

SINERGIA and AGRICARE: two European projects on energy efficiency in the agrifood and agriculture sector

Advantages coming from technological competences are a specific feature of the competitive processes of the industrialised world, since the development potential of advanced Countries depends on their ability to continuously innovate production systems

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In the Mediterranean in the agrifood and agriculture sector companies, often small and medium-sized (SMEs), still spend few resources on improving energy efficiency and innovation, which is, instead, a crucial factor for their competitiveness. Consequently, the energy costs associated with the various operations (e.g. soil tillage, sowing, harvesting but also pasteurization, drying, cooling, heating) may be very significant. It is, therefore, necessary for SMEs to implement actions aimed at improving energy

efficiency (e.g. adopting innovative cultivation techniques, replacing old machinery, changing technologies) and introducing energy self-production from renewable sources.

In this context the link between scientific research and the world of production has been strengthened with an increasingly central role in the transfer of technology from knowledge-based institutions (universities and public research centers) to those which use it economically (enterprises). The technological transfer enables the introduction of impor-

tant innovation processes in the SME system, including the improvement of energy efficiency, which is one of the main objectives of two European projects: SINERGIA for the agrifood and AGRICARE for the agriculture sector.

SINERGIA, "Increasing energy performance by transfer of innovation to agri-food SMEs in the Mediterranean Area", is a European project co-financed by the MED Programme, an EU transnational cooperation programme of the EU Cohesion Policy with the objective to strengthen



the competitiveness, employment and sustainable development of the Mediterranean area.

The general aim of SINERGIA was to promote technology transfer to SMEs in the agrifood industry in order to:

- identify innovative processes to address energy efficiency patterns in the productive chain;
- guarantee a wide replication of the technological solutions for energy saving and CO₂ reduction in the involved MED regions;
- strengthen the competitiveness of the agrifood industry in the Euro-Mediterranean and global markets.

In seven specific MED pilot regions across different agrifood pilot sectors SINERGIA Partnership has performed the following activities:

- capitalization of the most important MED and Research projects tackling the innovation in the agrifood sector and zooming the

critical factors related to energy efficiency in the agrifood industry, in order to steering enterprises towards adequate and innovative solutions;

- identification of innovative solutions and benchmarks also through the realization of energy assessments on a pool of 50 SMEs;
- at local/productive cluster dimension, multiplication of the SINERGIA energy efficiency cooperative model to a broader range of SMEs and stakeholders through the empowerment of existing eco-innovation help-desks in each project region as well as through the promotion of public and private agreements.

Then the project, which tackles the energy challenges, has developed some user-friendly instruments to increase SMEs' awareness on the best tailored actions to introduce innovation in energy efficiency processes, from monitoring to selection of the most fitting technologies to the energy managers' coaching

across the whole investment life cycle:

- a decision support system, named Energy Self-Assessment Tool (ESAT), which offers a set of energy performance reference values for the selected agrifood divisions and technologies, helps enterprises to pre-evaluate the potential benefits, and maps out the innovation hubs and the available local RES and E-services. It basically encourages agrifood companies to wisely approach their own energy performance problems and deal with the EU directive on energy efficiency, which promotes the energy diagnosis in the EU SMEs.
- a reliable, scientific-based and independent database, Food Energy Techs – FET, which helps the interested food & drink companies to get a first screen of the possible company-based interventions and to focus the best available technologies in the fields of energy efficiency and renewable energy production, that best fit with the numerous and different agrifood sectors.

Additionally SINERGIA has profiled a common vision and a set of future initiatives and recommendations addressed to both agrifood Federations and Governance bodies to help the Mediterranean SMEs to meet the current challenges in the fields of energy efficiency and green energy production - embedding a wider concept of sustainability and environmental footprint - in line with the EU2020 Strategy, in particular the climate/energy package objectives and Roadmap to a Resource Efficient Europe.

