TECHeese

Grant Agreement number
243638
Call (part) identifier
FP7-SME-2008-2
Project acronym
TECHeese
Project title
SOLVING THE TECHNOLOGICAL PROBLEMS OF SHEEP CHEESE PRODUCTION
Funding scheme
Research for the benefit of specific groups Period covered from 01/01/2010 to 31/12/2012

FINAL PUBLISHABLE SUMMARY REPORT

Project coordinator name:
María Isabel Berruga Fernández
Project coordinator organisation name:
UNIVERSITY OF CASTILLA-LA MANCHA (Spain)
Telephone number
+ 34 967 599363
Fax number
+ 34 967 599233
E-mail address
MariaIsabel.Berruga@uclm.es
Project website address:
www.techeese.eu

CAPACITIES
Research for the Benefit of SMEs Associations

TABLE OF CONTENTS

1.	Executive summary	1
2.	Summary description of the project context and objectives	2
3.	Description of the main S&T results/foregrounds	4
4.	Potential impact and main dissemination activities and exploitation of results	6
5.	Contact details	7

1. Executive summary

The TECHeese Project (Solving the technological problems of sheep cheese production) is a EU FP7 research project developed from 2010 to 2012 for the benefit of SME Associations. It included 12 partners from Belgium, Denmark, Italy, Romania and Spain that are distributed in 4 SME Associations, 4 SMEs and 4 RTD performers.

The aim of TECHeese was to avoid economic losses causes by undesirable microorganisms on cheeses, increasing the competitiveness of the European sheep sector by means of innovative techniques and the use of natural products, acting at two levels: prevention and control.

The preventive actions were based on the introduction of sheep feed formulations that contain aromatic plants with antimicrobial activity.

The control actions were focused on the development of a detection system able to detect the correct structure of cheese, discharging any undesired defect.

The work performed during 3 years permitted to achieve the expected results:

- Several feed formulations have been designed, implemented and tested under industrial conditions. The formulations demonstrated their capability to control undesirable microorganism at the same time that improve animal healthy state and milk yield and quality.
- The development of a non-destructive system for internal cheese inspection based on low energy X-ray, able to detect cheeses with holes on the surface susceptible to be attacked by fungi during ripening. The system includes a friendly and easy to use software based on tangential imaging to unveil the presence of peripheral voids and holes.

Results from TECHeese have been disseminated by means of scientific peer reviewed journals, national congress and professional fairs, workshops and press media. Detailed information on the project results, the team involved and all public reports are available on the TECHeese website http://www.techeese.eu.

2. Summary description of project context and objectives

The European sheep sector is involved in a structural decline intensified since 2006, that have encouraged the European Parliament to adopt a resolution proposing urgent actions to be taken to safeguard the sheep sector; which includes special support for research and development on both farm and product technical innovations.

One of the sub-sectors, the dairy sheep sector, has technological problems during elaboration and ripening of cheese provoked by bacteria or fungi going inside the cheeses. Particularly, fungi attack in the internal part of cheese is a widespread problem not only in Europe but at international level. While it is appreciated in the inner part of blue cheese, fungi presence is rejected having as a result the irreparable commercial damage and the reduction of consumption. Sheep cheese is generally sold in pieces and the defects are detected at the intermediary or the final consumer. This trade way means a logistic added cost for the return of the defective product and sends back a different batch to the consumer. Furthermore, it damages the reputation of cheese producers generating a lack of trust in the consumers.

As final consequence, a lack of competitiveness for the sector, mainly for SMEs which have fewer resources to provide solutions, is noticeable. Besides, traditional cheese producers prefer the use of raw milk instead of pasteurized milk to obtain a fully aroma cheese, and the potential bacteria contamination could produce not only technological problems, but even healthy problems for humans.

This project will avoid economic losses in the European sheep sector through development of innovative techniques and use of natural products. The general objective of the TECHeese is to increase the competitiveness of the European sector by reducing the losses causes by undesirable microorganism, acting at two levels: prevention and control.

- The preventive actions are based on the introduction of sheep feed formulations that contain aromatic plants with antimicrobial activity to improve productivity and

reduce the existing technological problems caused by fungi and bacteria on cheese elaboration.

