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Rural Development and Local Government - The example of the Regional Unit of Evritania in the development of beekeeping

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Abstract The region of Evritania is a mountainous area of Central Greece. Its intense and rough terrain is characterized by lush diversity in flora and fauna species and landscapes. It has a long history that extends back to pre-historical times. However, this unique nature's hot spot is facing during the last decades, intense depopulation driven mostly by financial factors (lack of job opportunities mostly to young people). In its effort to providing solutions to face this problem, the prefecture of Central Greece funded a research project to investigate, unfold and highlight beekeeping as a successful activity that could contribute to farmers' income. The project is based on a participatory approach, in close collaboration to farmers (beekeepers). The initial results from the project indicate the substantial potential of beekeeping as an activity that can enhance local economy but mainly the importance of regional authorities' involvement and support in local development.

Keywords: beekeeping, local authorities, *Abies* spp. fir honey, mountainous forest, climate change.

1. Introduction

Evritania a mountainous region of Greece, covered by forests mainly of fir (*Abies borisii-regis*), and to a lesser extent oak (*Quercus conferta)*, mixed fir and oak forest (*Abies borisii regis* and *Quercus conferta*), bushes (with main representatives the species *Quercus coccifera*, *Juniperus oxycedrus*, *Spartium junceum*), chestnut (*Castanea sativa*), plane tree (*Platanus orientalis*) and the black pine (*Pinus nigra*) from reforestations (Papadopoulos et al. 2011). The basic rock is hard limestone (predominant) and sandstone of flysch. It is also shallow and rocky and its fertility is variable with relatively low productivity. The mountain Timphristos and Agrafa have been declared as protected areas NATURA 2000. The lower altitude is about 500m in the valley of Acheloos river and the higher altitude is the top of the mountain Timfristos 2315m.

The region is characterized by its rich fauna and flora. The forest provides several ecosystem services ranging from provisioning, regulating, supporting and cultural. The area is one of the popular touristic destinations in Greece since its diverse landscape renders it ideal for touring and ecotouristic activities.

In the last decade the population of the area has been decreased rapidly. The cause is the shrinkage of the livestock and the lower income from the tourism.

The main occupation for the agricultural economy of the area is beekeeping, as there are over 250 active beekeepers with a total of over 15.000 beehives. The role and intervention of local government in facilitating the further development of this dynamic sector is becoming a catalyst. For this reason, the Evritania Regional Unit (RU), funded an innovative program delimited and defined for the beekeeping of the Prefecture, in collaboration with two universities (the Agricultural University of Athens and the Aristotle University of Thessaloniki) and the Hellenic Agricultural Organization (HAO) DEMETER. It is the purpose of this article to introduce the project and highlight the importance, responsibility and ability of local authorities to support local economies.

2. Description of the project

The specific project concerns the development of beekeeping of the Prefecture of Evritania and the identification of the produced honey (brand name). It involves the collaboration of the Regional division of Evritania with three scientific bodies, the Lab of Apiculture, Inst. of Mediterranean and Forest Ecosystems, HAO DEMETER, the Dep. of Forestry and Natural Environment Management, Agricultural Univ. of Athens and the Lab. of Apiculture – Sericulture, of Faculty of Agriculture, Aristotle Univ. of Thessaloniki.

The major goal of this project soughs to increase honey production of the Prefecture of Evritania, while maintaining and improving its quality characteristics, through the use of precision beekeeping, as well as the increase of the added value of bee products produced in the Prefecture, through modeling and verticalization of production, as well as its identification. The specific objectives of this project are multidimensional and range from economic to developmental. In specific, the economic include i. the

increase of honey production in the prefecture of Evritania, while maintaining and improving its quality characteristics, through the use of precision methods, and ii. The increase of the added value of the bee products that are produced in the prefecture, through the modeling and verticalization of the production, as well as their identification. The developmental objectives include the i. strengthening the beekeeping sector and improving the living standards of farmers and their families, ii. dissemination of knowledge and development of skills to producers - beekeepers with the aim of producing products of high biological value (honey, pollen, royal jelly, wax), competitive in the domestic market and in foreign markets, iii. familiarization of producers with new techniques for monitoring and modeling production, with the aim of reducing production costs and better dealing with adverse climatic conditions, and iv. the establishment of bee products, identification of Evritania.

