GOODFOOD

The GoodFood 2nd Newsletter

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Welcome to the GoodFood's second newsletter, which is regularly disseminated in order to keep you up to date on the achievements of the project.

The GoodFood project is an Integrated Project presented within the IST thematic area of EC VI FP and aims at developing a new generation of analytical methods based on Micro and Nanotechnology (MST and M&NT) solutions for the safety and quality assurance along the food chain in the agrofood industry.

GoodFood is now two years old and a lot of development activities have taken place since its launch on January 2004.

The GoodFood consortium will continue to keep you updated on its activities and results. Our next Newsletter is scheduled for July 2006, with new technical results and information on the next GoodFood workshop at Fall 2006.

More detailed information can be found at our website: www.goodfood-project.org.

A description of the GoodFood pilot site is presented in this issue, followed by a brief presentation of some technical results achieved by the Consortium until now on the logistics solutions addressed with flexible tags development. Results achieved for the antibiotics, pesticides, mycotoxins and pathogens detection will be covered in next issues. Finally, an insight on the International Workshop held in Florence (Italy) on November 15th and 16th, 2005, and focused on "Ambient Intelligence and Microsystems Solutions for the Industry" is reported.

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The Pilot Site: Montepaldi

Technological platforms and pilot solutions are planned within the GoodFood project to demonstrate that the agrofood sector is a very good case study for implementing the Ambient Intelligence (AmI) paradigm (http://www.cordis.lu/ist/istag.htm). An important agricultural application related to GoodFood is addressed implementing a significant pilot site for demonstrating the advantages driven to a complete food chain control by applying Micro and Nanotechnology based systems and AmI solutions.

The pilot site is placed in Montepaldi, about 20 kilometres south of Florence, Italy. The Montepaldi farm is a property of the University of Florence and it is in use by the Agriculture Faculty for training activities. The area chosen for the AmI infrastructure concerning the Good-Food project is 1 hectare wide and has been established in 1997 with Sangiovese.

At present a Wireless Sensor Network (WSN) developed during the first two years of the project is under test in this area. About twelve nodes are distributed uniformly in the vineyard. These nodes collect the data from the sensors connected to them and send the information to the mother node that is directly connected to the gateway, also placed in the vineyard.

The whole data packet then are sent via GPRS to a central database, which collects, stores and analyzes the information coming from the vineyard and performs the most suitable actions for a right management of the vineyard.

WIRELESS SENSOR NETWORK

The WSN has been implemented by means of a grid of nodes that communicate and exchange data by using radio links. The chosen nodes for the wireless communication are MICA2 from Crossbow (www.xbow.com). The routing is implemented on the base of the multi-hop communication protocol implemented in TinyOS Operating System. A variable number of sensors (up to 16) is connected to the node in order to provide the necessary monitoring functionalities. Data read from the sensors are internally routed, through the nodes of the network, to the mother node, the node directly connected to the gateway, and the gateway provides to transfer them to the Protocol Handler.

The Pilot Site: Montepaldi

THE NODES AND SENSORS

During the first season of experiment, the pilot site was represented by twelve nodes in 10000 sqm, uniformly distributed over the surface of the vineyard. Each node inside the vineyard is composed by three subnodes: plant, root soil and canopy atmosphere.

Sensors applied to plant

Diametric growth sensors (dendrometer), to measure the relative growth of the shoot diameter. In viticulture, shoot is defined as the primary unit of vine growth and the principal focus of many viticultural practices.

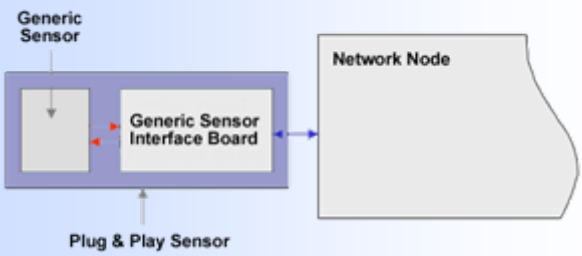
Leaf temperature sensors, installed on the blade of an apical, mature and well exposed leaf. The leaf belongs to the shoot supplied with a shoot diameter sensor.

