

Building resilient beekeeping production to climate change in the Rodopi mountain range, northern Greece

Return of bee colonies to the mountains: a necessary condition for their survival and the preservation of landscape biodiversity.



Honey bee and pollen.
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Beekeeping in Rodopi mountain range.
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/// Context ///

Over the last 50 years, the abandonment of mountain villages in Greece has also led to the disappearance of beehives from the mountains, a traditional activity of the inhabitants. In addition, the arrival of the Varroa destructor mite, the main enemy of bee colonies, led to the extinction of wild honeybees. Beekeepers have concentrated at low altitudes, using mainly cultivated plants and trees (*Citrus sinensis*) or scrubland (*Erica arborea*). Rising temperatures shorten the flowering period of these plants or often prevent them from flowering at all. Bee colonies thus face a severe shortage of nectar and pollen, while production costs increase due to feeding and transport to find new flowers.

Bee colonies in these areas also are exposed to plant

insecticides and herbicides, which they do kill the worker bees and accumulate in the hive and cause chronic poisoning, while their combination with insecticides used by beekeepers increases their toxic effect.

In the face of the decline of natural pollinators (bumblebees, other insects, birds), the honeybee is emerging as the guardian of biodiversity, pollinating 90% of wild plants on the planet and 75% of food crops.

The return of beekeeping to forests, mountainous and hilly areas will have multiple environmental, social and economic benefits. It will provide an economic outlet for the inhabitants of mountain villages, who will protect and enhance it through active management of its natural resources.

/// Solution for a Resilient Future ///

Climate change threatens the well-being of bees and forests. Practicing beekeeping in the forest can help both beehives and the forest to cope with the effects of climate change.

The forest needs honey bees and beekeeping:

- Conservation of flora and fauna biodiversity. 86% of forest species are pollinated by bees;
- Production of fruits, nuts and seeds that feed mammals, birds, insects and forest animals, each of which contributes to the conservation of the forest.
- Improvement of soil fertility through pollination of mountain meadow plants, e.g. wild clover.

Beekeeping in the forest does not impoverish – it enriches, does not destroy – it protects. Honeybees and

beekeeping need the forest for:

Synchronisation of the bee's biological cycle with the flowering season.

- Reduction of the need for food during hibernation, reduction of production costs.
- More efficient use of flowering plants, less overcrowding.
- Reduced Varroa mite infestation of hives due to interruption of egg laying during hibernation, reduced production costs.
- Protection against poisons.
- Summer flowering, when it is completed in the lowlands.

70-80% of the annual honey production in Greece is produced in forested, mountainous or semi-mountainous areas. The return of bee colonies to mountainous areas, apart from being a way out for the survival of the beekeeping sector, the reduction of production costs and the production of quality products with high biological value, will also strengthen life in abandoned mountain villages. It will provide an economic outlet for young people, while agro-tourism activities will sensitise urban



Meadow in Greece.
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visitors to the importance of the forest and food production.

In northern Greece, in the Rodopi mountain range national park, two apiaries have been created at an altitude of 1.500 m, protected by electric fences. The beehives are placed on specially shaped scales with sensors that measure in real time the weight of the hive, the temperature and the humidity.



Beekeeper's training in new management techniques.
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/// Always Moving Forward ///

Together with the sector's inherent vulnerability to climatic conditions, it is necessary to strengthen the capacity of producers to effectively collect and use the necessary information on their production and to adapt their farming practices in time, in the context of so-called 'precision farming'.

Similarly, precision beekeeping is a system of beekeeping based on information and technology. Technology is used to collect, evaluate and combine data on the biology of the organism – the colony – beekeeping techniques and climatic data in order to create models that can help the beekeeper to increase production, reduce production

costs and at the same time protect and optimise the quality characteristics of the products produced.

The peculiarity of beekeeping, in comparison with other agricultural activities, is that the production of apiculture products, honey, pollen, royal jelly, etc., is the result of a natural system whose elements are the plant, the bee and the beekeeper, and whose main regulator is the climatic conditions. To be able to make models in this case, it is necessary to study the relationship of each element to the production separately and then to study their criticality in the final result.

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