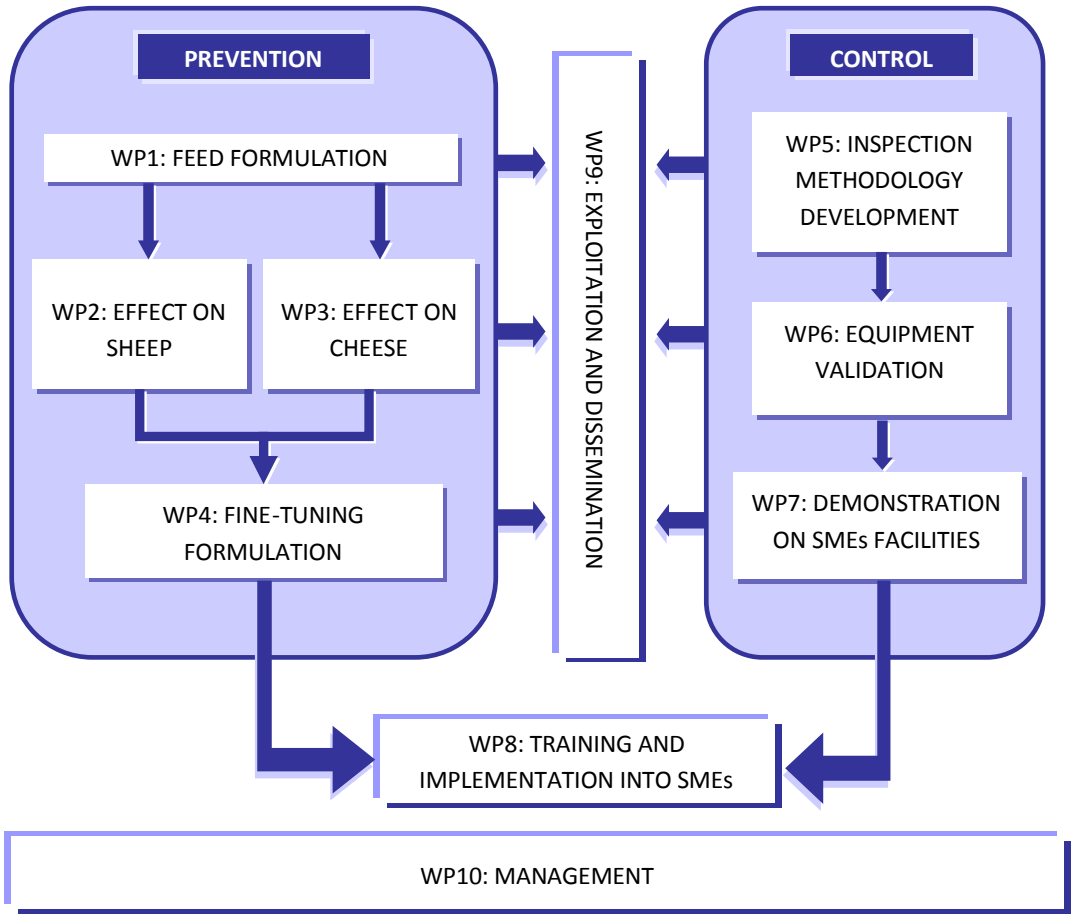
- TECHeese will also develop a detection system, based on X-ray imaging and analysis, able to detect the correct structure of cheese, avoiding that any defective cheese leaves the factory. The implementation of the X-ray technology developed also will contribute to reach higher food safety standards.

These two main objectives are divided en several others specific:

Specific TECHeese objectives regarding prevention branch
– To determine the capability of the aromatic plants with antifungal and antibacterial activity mentioned in the bibliography to fight against the microorganism responsible for the technological problems in cheese. – To formulate new diets with high nutritional value and palatability containing the selected aromatic plants. – To determine the relationship dose-effect on the healthiness of sheep of each formulation. – To establish the amount of antifungal and antibacterial compounds in the milk excreted after been feed with the formulations containing aromatic plants. – To determine the increase of milk production and the effect of each formulation over the milk quality and suitability for cheese production. – To determine the protection that milk, containing active compounds, gives to the cheese elaborated against microbial attacks. – To establish the influence of the sheep feed with aromatic plants on the sensorial properties of cheese.
Specific TECHeese objectives regarding control branch
– To develop a system based on X-ray technology for the detection of internal microbial contamination in cheese. – To develop optical laser technology for the external inspection of surface cheese. – To integrate and optimise both technologies working together. – To validate integrated equipment performance under real industrial conditions. – To exploit actively the foreground obtained in order to solve as much as possible the problems of the SME AG members.