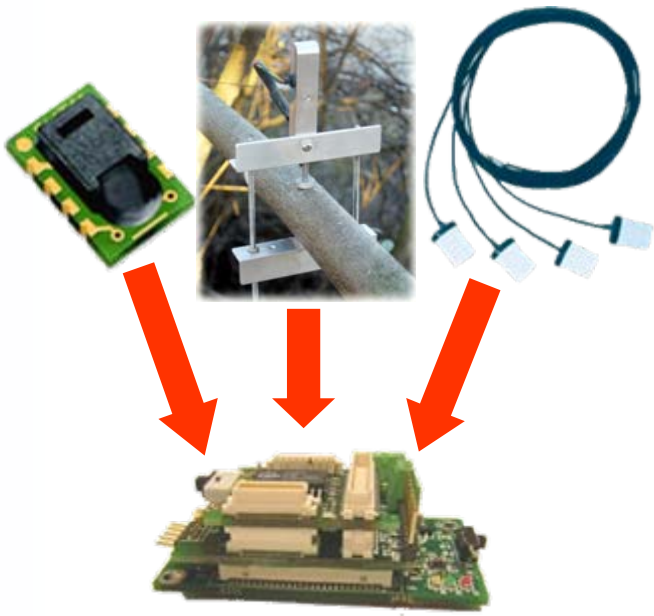
Sensors applied to soil

Soil temperature and soil moisture sensors, located at 20 and 50 cm of depth. The sensors will be positioned close to the plant-node, between 50 and 100 cm from the base of the trunk, because of the wide extension of physiological active root system.

Sensors applied to canopy atmosphere

Air temperature/humidity are positioned very near to the bottom side of the leaf blade monitored for leaf temperature.





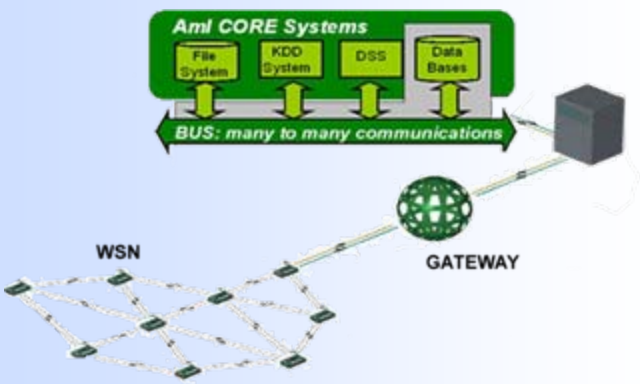
GENERIC SENSOR INTERFACE BOARD

In order to monitor the mentioned environmental parameters in the vineyard, a wide range of sensors has been connected to the network nodes. Sensors available on the market and sensors developed within GoodFood have different characteristics in term of supply voltage, output signal, input range, etc. For this reason in the GoodFood project a generic “sensor to node interface board” has been developed, which allows to transform a generic sensor into an “AmI Compliant” sensor. This is a sensor that can be easily connected to whichever node of the network and that is able to work without changing any configuration parameters in the network. The heart of this interface is a microcontroller with run time, analog and digital reconfigurable hardware architecture. The main important features of this intermediate hardware interface layer is the capability to change the configuration of analog circuitry for the ease configuration of some software parameters (configuration TEDS).

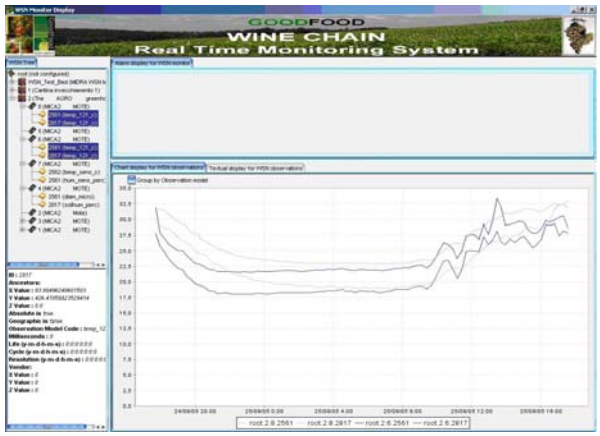
The Pilot Site: Montepaldi

AMBIENT INTELLIGENCE

The AmI infrastructure includes sensors, interfaces, nodes and the whole Wireless Sensor Network, the databases and all the analysis systems. In the AmI vision computers and networks are integrated into the everyday environment, making a multitude of services and applications accessible through easy-to-use human interfaces. This vision of "Ambient Intelligence" places the user, the individual, at the centre of future developments for an inclusive knowledge based society for all (ISTAG definition). The whole infrastructure developed in the GoodFood project is a practical application of the AmI concept in the agro-food field.



