Biodiversity and Sustainable Development Goals

Ecosystems are essential for the sustainability of life in the planet as its use comes from an infinite amount of ecosystem services that without them, our civilization development could not have been possible. Some examples of these services are: polinization, preventing floods, availability of drinking water and healthy soil that make the production of food possible.

The ecosystem's capacity relies on the diversity of species that live there and in the functional interrelations in which these species are established. It's a fact that the loss of specific and functional diversity impact negatively in the sustainable management of natural resources, like soil, water, forests, wetlands, etc. and can also limit the food production to the population.

These events are the ones that determined that various "Sustainable Development Goals (SDG)" have like a target of their performances some of the elements pointed out before, emphasizing the biodiversity care.

In a sense, objective 15 "Life on land" of the 17 Sustainable Development Goals (SDGs) focuses in a sustainable management of forestry, the fight against desertification, like stopping and inverting the degradation of land and the biodiversity loss. You have to consider that 40% of pollinator species (especially bees) are in a risk of extinction.

The big challenge for society in the present day is offering quality food products that satisfy the nutritional necessities of the growing global population. To achieve food secureness, the nutrition, by sustainable agricultural systems, various institutions, mainly the Food and Agricultural Organization of the United Nations (FAO), collaborating with the 17 Sustainable Development Goals (SDGs) of the 2030 agenda for a sustainable development, that involves a guide to the international community in the period of 2016-2030.

The importance of pollinator species

The disappearance of pollinator species could lead to some of the essential foods vanishing too. We must consider that nearly 80% of the crops that produce fruits or seeds for human consumption depend largely on pollinator species like bees.

The role that bees play in the Sustainable Development Goals (SDGs) is key, as many agricultural species depend on bees and other pollinators, and with that the nutrition and nourishment that are in various SDGs:

SDG 1. Inclusive agriculture and food production help create employment and decreases hunger in rural areas, making it possible for families to have access to a worthy home.

SDG 2. Amongst other objectives, it promotes a sustainable agriculture, nutrition improvement and food-secureness. In addition, its essential the role of pollinators in the production of food.

SDG 3. Guaranteeing a healthy life and promoting welfare with nutrition. FAO considers "A Single Health" that agglutinates the human, animal, plant and environmental health.

SDG 8. Promote the sustained, inclusive and sustainable economic growth, full and productive employment. The role played by agriculture as a source of employment provokes a relevance of the pollination to do the main role in the global agricultural yield.

SDG 9. Constructing resilient infrastructures, considering that more than three quarters of the population live in rural areas, where the dependence of agriculture is big. Strengthening the sustainable development in rural areas favours markets, the link between the countryside and the city and slows down rural exodus towards the city.

SDG 13. Adopting measures against climate change to decrease the lack of food, favouring sustainable agriculture, as well as promoting the protection of biodiversity. Climate change, linked to other factors like intensive agricultural systems or the use of pesticides, has alarmingly decreased the number of pollinators.

SDG 15. Stop the loss of biodiversity to maintain the subsidence systems of the planet. As we previously said, the changes in the use of soil in the intensive agricultural systems, the pesticides and the monoculture have fragmented and degraded the pollinator's habitats.

The protection of the pollinators and bees are based on implementing favourable policies to them, with the adoption of measures like the control of plagues and the limitation of pesticides.

The role that different organisms and institutions play in the protection of said policies is basic and fundamental, by means of elaboration and implementation of innovative policies and systems. Furthermore, universities, one of the main factors of change, through research networks helps the transference of investigation to the society.

UMA and the protection of pollinator species

UMA, through the vice-rector of Smart-Campus, implements ways for the achievement of objective 15 "Life on land" of the 17 Sustainable Development Goals (SDGs), through various areas:

Management

The strategic planning is part of a project named "The Protection of Biodiversity. Pollinator species" (http://www.sga.uma.es/index.php/proyectos), aligned with the "Nature and Environment" sector, and implementing in the Environmental Project developed annually from the year 2010, specifically objective 4."Sustainable management in green zones. Biodiversity protection". The actions that are used are routed to various objectives:

a) Sustainable management of green zones, through the development of the actions that imply an environmental behaviour more sustainable taking care of vegetable species, like the biological fight against plague control or the plantation of indigenous vegetable species and/or that require few water resources.
b) Expanding and improving green zones. Applying measures like "Landscaping Project of Boulevard", the "Green Trails and Islands Project", or the creation of orchards in UMA.

Investigation

In the year 2018, the Vice-Rector's Smart-Campus Plan is elaborated, with an investigation/extension vision to society. Because of this vocation of applicability of research results and knowledge previously established, two projects related to the protection of biodiversity are financed:

The project APICAMPUS:

This innovative project involves one of the first experiences of urban apiculture in Andalucía. In addition, it has a new line of action of an academic level. The project promotes the development of apiculture in urban environments, raising the awareness of the importance of bees and other pollinator insects, at the same time it foments the study of the properties of bee products. This is a breakthrough in the investigation of bees as the university is the first Spanish one to install beehives in the university campus.

The site chosen for the development of the project's prototype is the Faculty of Sciences' rooftop, in the Teatinos campus. A traditional Langstroth wood beehive has been installed and a new type of beehive made of polystyrene.

This is an interdisciplinary project in which professors from various departments in the University of Malaga have participated, especially de Plant Biology (Botanic), Ecology and Geology, Animal Biology and Mechanical Engineering departments, many students and Bee Garden Malaga (an environmental and multidisciplinary business specialised in apiculture and from Malaga.

In the development of the project there will be monitoring techniques applied and marking of bees to allow us to know data like the temperature, humidity and weight of the beehive, the numbering of the bees and the study of the bees' movements throughout the year with the help of real-time video cameras and other specific sensors. The project also has one of the first studies about urban pollinators and the study of the bee products' properties (honey, pollen and propolis) in the urban life.

The Hort-Sost project:

The main objective of this project is to work on the improvement of the natural resources in the cultivated areas in the campus management. The resources on which it focuses on are water, soil and cultivated diversity. With the dependence of the food production of pollinator species that we previously mentioned, another big problem is the massive genetic erosion that over 100 years the cultivated diversity has suffered. In the present day, more than 80% of human diet comes from plants and the humanity has cultivated for food purposes nearly 7000 species in approximately 10000 years of agricultural history. In the Agriculture and Sustainable Rural Development document, FAO has indicated in 2007: "*more than 90 percent of crop variety have disappeared from the fields in the last 100 years, and 690 cattle breeds have been extinct*". One of Hort-Sost projects insist in this aspect and some of the SDGs mentioned before.

Hort-Sost carries out various tasks:

Develop a meteorological robust prototype of low cost to enable an intelligent and efficient irrigation.

Try out and characterize the compost in small scale, the quality of cultivated soil in the campus and the value of the remaining soil in the campus with an agriculture history.

Contribute to the conservation *in situ* systematized by a variety of premises and traditional cultivation and try out alternatives for glyphosate for herb control.

Also include a general characterisation of the auxiliary fauna present in the campus.

<u>Environmental education</u>

Formation activities.

Throughout the year various activities of formation, volunteering and awareness of biodiversity protection take place through the Environmental Program.

In particular, since 2015 an Apiculture and Urban Orchards Day is organised, with the collaboration of Bee Garden Malaga to value the role of apiculture and horticulture.

In addition, with the annual International Bee Day many Formation and Awareness days are organised too.

Awareness activities.

Various awareness campaigns are organised like the "Rétame" competition.

In the year 2019 de first "Pollinators in Malaga city" photo competition was organised with the collaboration of Bee Garden Malaga.