

## **A HYPERMEDIA DIGITAL LIBRARY FOR THE EDUCATION AND EXTENSION TRAINING OF GREEK BEEKEEPERS**

*<http://beekeeping.vet.auth.gr/home.htm>*

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**Abstract:** In this paper a hypermedia digital library is presented which has been designed and developed to meet the educational needs of Greek beekeepers. These needs are not fulfilled by the current extension services. This lack has identified as one potential reason for the low productivity of the industry in Greece. Five distributed hyperbases have been produced covering the main areas on which beekeepers expressed interest. A web authoring tool called HyperTree has been used to help the collaborative authors of the library to effectively structure and interconnect the information provided, and to preserve a common interface design thereby making the library more usable.

**Keywords:** Hypermedia digital library; HyperTree; Education and extension training; Greek beekeepers.

### **1. Introduction and economic background**

Beekeeping is an agricultural activity which provides supplementary income to a large number of rural families (Batzios et al. 1989). It brings direct income through honey production and other beekeeping products (e.g. propolis, royal jelly). In the European Union (EU) beekeeping is most highly developed in Germany, France, Spain and Greece. The total annual honey production of the EU countries is 115,148 tones (FAO, data 1995) with the aggregate self-sufficiency being only at about 45% for the last ten years.

In Greece, beekeeping is traditionally a popular activity. It is estimated that nearly 25,000 beekeepers are involved in the industry, maintaining 1,200,000 beehive colonies. The majority are part-time beekeepers and only 5% have strong commercial interests (Androulidakis and Harizanis, 1996). Although Greek countryside possesses a comparative advantage in beekeeping, the Greek beekeeping industry lacks rational economic behavior and suffers from low productivity and consequent poor image. This image includes the reputation that beekeeping is more an “art” than an “industry”. This is partly explained by the basic characteristics of the beekeepers, but largely by the methods of education and training applied. Current applied educational services do not fulfill the specific needs of individuals.

In this paper, a hypermedia digital library which is designed and developed to provide an extension service for Greek beekeepers is presented, and the potential effect of such a system for the productivity of the beekeeping industry is discussed.

The system deals with the main subject areas which meet the expressed information needs of the Greek beekeepers. It is globally accessible through the World Wide Web (WWW) and is easily extensible (i.e. new educational needs can be covered and new information on existing topics can be easily added as it becomes available). In authoring the hypermedia digital library collaborative authors use a hypermedia system called HyperTree (Salampasis and Tait, 1995). HyperTree emphasizes in the structure quality and the readability of the produced Web pages and attempts to increase the usability of the library.

## **2. User and System Requirements Analysis**

### *2.1 The educational needs of Greek beekeepers*

For any training and extension service it is required to clearly identify the real information needs of its users so that the content of the library can be determined. A recent survey undertaken by Androulidakis and Harizanis (1996) identified the educational needs of the Greek beekeepers (about 1000 Greek beekeepers were studied). A summary of the survey findings is as follows:

- The majority (> 65%) of the Greek beekeepers studied expressed a strong need for continuing education, development and training referring to the areas: a) bee biology and colony manipulation (e.g. swarm preventing, behavior); b) hive products (e.g. production, processing, marketing); c) biological and environmental aspects (e.g. pollination, climate conditions, plants, equipment, etc.); d) financial issues and laws.
- Most of the respondents (64.3%) are prepared to pay for educational services. A significant percentage (29%) have already attended at least one agricultural or vocational school for a short or longer period.

Other researchers have noted that the profitability of most apiaries in Greece directly depends on the applied management skills (Batzios et al. 1989; Kitsopanidis et al. 1992). For example, the selection of the location of an apiary, the proper apiary size, and product distribution, and so on are management skills which affect the productivity and profitability of beekeeping. Based on these findings we have decided that our hypermedia digital library should provide information for each of the five main areas on which the need for education has been expressed:

1. *bee biology and colony manipulation;*
2. *beekeeping products;*
3. *biological and environmental issues;*
4. *financial and law issues;*
5. *management skills.*

### *2.2 System requirements*

In conjunction to our effort to develop an extension service which could cover the real information needs of Greek beekeepers, we also tried to identify other system requirements which were driven by the special characteristics of Greek beekeepers. Primarily these were work attitudes (i.e. part-time occupation); the consequent access restrictions; and level of general education. For example, the beekeepers may find it difficult to participate in an otherwise highly rated professional training program if it requires attendance at a centre some distance from their home.

We made an in place study of one of the largest honey producers in North Greece (Agricultural Beekeeping Cooperative of Nikiti Chalkidiki) in order to further investigate the system requirements. We have discussed with the professional beekeepers (20 individuals) the effectiveness of current extension training services, their problems in finding information etc. Most of the beekeepers (64.7%) can't easily find information which meets their specific needs. The cost (i.e. buying books, journals,

attending seminars) was a problem for 52%. Current extension and education services are ineffective for 70% of this relatively privileged group of beekeepers. We have shown them the hypermedia digital library and demonstrated how information can be accessed through the World Wide Web and the Internet. All of them expressed their belief that our system can provide them better extension services than those currently available. However, most of them also expressed the need for easy-to-use interfaces and access to information.