All the data collected by the Wireless Sensor Network through the sensors are sent to the AmI core, where it is stored and processed for acquiring knowledge and taking the appropriates decisions: to irrigate a specific zone of the vineyard, forecast a pathogenic attack and specify the zones that need a specific treatment, to identify the right time for the harvesting, the better grapes for the high quality wine and so on and so forth.



THE PORTALS

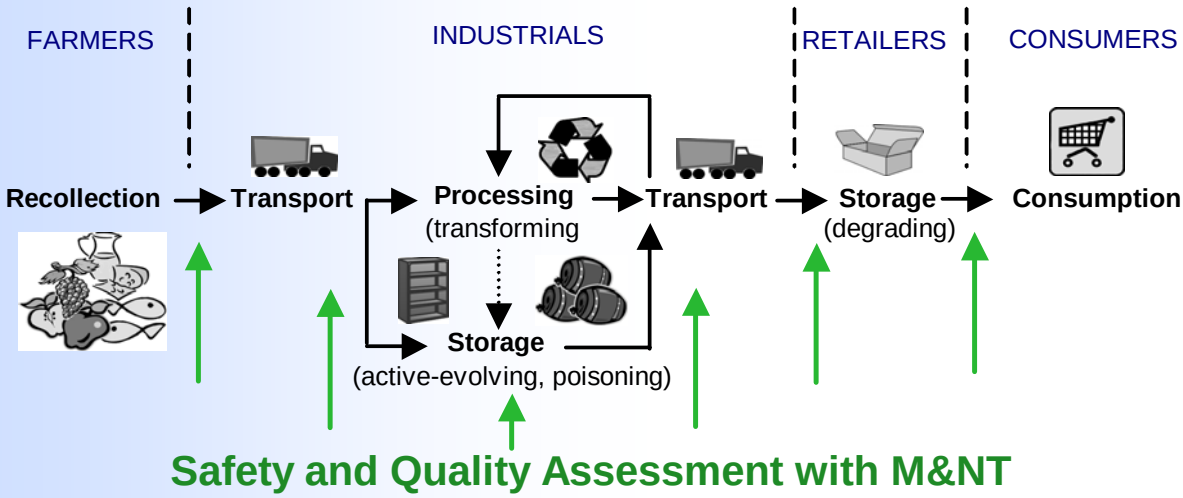
Two instruments have been developed for storage and display of the data. A simple portal (http://www.unifi.it/midra/goodfood/) developed by the University of Florence allows an easy and quick visualization of the data measured by all the sensors in the vineyard. This instrument is efficiently used for control and debugging of the WSN.

The second portal (http://ami.goodfood-project.org/) developed by Synapsis, in addition to the real time monitoring, shows other important functionalities. In particular, it includes three major areas: Real-Time, Off-Line and Configuration Area. In the Real-Time Area the applications receive and immediately display observational data coming from the sensors connected to the GoodFood AmI platform. For each represented sensor users can see: spatial location, last observed value (numeric value, graphic and/or color representation), observation timestamp. The applications in Off-Line Area use stored historical data to perform data analysis by means of datamining algorithms. In the Configuration Area, users can modify some parameters of the network (e.g. the position of a node that has been physically moved).

Logistic scenario – Flexible Tag Microlab

DESCRIPTION OF THE LOGISTIC SCENARIO

One of the main targets of the project is to improve the food quality control during transport, storage and vending through the development of a microlab on a flexible label (FTM).

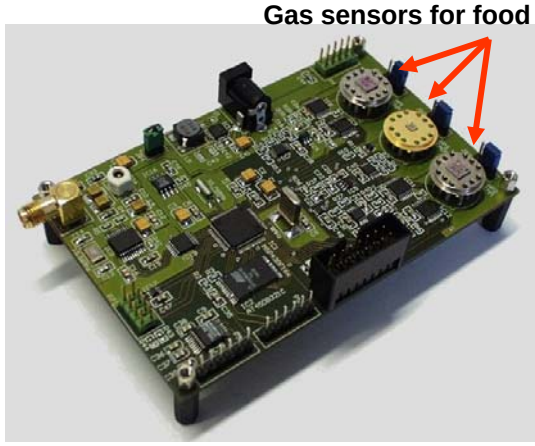


Today's food monitoring systems rely on expensive and bulky sensors suitable only for specific measurement tasks. GoodFood develops a label that follows the products along all the food chain, from the production site, storing the information about the site, the received treatments, the date of packaging. Then it continues to acquire data during the various steps of the food chain and registers the overcoming of several thresholds in terms of temperature, humidity, light, gas concentrations. At the end of the chain the consumer will read all this information in an easy way (e.g by using a mobile phone or a IR reader).