SINERGIA recommendations highlight that making agrifood compa-

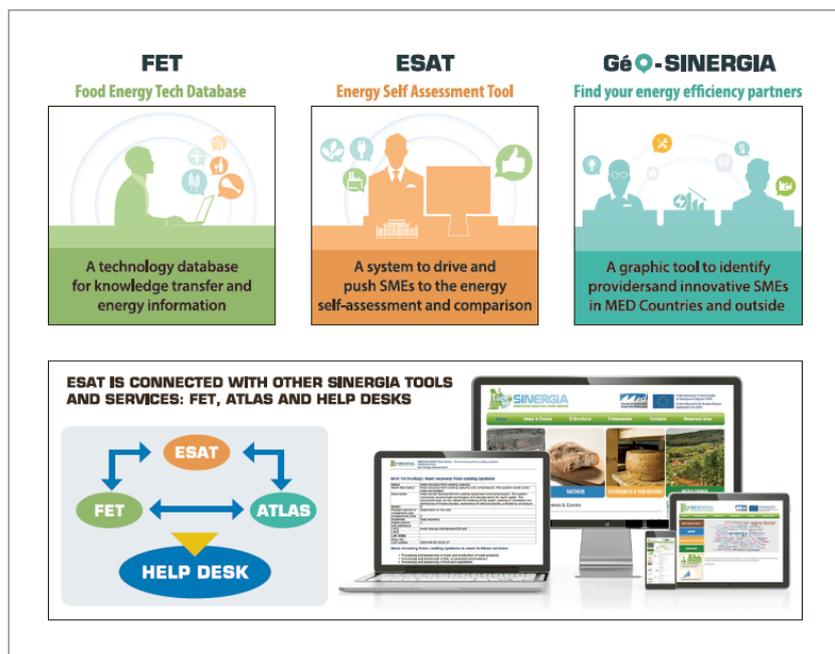
nies – particularly SMEs – aware about their potential energy efficiency upgrade is definitely the first step to address the problem. Helping them to run an initial self-diagnosis of their energy consumption is the way to convince them to investigate market and organizational solutions to deal with energy innovation. It is also a pro-

ful one. However enterprises, especially small- and medium-sized, must be supported in order to fully exploit the advantages offered by this heterogeneous, numerous and complex information instrument. SMEs do not often have a sufficient capacity to understand what technology options could best fit with their own production patterns and

tion but this process should be guided by technology intermediates and skilled specialists to better fulfil companies' expectations.

Agrifood associations are invited to enhance their efforts to provide their members with a vision over future market trends and new services, with the goal of promoting the large scale introduction of eco-innovation model analysis in the agrifood sector and stimulating targeted investment to green the food & drink industrial supply chain.

The European Regional Development Fund, which roughly represents one/ third of the European Union's budget in the period 2014-2020, represents in terms of budget, investment schemes and accessibility an important financial instrument to support European companies towards low-carbon production phases and in greening the supply chain. Agrifood federations should provide policymakers with result-based recommendations to invest resources to support agrifood companies in improving their energy efficiency standards and promoting synergies among agrifood cluster and local administration on energy policies. EU Funds could support investments with positive impacts for the whole agrifood local systems and could stimulate replication mechanisms. The ownership and circulation of a successful case study become a crucial factor to stimulate worthy projects specifically addressed to the agrifood system and make the best cost/benefit use of the dedicated Structural Funds. Agrifood industrial associations should help their members to deal with the bureaucratic procedures to access the financing and - in short - catch the opportunities offered by the European Union, possibly through specific consultancy services.



SINERGIA Project dissemination tools kit by Marco D'Andrea, ENEA

paedeutic step to identify suitable low-carbon technologies fitting with their own industrial processes. The access to good quality and scientific-based innovative ideas to improve the environmental performances of the food & drink industry is one of the main challenges to stimulate the green innovation of this sector. Among the various source of information and telecommunication technologies available today, the internet is certainly the most innovative and use-

to calculate the cost/benefits of the investment in the full life cycle. Key elements to meet new SMEs' requests for information are the various tools available online to enable two-way information flows, starting from the simplest to the more evolved, that attract companies, making it possible to obtain useful information about the opportunity of new energy technologies. Therefore, using organized and structured tools allows SMEs to achieve a high level of innova-



