This series of informative publications present examples collected by the ENRD Focus Group on Knowledge Transfer and Innovation. The case studies describe practices and approaches that EU Member States and regions have put in place to promote Knowledge Transfer and Innovation, mainly but not exclusively, through their Rural Development Programmes (RDPs) in the current period. These examples aim to contribute to the understanding of what has worked well and less well in supporting innovation during the 2007-2013 period and to draw some tentative lessons that can inform future improvements to the programmes.

Introducing remote censoring technology in the beekeeping sector in Spain

SUMMARY: Technical Assistance support from the Spanish National Rural Network was used to develop and test remote censoring technology in the beekeeping sector.

1. Why the approach has been put in place

Over the past 10 to 15 years, beekeepers have been reporting unusual weakening of bee numbers and colony losses, particularly in Western European countries including France, Belgium, Switzerland, Germany, the UK, the Netherlands, Italy and Spain. The problems that the sector is facing are primarily due to biodiversity loss, use of pesticides in agriculture, arrival of new diseases and climate change etc. Colony Collapse Disorder has increased hive mortality to 25%-30% per year as against expected mortality of 5% to 12%. At the same time, beekeeping management techniques have not evolved a lot and rely on know-how developed a long time ago.

As a consequence, by 2008 the sector in Spain has seen decreases of between 20% and 25% on average, in terms of annual honey production.

This general crisis in beekeeping is also fuelled by economic factors such as increased costs and competition from other countries. The loss of profitability over the past few years jeopardizes many farms and jobs. To improve the situation in the sector it was considered necessary to develop new beekeeping technics to protect and restore productivity while reducing production costs.

2. How it was done in practice

Detecting the problems that arise in the apiaries at early stages was considered essential to address profitability challenges and to reduce operational costs. For this purpose a project was set up to develop tools that remotely monitor beekeeping practice, allowing more intensive and more systematic oversight. This pilot project was funded by the National Rural Network of Spain and was developed by the European University of Madrid in collaboration with the University of Cordoba and the Beekeeping Federation of Asturias and the ARNA Beekeeping Association. The project also received support from NASA, the Regional Beekeeping Center

of Castilla la Mancha, and the Sierra Norte Beekeepers Association of Madrid (APISCAM).

The project considered new ways to monitor the state of beehives. Normally, in order to check the status of a beehive it is necessary to perform an *in situ* inspection. This has a high economic cost for a beekeeper especially when the apiaries are located great distances apart. Beehives can therefore only be inspected at regular intervals. Due to the interval between inspections and the laborious nature of some tasks - e.g. estimating the level of infection of *Varroa Mites* which is a harmful type of parasite - in many cases the disease or problem is detected and treated late, thus reducing the productivity of the hive.

Modern technology can be used to develop remote monitoring sensors through which it is possible to be continuously informed. The application of such technology can help beekeepers to plan their work better and intervene in the apiary at the right time.

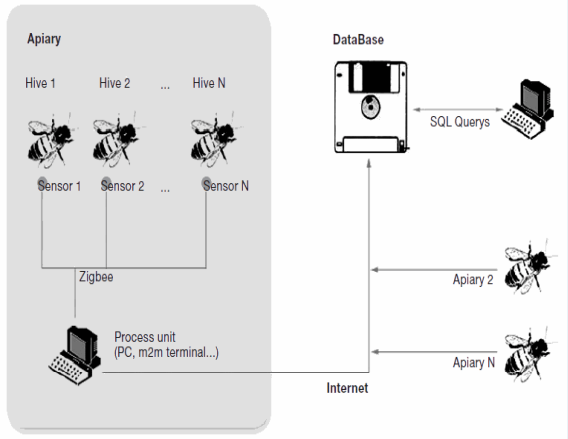
The monitoring platform developed by the project has the following architecture:

Bees produce a constant sound that reflects the specific communication established between the bees in coordinating the division of their tasks - gathering nectar of the flowers, breeding, evaporation of moisture from the nectar, etc.

All hives in an apiary are thus equipped with a sensor that sends information to a single terminal that processes the sound information and stores the data in a database. When swarm activity decreases, the beekeeper is alerted and can take appropriate action. The information is processed to identify patterns and generate reports and alarms.

The beekeepers receive reports on their computer or alerts on their phone and plan the work to be done in the hives and the dates they must be carried out.

The innovative hive monitoring project simplifies the decision-making process by providing real-time information that allows the beekeeper to act when needed.



The direct benefits include:

- The hives are opened on fewer occasions. This reduces the stress experienced by colonies during inspection.
- Reduced transportation costs since in most cases looking at the data is enough to make a decision whether to visit the hives or not.
- Reduced mortality. Disease treatments are applied at the right time due to early detection, effectiveness of treatments can be verified and potential infestations are identified.

In addition the project had a strong research component. The innovative approach was not only beneficial for beekeepers, but also for scientists. The database that was created also benefits research on climate change and ecology, facilitating greater understanding of pollination and the value of the honeybee as bio-indicators of the state and the phenology of many ecosystems. It is also expected that the monitoring platform will contribute to the fight against Colony Collapse Disorder. The information collected on the daily activity of

the colony before the collapse can be very useful in studying the problem.

3. Lessons learnt for the future

- The beekeeping project is a complex project as it is cross-sectoral and applies an innovative use of modern technology to the rather traditional profession of beekeeping.
- The support received from the National Rural Network was fundamental. The subsidy allowed the project to move from prototype to pilot and to be tested in a real environment by semi-professional and professional beekeepers.
- The implementing entity however, had difficulties in meeting deadlines and justifying all needed but unforeseen expenditures. Projects with a strong research component are very uncertain and change constantly, whereas the grant schemes and the requirements of the European Agricultural Fund for Rural Development (EAFRD) are inflexible and based on a rigid project cycle. This created uncertainty for the project and resulted in administrative delays.
- Sometimes, the principal investigator, who typically works for a university or research centre can lose all rights of exploitation in benefit of a company. Usually of a third party which usually join the project at the last minute.
- More flexible funding could address these issues by allowing for more options and the agility needed to adapt to the needs of the research project and its objectives.