THE READER

The heart of the designed food container tracing system will be an RFID system (Reader + Tag) with food sensing capabilities. The Reader will contain a micro screening system for food quality and safety monitoring, a data evaluation and storage system as well as a communication system. This communication system will enable a data exchange with the Quality and Safety AmI Network. On the other hand the tags will be addressed like conventional RFID-tags. At the moment the gas sensors are integrated on the reader, however the goal is to transfer reader functionalities as much as possible to the tag, until reaching a flexible tag microlab. The aim is to follow the ISO 15693 standard for the development of the Reader/Tag system.

Gas sensors for food quality



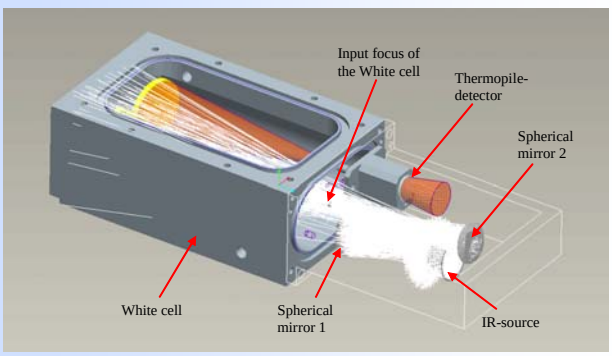
Logistic scenario – Flexible Tag Microlab

THE INFRARED SYSTEM

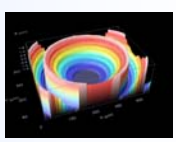
Another module that can be connected to the reader or directly to the gateway is the InfraRed Sensor System. In today's storage-houses the ripening of climacteric fruit is controlled by the ethylene concentration in the ambient atmosphere. For long-term storage an ultra low oxygen atmosphere is used and low levels of ethylene have to be early detected since they are indicative of fruit ripening. Conversely, ethylene is actively added when the ripeness of the fruit in storage has to be promoted.

In addition to long time storage, another proper logistic scenario for ethylene monitoring could be long time transport, since in this situation high volumes of products are again at risk for a long time (up to 1-2 months).

A miniphotometer with coupling optics encasing a 1,6m optical path in a 10cm cell, with a new generation thermal emitter, thermopiles as infrared detectors with hybrid integration of narrowband filters and Fresnel lenses as focusing elements is being built to discriminate ethylene from other interfering gases.

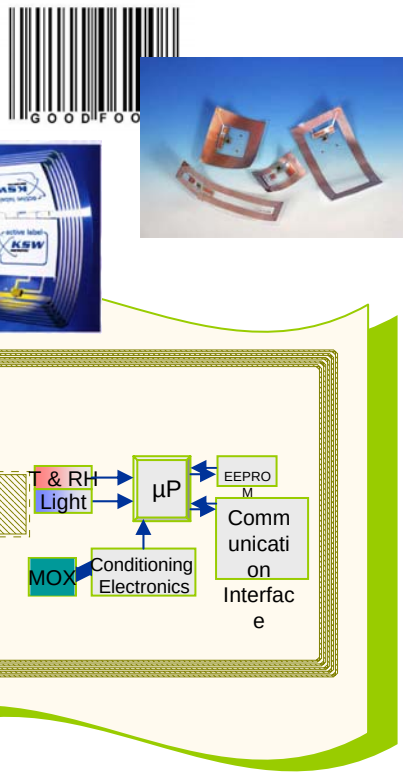






FLEXIBLE LABEL EVOLUTION

The actual Bar Code supplies some simple and static information on the product, such as the producer, the creation and expiration date. A first evolution of the Bar Code is the read only RFID labels. They are the simplest type of RFID labels, already widely used and in which the data is written only once during manufacture.