Furthermore agrifood federations, R&D centers and public administrations are called to profile fresh schemes to get research out of laboratories, meet the real companies' demand for innovation and get subsidies to introduce eco-innovation technologies for energy efficiency and RES in the Mediterranean agrifood sector. Services and applications delivered by the close-to-market research need customization and adaptation when applied to different market sectors, whilst tailored-made strategies to penetrate the agrifood organization structures are demanding to be concretely used by SMEs. Special attention must be devoted to diffuse, across stakeholders, mature technologies and organization models that are currently existing on the market but that suffer no technological barriers (knowledge and ways of application, costs, understanding of the whole investment life cycle costs, etc...). The creation of public and

private partnerships for the green innovation of the agrifood sector, both at territorial and European level, becomes a matter of competitiveness.

In fact agrifood is one of the main economic pillars in the Mediterranean area and is recognized in most of the Regions as Smart Specialization Strategy (S3), with a goal that is to boost regional innovation and growth by enabling regions to focus on their strengths. The introduction of the eco-innovation model analysis in the agrifood sector, both to reduce the environmental stress factors in the supply chain and to support the competitiveness of the agrifood SMEs, is part the roadmap. This requires a convergence of the education and business regional strategies:

- the specialization of the educational systems, from the technical colleges to universities, to meet the demand of new green skills and

green jobs shall be pursued by encouraging new forms of public and private collaboration on the labour market;

- the enrichment of the vocational training with topics for the development of skills on eco-innovation, the innovation management and the sustainability issues.

Initiatives among agrifood federations, high education and R&D and specialized market/skills intelligence organizations – also at transnational level by using the available Growth and Jobs EU Funds – should be launched to increase the professional abilities in energy diagnosis and green energy projecting in agrifood enterprises, also by extending the concept of sustainability to the global environmental footprint.

LIFE+ AGRICARE, "Introducing innovative precision farming techniques", is a project coordinated by Veneto Region's Agency for innova-

MED PROGRAMME

The MED Programme is an EU transnational cooperation programme among the "Territorial Cooperation objective" of the EU Cohesion Policy. Partners from 13 countries including the whole Northern Mediterranean seacoast are working together to strengthen the competitiveness, employment and sustainable development of this area. The transnational setup allows the programme to tackle territorial challenges beyond

national boundaries, such as environmental risk management, international business or transport corridors. So far, 144 projects have been programmed, co-funded by the European Regional Development Fund (ERDF) up to a rate of 85%. The Programme objectives are to improve the area's competitiveness in a way that guarantees growth and employment for the next generations and to promote territorial cohesion and environmental protection, according to the logic of sustainable development.



tion in the primary sector, in collaboration of Maschio Gaspardo SpA, Department of Land, Environment, Agriculture and Forestry of Padua University and Agroindustry Division of ENEA, and is co-funded by LIFE+ Programme with a duration of three years from June 2014 to May 2017.

The overall objective of the project is to demonstrate how the application of advanced techniques in precision farming (Variable Rate Application and assisted steering systems), combined with different types of no-till farming, can play an important role in terms of greenhouse gases (GHG) reduction, and energy saving.

The project regards four different rotated crops (winter-wheat, canola, maize, soybean) and four different soil management techniques: conventional, minimum tillage, strip tillage and no-tillage at the pilot farm Vallevicchia managed by Veneto Region's Agency for innovation in the primary sector (Venice, IT). The testing regards 16 parcels (1.5 hectare each) of department 12 in the pilot

farm Vallevicchia subject to winter-wheat, canola, maize, soybean rotation. Harvest, in all scenarios, is done by combines equipped with yield map systems.

The specific objectives of the project are to:

- Verify and demonstrate the effective potential of the precision farming techniques in terms of energy saving and greenhouse gas reduction.

- Analyze the efficiency of the machines used, enhanced by electronic precision farming devices which reduce CO₂ emissions.
- Examine the suitable scenarios for the diffusion of such techniques in different Italian agricultural contexts.
- Assess the threshold of economic convenience and environmental benefits.
- Assess, through analytical models based on “ground, plant, climate” data and Life Cycle Assessment (LCA), the long term effects of the experimented technologies introduced.
- Diffuse what examined and proven by tests, not only in the pilot site, to encourage the diffusion of such technologies and techniques.