3. Description of the main S&T results/foregrounds

All the objectives foreseen in the Project at the beginning of the project were reached satisfactorily, even the objectives were extended doing more ambitious (more plants analyzed) and more complex (additional tasks were designed and performed during project execution). The main scientific results achieved during the TECHeese project are described in this section.



Within the prevention branch, during the Work Package 1 (WP1) 18 aromatic plants were tested against the microorganism identified as the most problematic. The 7 plants showing *in vitro* the higher activity and nutritional value, together with the best palatability in field trials, were selected for following WPs.

Several diets were elaborated with these 7 plants that were tested on *WP2: Effect on sheep*. In this WP was established the effect of the designed diets at several doses, on milk quality and productivity as well as on the sanitary state of animals fed with them for a short period. Besides, the milk obtained permitted to elaborate small batches of Fiore and Burduf cheeses and establish the transference of antimicrobial compounds from plants to milk and cheese (*WP3: Effect on cheese*). In addition, new tasks conducted to catch information about

specific effects of the 7 aromatic plants on the cheese technological process have been created and developed, and the rate of transference of volatile compounds has been established.

The 3 plants which showed the best transference of active compounds and antimicrobial activity were newly selected for a longer period trial (conducted in parallel in two countries with two different dairy sheep breeds) in order to know in detail the long term effects of these plants on animal health and milk production.

The obtained milk allowed also to achieve enough amount of milk for the elaboration of cheeses typically produced with the milk of these breeds (Fiore Sardo and Manchego cheeses), that have enabled the study of the carryover of volatile active compounds from the plants into the cheeses, as well as the antimicrobial activity transference and the sensorial influence on the final products.

Within the *WP 4 Fine-tuning formulation*, several final blended diets were tested at a single dose, and the effects on health and milk, as well as the transference of active compounds were established, determining their potential synergistic therapeutic effect on sheep's. This WP permitted to select the best option for feed and cheese producers.

In the other hand, regarding the control branch of TECHeese project, it was developed a system using low energy X-ray scanning able to detect surface holes that are usually the entry point of the fungal contamination to the inner part of the cheeses. For reaching this main objective several built up and validation tasks were developed within *WP5 Methodology Development*, *WP6 Equipment Validation* and *WP7 Demonstration on SMEs facilities*.

4. Potential impact and main dissemination activities and exploitation of results

It is expected that implementation of one or both of the approaches developed:

- The formulations of single or blended aromatic plants for sheep feed for different purposes: increase milk quality or productivity, improve sheep health, and reduce the technological problems appearing during cheese production.
- the X-ray energy tool able to detect internal defects on cheeses,

will have a noticeable impact in SMEs producing sheep cheese, replying them to a competitive threat by reducing their losses currently suffered at three different levels:

- reducing the percentage of contaminated cheese that they must discharge,
- avoiding the high logistical cost for returning contaminated cheese throw the whole chain with 2 to 4 intermediaries and send back product to replace the defective one,
- and improving marketing confidence avoiding the lack of confidence regaining consumer confidence.

Also, sheep farmers could obtain benefits from having recipes that can replace the banned antibiotics used until now as growth promoters. Recipes which with high probability will improve not only health state of animals but also will improve their milk production yields. In other side, the animal feed producers will have new products to market, giving them a better position in the global market, while producers of aromatic plant will have a new application for aromatic plants that as a consequence could create new markets inexistent till now.

Besides, the sheep farming, particularly of traditional breeds, plays an environmental key role that includes the natural upkeep of less fertile areas and the preservation of landscapes and sensitive eco-systems; whereas natural spaces of the pastureland type have been preserved for centuries thanks to sheep farming; whereas, in addition, the eating patterns concerned, help maintain the biodiversity of the flora, protect wild fauna, and clean up the natural spaces by removing dry vegetable material, a key factor for fire prevention in Mediterranean countries. Typically, sheep farming takes place in less favored areas, where such farming is very often the only agricultural option and which therefore makes a crucial contribution to the economy in rural areas within the EU.