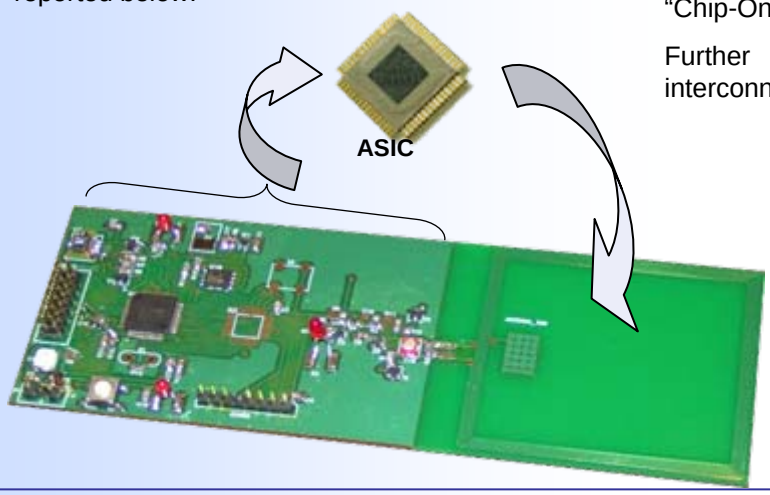
The advantages are the possibility to store a greater amount of data and to read them also when not directly visible by the reader (e.g. within a box). A further evolution of this type of tag is the read and write labels, which can be written during the food chain adding information on the storage conditions. These labels need a reader with integrated sensors that travels with them along the food chain.

Logistic scenario – Flexible Tag Microlab

The actual challenge is the integration of sensors on board. In this case the labels need also a battery, because the power given by the electromagnetic field of the reader is not enough for supplying the sensors, especially when acquisitions from the sensors are required and the flexible label is situated more than ten centimetres from the reader. At present some companies, like KSW, produce sensorized labels, including temperature and humidity sensors. The GoodFood project aims to carry out a real innovative aspect in this field, integrating gas sensors in the flexible label, in particular MOX sensors developed within the project.

FTM - PRELIMINARY ARTIFACTS

In the GoodFood context, 13.56MHz band has been chosen among the various frequency bands used in RFID applications. By operating in this frequency range, the tag antenna can be a few tens of centimeters long (about 80 cm when unwrapped) and therefore the area of the tag can be made relatively small. At the same time, at this relatively low frequency, the complexity of the electronic circuitry needed for communication can be kept at a minimum, allowing the consortium to exploit low cost components instead of ASICs. A picture of the rigid tag developed on PCB substrate within GoodFood is reported below.



The final aim of the development of the custom front-end is to prove the feasibility of the flexible tag microlab vision. Future optimization of the tag electronics will allow to enhance the RFID communication performance and reliability; the realization of an ASIC integrating the tag electronics will be considered at the end of the project.

MOX SENSOR INTEGRATION

A preliminary study of gas sensor integration on the flexible tag has been performed.

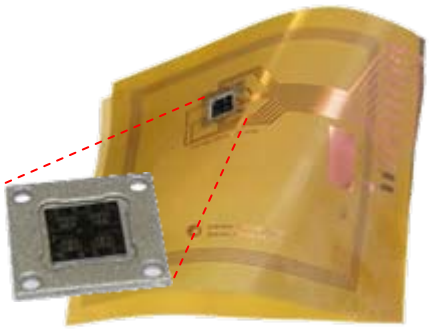


Figure above shows a possible solution for the integration of the MOX sensors based on the “Chip-On-Flex” wire-bonding technique.

Further solutions based on a Flip-Chip interconnection are under test.

GoodFood Workshop on Ambient Intelligence and Microsystems Solutions for the Industry

On November 15th and 16th, 2005, an open 2-day Workshop was held in Florence with the aim of opening the project to the industrial and research communities from outside of the consortium. The workshop was planned for contributing to both the dissemination of the aims and achieved results of the project and also to the training of researchers and industrials through tutorials given by key persons from different countries.

As the Workshop was planned in direct relation with the general assembly held in Florence, where the vineyard pilot site and a relevant part of Italian wine producers are established, the core subject of the event were the Ambient Intelligence solutions for the wine food chain. Thus, for coherence, most of the presentations carried out by GoodFood members were also linked to the wine and grape food chain.

All registered members of the Users Club were invited to the event, and an effort of making publicity though Newsletters and direct mailing was also done. The result was an attendance of more than 60 people from outside the project, summarising around 120 attendees each day.