As a result of our overall findings from the study, we believe that for a digital library system to become an effective educational service for Greek beekeepers should meet the following requirements:

- the interfaces used should be simple and increase the usability of the library;
- must provide a rich and effective information seeking environment;
- it should be self-driven and highly individualized (e.g. every beekeeper has specific needs and would like to develop his/her own paths to information);
- must be continuously updated and easily accessible.

### 3. Designing and Developing the Hypermedia Digital Library

Based on the analysis of the user and system requirements mentioned in Section 2 we designed and developed a prototype hypermedia digital library system. We have selected a hypermedia approach (i.e. nodes of multimedia information interconnected with links) for three main reasons:

1. hypermedia can provide a learning environment which is self-directed and can be individualized;
2. information seeking is possible using *both* non-analytical, opportunistic, intuitive *browsing* and analytical *query based* strategies.
3. the powerful style of multimedia presentation which impacts positively on learners.

A different and autonomous team of authors is responsible for creating and keeping up-to-date the multimedia information stored in each of the five hyperbases. We have developed a hypermedia authoring tool called HyperTree which will help the authors of the individual hyperbases to efficiently organize learning material for the beekeepers (Salampasis and Tait, 1995). The HyperTree system operates as a front-end to a hypermedia database (hyperbase). HyperTree provides a method for converting (using an interchange algorithm) a hypermedia database (or a subset of a database) to a document structure which is identical to that used by the WWW. It also provides the capability to automatically create hierarchical and alphabetical indexes of the hyperbases. Use of HyperTree could decrease the classical hypermedia problems of user disorientation and cognitive overhead so often felt by WWW users (McDonald and Stevenson, 1996).

In order to provide the users with an integrated view of the whole system, a central WWW server is used which acts as an intermediary between the beekeepers and the five individual hyperbases and their maintainers (Figure 1). The beekeepers will access this central WWW server through the Internet using WWW clients (e.g. Netscape Navigator). Using the WWW client software, the user can browse through the information stored in each of these five hyperbases or,

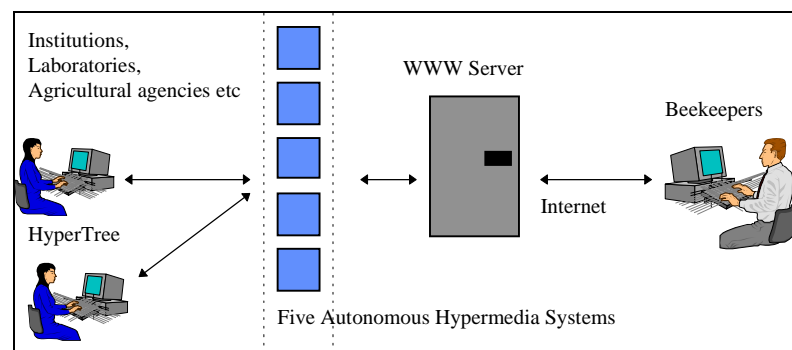


Figure 1. A Digital Library for the Greek Beekeepers

alternatively create and submit a query and cooperatively retrieve relevant information (Salampasis et al, 1996).

#### 4. Increasing Productivity of the Beekeeping Industry

Taking into account the comparative advantages possessed by Greece as well as the increasing demand of European consumers for natural products (e.g. free of contaminants), Greece must take the opportunity to develop the beekeeping industry and to increase its share of the European Union market.

The development of Greek beekeeping industry pre-supposes continuing education and updating of producers involved. Therefore education, training and development process for Greek beekeepers should follow a new approach. It is believed the hypermedia digital library could form a cornerstone of this new approach for the following reasons.

- It facilitates immediate access to up-to-date information which is crucial for effective decision-making and increased profitability.
- It provides high quality education and training because institutions like the Apiculture Cooperatives, leading University Laboratories relevant to beekeeping etc., can easily contribute to the hypermedia digital library, and thus offer underwrite the quality of the service.
- It allows information to be accessed on demand, and according individual problems and needs.
- Through other services that the Internet offers (e.g. e-mail), communication between beekeepers other beekeepers and information providers can be direct, fast and easy. In this way exchanging ideas and experiences is feasible, resulting in better solutions to everyday problems.

#### 5 Conclusions

The digital library system described here establishes a framework in which information is directly and immediately accessible through the Internet. Moreover, it is easily extensible and offers an easy to use powerful and flexible interface for information retrieval. This is crucially important for effective decision making, and thus, for increasing productivity and profitability in the long term.

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