Many dissemination activities have been prepared to spread the achievements of TECHeese project. During the last year of TECHeese four workshops took place in Belgium, Italy, Romania and Spain with the members of the SME-AGs involved in the project. Also, TECHeese partners have participated in numerous professional fairs, press conferences, and radio and television interviews to publicize the development and the final results of the project. At the scientific level, 4 peer reviewed papers and 4 communications to congress have been presented, 2 more papers are actually under review and at least are 3 papers more planned. Moreover, several doctoral and bachelor thesis have been developed in the context of TECHeese.

5. Address of the project website & contact details

Web platform for TECHeese Project has been implemented at the following URL address http://www.techeese.eu/ and serves as communication tool and dissemination purposes, providing relevant information on the project's activities and objectives and allowing public as well as restricted access to deliverables, presentations, publications and other material.

The identification logo of TECHeese Project is:

The contact details of the TECHeese's Project Coordinator are:

Coordinator: Dra Mª Isabel Berruga Fernández
Address: Universidad de Castilla-La Mancha
Instituto de Desarrollo Regional
Campus Universitario s/n. Albacete 02071. Spain
Telephone: +34 967 599363
Fax: +34 967 599233
E-mail: mariaisabel.berruga@uclm.es

The consortium is configured by 4 Associations (SME-AGs), 4 Companies (SMEs) and 4 Research and Technology Developers (RTDp).

Partner profile	Acronym	Contact person & E-mail
SHEEP BREEDERS	**AGRAMA**- SME-AG, **Spain** ASOCIACIÓN NACIONAL DE CRIADORES DE GANADO OVINO SELECTO DE RAZA MANCHEGA	Mr Roberto Gallego rgallego@agrama.org
ANIMAL FEED PRODUCERS	**BEMEFA**- SME-AG, **Belgium** BEROEPSVERENIGING VAN DE MENGVOEDERFABRIKANTEN VZW	Mr Yvan Dejaegher info@bemefa.be
AROMATIC PLANT PRODUCERS	**ROPAM**- SME-AG, **Romania** ASOCIATIA PRODUCATORILOR, PROCESATORILOR SI UTILIZATORILOR DE PLANTE MEDICINALE SI AROMATICE DIN ROMANIA	Mr Dumitru Lazurca dlazurca@deltanet.ro
SHEEP CHEESE PRODUCERS	**FIORE**- SME-AG, **Italy** CONSORZIO PER LA TUTELA DEL FORMAGGIO FIORE SARDO DOP	Ms Cristina Cau consorziofioresardo@tiscali.it
SHEEP MILK & CHEESE PRODUCER	**DEHESA**- SME, **Spain** DEHESA DE LOS LLANOS S.L.	Mr Angel Esparcia a.esparcia@dehesadelosllanos.es
ANIMAL FEED PRODUCER	**LAMBERS**- SME, **Belgium** LAMBERS-SEGHERS	Mr Danny Van Mullem danny.vanmullem@scarlet.be
AROMATIC PLANT PRODUCERS	**NUTRACEUTICAL**- SME, **Romania** S.C. NUTRACEUTICAL S.R.L.	Ms Madalina Lazurca contact@nutraceutical.com.ro
SHEEP MILK & CHEESE PRODUCER	**DELOGU**- SME, **Italy** DELOGU GIANFRANCO E LUCIANO	Mr Gianfranco Delogu marchesabandinu@tiscali.it
RESEARCH EXPERTISE ON CHEMICAL COMPOSITION, ANTIMICROBIAL ACTIVITY & CHEESE QUALITY	**UCLM**- RTDP, **Spain** UNIVERSIDAD DE CASTILLA-LA MANCHA	Ms Mª Isabel Berruga mariaisabel.berruga@uclm.es
RESEARCH EXPERTISE IN X-RAY INSPECTION TOOLS	**INNOSPEXION**- RTDP, **Denmark** INNOSPEXION ApS	Mr Joergen Rheinlaender jr@innospexion.dk
RESEARCH EXPERTISE IN SHEEP MILK	**UTBV**- RTDP, **Romania** UNIVERSITATEA TRANSILVANIA DIN BRASOV	Mr Romulus Gruia ecotec@unitbv.ro
RESEARCH EXPERTISE IN SHEEP FEEDING	**UNISS** – RTDP, **Italy** UNIVERSITÀ DEGLI STUDI DI SASSARI	Mr Antonello Cannas cannas@unis.it