3. Description of the study area

The research area is delimited by the borders of the Prefecture of Evritania, and includes two Municipalities, the Municipality of Karpenisi and the Municipality of Agrafa, 82 Communities (of which 81 are designated as the mountain base of the Directive (85/148 / EEC) and 184 Settlements. The Prefecture of Evritania belongs to the western part of the Region of Central Greece, has an area of 1871 km2, with mountainous morphology, rich in vegetation since 45% of its surface is covered by forests. The total area of the Prefecture is distributed in terms of basic categories of land uses as follows (Table 1) (ELSTAT, 2000):

Table 1: Basic land use categories of Evritania

Land use type	Area in ha
Forests	85000
Pastures	75137
Settlements	9100
Agricultural land	9063
Lakes - rivers	8800
Total	**187100**

The flora of the area is very rich since more than 1119 plant taxa were recorded only in Mountain Timfristos which is a part of the Prefecture of Evritania (Dimitrellos 2005).

The real population has decreased significantly in the last 10 years (Table 2), to a level of 10% and its age structure shows continuous aging (Table 3) (ELSTAT 1991; 2011.

Table 2: Population data of Evritania

Population/year of inventory	1991	2001	2011
Permanent	20390	19518	20081
Registered			30790
Actual	24307	32053	29080

Table 3: Distribution of population per age range

Age range	0-14	15-24	25-39	40-54	55-64	65-79	≥80	Total
Total	2872	2280	3634	3217	2342	4172	1001	19518
Men	1460	1166	2006	1799	1034	1952	419	9836
Women	1412	1114	1628	1418	1308	2220	582	9682

Climate represents the main driver on agricultural production type per region (Bank of Greece 2011). The climate of Karpenissi as well as the prefecture of Evritania is mountainous Mediterranean. Based of the meteorological station of Karpenissi (38° 54′ N., 21° 47′ E., 1001 m a.s.l.) of the National Meteorological Service of Greece, the mean annual precipitations is 1087 mm, the mean annual temperature 11,7 ^{0}C, the mean minimum temperature of the coldest month -0,2 ^{0}C and the mean maximum temperature of the hottest month 26,4 ^{0}C. The dry period after obrothermic diagram is 3 months (Figure 1).

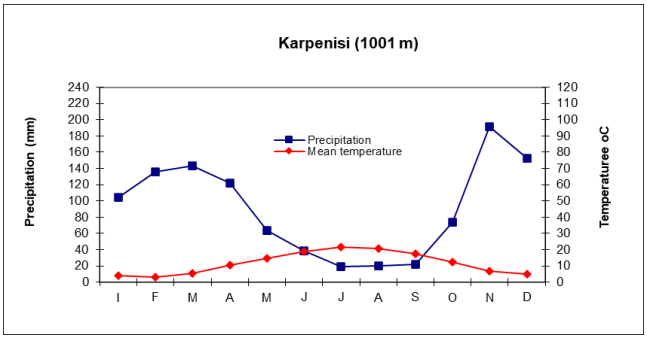

Figure 1. Ombrothermic diagram of the meteorological station of Karpenisi.