In addition to the tests performed in the pilot farm, the project foresees a self-assessment Web application with related guidelines to calculate the convenience to introduce new technologies and different soil management in fields, while significantly reducing the GHG emissions and the energy consumption.



Vallevicchia pilot farm



ZEBRA strip tiller by Maschio Gaspardo, working at Vallevecchia pilot farm

This free web application, developed by ENEA and placed on the project website, will guide farmers through some defined steps to fill information about their farm crops and cultivation techniques and will provide them with a calculation of their own energy consumption as well economic balance.

Another important project result is represented by the analysis of energy and environmental benefits, direct and indirect, resulting from the in-

tegrated use of precision farming equipment and the soil management techniques of no-till farming (conservative farming). It was carried out to assess potentially generable carbon credits from the introduction of such techniques to farms and to compare financial incentive schemes for the reduction of agriculture carbon emissions in Italy and Europe.

The analysis of energy and environmental benefits were carried out in particular to:

1. test and demonstrate the benefits associated with the introduction of the latest prototypes of conservative farming machines, integrated with precision technologies, compared with similar traditional tests;
 2. assess the environmental benefits associated with different methods of soil management for the 4 different crops (winter-wheat, canola, maize, soybean), with or without precision farming;
 3. compare energy consumption and potential environmental impacts for different soil management systems on the basis of chosen crops: winter-wheat, canola, maize, soybean including cover crops, where provided.
- The evaluations were made separately for each method of soil management techniques. Then a first data collection and systematization were carried out by the implementation of a shared collection and management data protocol for each operation. The analysis allowed to calculate the following indicators: Gross Energy Requirement (GER), and Energy Efficiency. GER is defined as the amount of energy required for the production of a specific product and includes all crop cultivation

LIFE+ PROGRAMME

The LIFE programme is the EU's funding instrument for the environment and climate action. The general objective of LIFE is to contribute to the implementation, updating, and development of EU environmental and climate policy and legislation by co-financing projects with European added value.

The 'Environment' strand of the new programme covers three priority areas: environment and resource efficiency; nature and biodiversity; and environmental governance

and information. The 'Climate Action' strand covers climate change mitigation; climate change adaptation; and climate governance and information. One of the main energy-related policy drivers in the EU is the reduction of greenhouse gases (GHG) at their sources. LIFE climate change and energy projects reflect this priority: exploring innovative ways of implementing mitigation or adaptation measures to reduce GHG; and targeting energy production and distribution, renewable energy technologies and energy-efficiencies in areas such as industry, services, buildings, transportation, lighting and equipment.

operations and also machines and technical inputs applied. Energy Efficiency means the amount of energetic input to produce a unit of energy output. When conservative techniques were integrated with rate variable application of inputs, energy consumes slightly decreased. For each crop, use of machines, fertilization and/or irrigation were the most energy intensive operations. With regard to environmental and energy evaluation, results showed that direct and indirect impacts of agricultural activities varied on the basis of the different techniques used. In particular, no-tillage technique was the most interesting result in terms of energy used and, consequently, CO₂ emission.

In general, the most energy consuming crop operations were those related to soil tillage and to use of fuel consuming machines, and those relating to fertilizing, especially nitrogen fertilization. Energy-intensive operations were also those that substantially contribute to CO₂ emissions.

However an interesting outcome was that introducing new technologies and techniques could reduce the impact of agriculture on the environment, decreasing energy use and supporting accumulation of carbon in the soil.

The data validation and control process are still ongoing but the processed data clearly indicate that the innovative techniques are

less energy consuming and variable input management gives an important contribution to improve overall performance, although it is complex in its planning and implementation.

The experiences made in the framework of the SINERGIA and AGRICARE projects will be shared in the technical workshop organised with FAO on the Nexus between Food Energy Water, in the contest of a MoU for enhancing the sustainability of the food production and nutrition in developing countries.

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