the farming systems cattle, slaughter and market. Another example concerns the water coming from the

cheese production. The washing water is recovered, depurated through a phytodepuration process and used for fish farming. This new activity gets fishes that can be sold to the Giaveno's market.

From the cultural and social point of view, the Giaveno's local market adds to the direct relationship, the social side of the market and user-friendly and creates a new space for meetings between small producers and consumers. An alternative food networks that seek to put in communication small farmers and urban consumers in order to create a relationship of trust and solidarity between town and country and to heal the rift between society and the environment that has been created by industrialisation and agricultural modernisation. In addition supporting the local products, it is re-evaluating the role of the farmers, their work and their knowledge, as well as adds greater awareness in consumer preferences.

4. CONCLUSIONS

Trying to resume the results of our project, we first have to say that a work like this one can never be considered really concluded. A system for his nature it's always extendable and always evolving. The final aim of our research is however to create a network of connections between weaving factories, in order to put together not only the outputs but also the knowledge concerning a territory. Applying the systemic approach to the *Val Sangone* area, we connected the different weaving factories, breeding and agriculture ones, re-designing the food system, in which knowledge, potentiality, products and overall outputs are shared to pursue goals in common and to create new opportunity, dividing cost and pay-off. From the point of view of the products, shortening the weaving factories, avoiding, in this way, useless intermediaries between producers and the final consumers. Doing so there is a double benefits, producers receive incomes directly from the sale of their goods being careful to supply always the best product possible; the consumers take advantage as well in quality, information and economically.

A first positive environmental relapse from shortening the weaving factories is of course a reduction of polluting emissions related to transportation of the goods, as well as the re-introduction of local varieties that better fits on the territory and enrich the typical products of a territory. In addition, taking as a reference point the realities of small-scale, it is evident as how they are the result of the territory in which they develop. In their products it is possible to find the territorial peculiarities that generated them. The added value of a systemic process lies in considering these realities, not as individual units, but as part of a network, based on exchanges of matter, energy and knowledge among its members and the territory itself. The connections that are formed between nodes are based on a relationship of interdependence and create a sense of shared responsibility throughout the supply chain. In these terms, the product ceases to be a single entity, but it becomes primarily an expression of a network of relationships.

So the real challenge of this work is changing the way we think about sustainability, only with the dialogue and collaboration between the local weaving factories, it's possible to create a correct and fair development: a network in which output becomes input, wastes are resources and the processes are in balance with territory and ecosystem.

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