4. Methodology of the project

The project is implemented with the methodology of the bottom-up approach with the active participation of the beekeepers of the Prefecture and with the method of monitoring case studies, based on previous studies in the phenology of honeydew producing insects in the county of Evritania and in the exploitation of honeydew secretions s by honey bees (Gounari et al., 2004, Gounari et al. 2013). Initially, a call was launched to identify beekeepers interested to be involved in the project. This involved three meetings where the participants were informed about the program and its possibilities. At the same time and with their cooperation, the areas where indicative apiaries could be located were determined, the map of the extensive sampling was completed and the groups of beekeepers who would carry out the sampling were also organized. A group of interested beekeepers was formed, who offered their beehives to be used as indicators. At the same time, vegetation samples were collected with emphasis on bee/honey supporting plants and their abundance number (both in number of species and in number of individuals). The beehives - indicators were placed in areas where the most representative species of honey of the prefecture are produced, composed of fir, heather, spring or autumn flower honey. In this way it became possible to sample the honey for identification. The management of the bees was done with specific manipulations through the cooperation of the Lab. of Apiculture of HAO DEMETER and the respective beekeeper.

The next steps includes the creation of a network of reference apiaries equipped with systems for monitoring the biometric data of honey bees, the regular sampling of fir branches to monitor the population density of honeydew producing insects, the analysis and correlation of meteorological data with production and finally the establishment of a model for predicting honeydew secretions and information of beekeepers in real time.

5. Expected results

Presently the project runs in its second year of implementation and below is presented a description of the expected results – deliverable and the ones already accomplished.

So far, the areas of the prefecture with criteria of population density and the species of honeydew producing insects have been depicted. We sought to expand the areas that beekeepers can exploit in order to increase honey production. This information will also contribute to the protection of the honeybees from diseases or abnormalities caused by the overcrowding of many bee colonies in the same place. The investigation of the flora composition of the proposed areas with emphasis on the diversity, quality and quantity of native beekeeping species in underway.

The knowledge of the bee's manipulations from the reference apiaries, the identification and population density of honeydew producing insects and the analysis of the effect of climatic data on honeydew secretions and honey production will be used for the creation of educational material focused on beekeeping in the forest, depicting manipulations and interventions that would increase the production of a quality honey of high biological and nutritional value.

The analyses from the periodic sampling of fir branches, currently underway, will provide data for study of the biological cycle of the honey-producing insects, their enemies and their population density. These data, structured in biological diagrams, are being simultaneously processed with climatic - bioclimatic data, in order to find the relationships and the importance that will lead to the substantiation of a model for predicting honeydew secretions and honey production.

Through the above procedures, a team of beekeepers will be trained to be able to monitor the presence of honey-producing insects and identify new usable areas. Simultaneously with the management of the reference beehives - indicators, the beekeepers themselves are trained in the electronic systems of monitoring and recording (scales) of the biometrics of honeybees, growth, weight, and internal temperature.

All the above data are being collected on a server that provides the monitoring systems, and are processed. Beekeepers will be informed, in real time, about the course of honeydew secretion, either through the Beekeeping Association or electronically.

A major goal of the project is the identification of Evritania honey, highlighting its quality and its biological properties. Specific areas are defined for this action that yield significant quantities of the main species produced in the prefecture, fir, heather, spring flower honey or autumn flower honey. In collaboration with the beekeepers, samples of honey are collected using a specific sampling protocol and sent to the Laboratory of Beekeeping - Sericulture of AUTh (EMS - AUTh). The honey samples are kept in freezing conditions and analyzed by the official methods of analysis, in order to determine the physicochemical and microscopic characteristics, in order to determine the identity of the honey produced in the area and to investigate its possible specificity in terms of its quality characteristics. as well as to its biological actions.

6. Conclusions

The present project will yield the complete profile of honey (physicochemical characteristics, biological actions) combined with the biodiversity of the flora of the prefecture of Evritania.

The specific project, through the involvement of both beekeepers and the local authority of Evritania Regional Division, aims to be sustainable after the end of the program and its results to be permanent in the honey production force of the Prefecture. For this reason, beekeepers are trained to be able to use precision techniques on their own, as well as a permanent monitoring station - Information on the production of fir honey, giving the opportunity to extend the action to other producing honeys such as oak, heather, etc. in the future.

The involvement of the local government, both first and second degree can and should be active in each region to assist the agricultural sector, as it can recognize the comparative advantages of each region and invest in them producing tangible and measurable results.

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