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Conceptual Paper

Agriculture, Biodiversity and Technological Innovations

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The loss of biodiversity is a complex problem affecting both the environmental and economic field, because the natural capital provides essential resources for industry and agriculture.

The main causes behind the loss of biodiversity are: a different usage of soil, an excessive exploitation of the resources, the climate changes, pollution and the presence of invasive species, which are quickly affecting the ecosystem and making the previous natural environment disappear. Moreover, the biodiversity crisis and the climate one are intrinsically related, sharing causes and consequences.

Investing money in the protection and restoring natural environments is a critical point also for the economic recovery post Covid-19 emergency.

The agricultural sector has a unique potential for human society, for instance to improve positively biodiversity and produce food at the same time. To date, for generations, agriculture stands behind a multitude of species and habitats which deserve to be protected. A sustainable usage of the agricultural land is a matter of the utmost importance to protect biodiversity and preserve the cultural landscape as well, to avoid the abandonment of the fields.

The reduction of biodiversity in place may, therefore, significantly affect agriculture and then our food production. This is the risk FAO (Food and Agriculture Organization of the United Nations) drew attention on during its last report on the topic, highlighting how in the future the possibility of food shortage on a global scale is real. FAO came to these conclusions on the base of data found in as many as 91 different countries, which make it evident how it is essential to adopt sustainable models in the agricultural field. Other critical topics are reported in the document, among them: a reduction of the biodiversity of agricultural fields and of the diversity of the breeds from which food production depends, the destruction of habitats and lands meant for agriculture and the unsustainable handling and management of natural resources. In order to face adequately the problem, it is necessary to analyse it in a wider perspective, which valorises the role of plant and animal species contributing to the environment balance of the planet. This does not mean considering just the cultures or the farms, but also the myriad of other plant, animal and microorganism species promoting the production, creating or making it possible to maintain healthy soils, pollinating the plants, purifying the water, providing protection against extreme meteorological events, or other essential services.

In order to deal with the loss of biodiversity and restore the ecosystems, large public and private, national and international investments will be necessary, and it will be needed to use all the programs and the financing instruments available. In particular, it is useful to set mandatory goals, such as:

- To reverse the trend to a reduction of the pollinators.
- To reduce even more the chemical risks and the use of pesticides, especially the most dangerous ones.
- To assign a greater and greater number of fields to organic farming and increase significatively the use of good agricultural practices.
- To plant new trees, respecting ecological principles.
- To make significant progress in contaminated land reclamation.
- To reduce the number of species endangered by the exotic invasive ones.
- To reduce the loss of nutrients contained in fertilizers.
- To eliminate the use of chemical pesticides.

- To substantially reduce the negative effects of fishing and extraction activities on sensitive species and habitats, including the seabed, in order to restore good ecological state.
- To reduce the by-catch rate to a level that makes it possible to restore the species and not affecting the ecosystem.

The agricultural research aims to create new solutions and perfectionate the pre-existing ones, in order to make the agricultural activity evolve favouring the defence of nature and contributing to reach the previously listed goals. It is essential, in particular, to invest in scientific research for a further understanding of the interactions between current agricultural practices and biodiversity and promote an agriculture more compatible with the environment.

The extensive usage of top technical solutions or innovative approaches can represent a significant advantage in this sense. Technical innovations, both in resources management and agricultural machineries, can meet the new biodiversity needs, preserving at the same time the competitivity of the field.

Several innovative technological solutions can help to promote a sustainable agriculture, making it possible, for instance, to follow a preventive approach and therefore reduce the use of pesticides and other potentially toxic compounds. An example of this are the robots, recently introduced in Europe and several other countries, which can detect the presence of parasites on the plants, equipped with wheels and a camera programmed with an image recognition algorithm. If something abnormal is found, the camera sends a notification on the mobile phone of the farmer through a dedicated app.

In Europe a project conjugating viticulture and solar energy production can be found as well. In the agritech field, some farms have recently used a peer-to-peer web to offer solutions to the holders for facing the daily challenges. Sensors, drones, satellite images, geolocation, and Big Data are the innovative instruments on which people are betting, also in the United States, since they help the farm holders to manage all the aspects of their activity using a shared technological platform.

There are several other research projects started in other countries of the world supporting the innovation in the agri-food field. Among them, we can find some which aim is to create competitive and sustainable vegetable supply chains, to create strategies and technologies for an agriculture more and more free from fossil fuel usage. The approaches are meant to valorise the food subproducts in the different contexts. Another aim is the definition of future competences necessary for the sustainability in the agricultural field, for bioeconomy and digitalization.

The use of technological innovation in the service of environment preservation and sustainable agriculture seems to be a promising approach, in step with the current needs of our planet.