The main tutorials on AmI and related subjects were carried out by key speakers from Intel, Motorola, Arched Rock, TU Berlin, etc. On the other hand, dissemination of results of the different Workpackages of GoodFood related to fruit and wine were given by the respective WP leaders.

As a conclusion, we can say that the event was a very good opportunity to learn from and discuss face by face with key groups that are working with similar approaches. Additionally, good dissemination of GoodFood related work was also carried out to them and to the open audience, with an important attendance of wine producers of the region. However, the event not only had a local impact, since the presence of coordinators from other European projects and R+D groups and SME's from 10 different countries shows that the impact was much broader. The attendance of such persons was also important for the networking, sharing of knowledge and preparation of collaborations for the future.

Some of the lectures given during the Workshop by the different speakers will be available on the GoodFood web site, in the "Training activities" section.

Fall 2005 GoodFood Workshop on Ambient Intelligence and Microsystems Solutions for the Industry

November 15th

Official language English

09.00 - 09.15	*Welcome*	*A. Marinelli, Università di Firenze* *D Beernaert, DGINFSO*
09.15 - 09.30	*Opening remarks*	*GF Manes, Università di Firenze*

1st day morning
Wireless Sensor Network Technology

Session 1

Chair	***G Manes***	***A Roveri***
09.30 - 10.00	*Keynote speech* Ami strategies in assistive environments	D Beernaert, EU DGINFSO
10.30 - 11.00	Intel Motes Sensor network and applications	L Nachman, Intel Corporate Labs Usa
11.00 - 11.30	Asset Visibility via Wireless Sensor Networks	T Bancroft, Motorola Labs USA
11.30 - 11.45	*Coffee break*	

Session 2

Chair	***R Fantacci***	***L Nachman***
11.45 - 12.15	Sensor Network in a Box	W Hong, Arched Rock Corporation, Berkeley USA
12.15 - 12.45	WSN in a vineyard	WP07 GoodFood
12.45 - 13.15	Sensor networks: a change in information collection	A Wolisz, TU Berlin
13.15 - 14.30	Lunch	

1st day afternoon
Micro & Nano-Sensors

Session 1

Chair	***V Schettino***	***C Canè***
14.30 - 15.00	Nano-sensors	G Maracas, Motorola USA
15.00 - 15.20	Microsystems Technology solutions for the rapid detection of pesticides	S Setford, Granfield University
15.20 - 15.40	Microsystem Technology solutions for the rapid detection of Toxingenic Fungi & Mycotoxins	A Lo Grieco, ISPA, CNR I
15.40 - 16.00	*Coffee break*	

Session 2

Chair	***P Dario***	***G Maracas***
16.00 - 16.20	Multysensing Microsistems integration for food quality control	P Siciliano, IMM, CNR
16.20 - 17.00	Sensor technology at Università di Firenze	M Mascini, Università di Firenze
18.30 - 20.00	**Reception**	

November 16th

Official language English

Session 2: THE IMPACT ON AGROFOOD INDUSTRY MANAGEMENT

09.00 – 09.20 *Welcome*

2nd day morning
The impact on Wine Market

Session 1

Chair	***D Beernaert***	***L Casini***
09.30 - 10.00	Ami GRID and user interface	D Guerri, Synapsis
10.00 - 10.30	Making Sensors Useful in the Vineyard	R Beckwitt, Intel Corporation
10.30 - 11.00	*Coffee break and Demos*	

Session 2

Chair	***P Fiorino***	***S Mastroianni***
11.00 - 11.30	User perspective	S Mancuso, Università di Firenze
11.30 - 12.00	Market perspective	J Goossens, Bio-Sense, Be
12.00 - 13.00	Panel discussion	**Chair: L Casini**
13.00 - 15.00	Lunch	

2nd day afternoon
The Impact on AgroFood Market

Chair	**G Metakides**	**P Brereton**
15.00 - 15.30	GoodFood Demo	GF Management board
15.30 - 16.00	TRACE: tracing the origin of food	P Brereton CSL lab, UK
16.00 - 16.30	User perspective	Jean Marc Diserens, Nestlè
16.30 - 16.45	Coffee break	
Panel moderator		**Chair: P Brereton**
17.00 - 18.00	Panel discussion	
Gala Dinner		