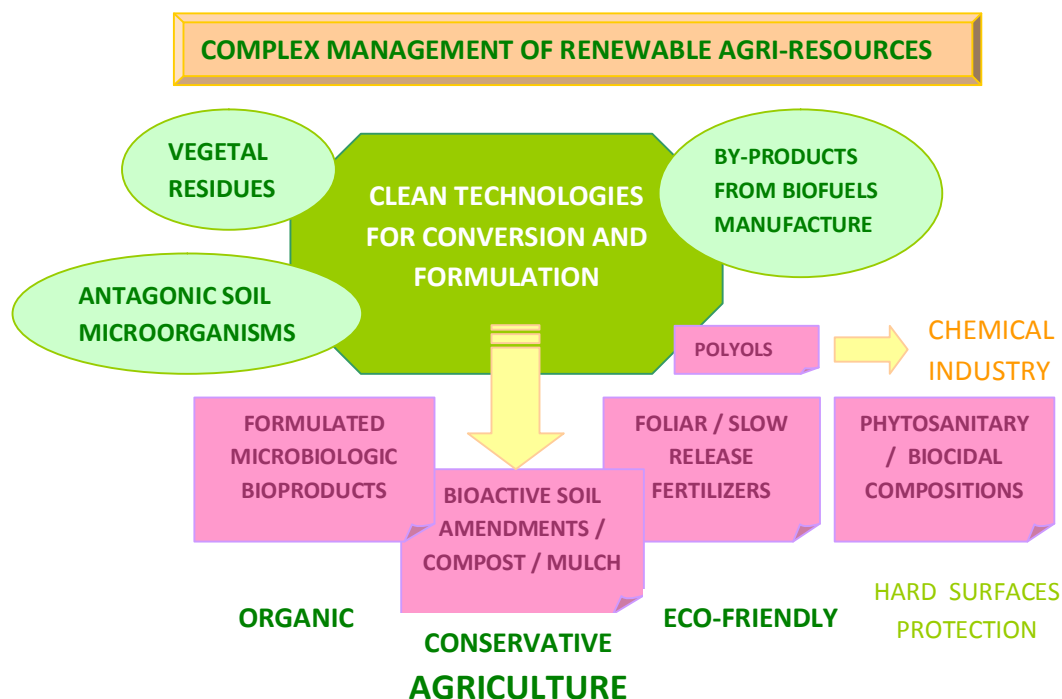


E 4: BIOACTIVE COMPOUNDS (BIOPRODUCTS)

Short description of the research domain

The main research activities were conducted within direct contracts and national R&D projects to improve the exploiting level of renewable resources from agricultural activities into eco-friendly added value (bio)products by clean technologies for sustainable development of industry and agriculture: advanced intermediary materials and technologies for chemical industry, ecological surface biocide compositions, liquid and granulated slow-release fertilizers and bioproducts (based on vegetal and microbial active principles) for organic farming.



Research direction change

The transition from chemical synthesis of intermediates for pesticides to semi-synthetic technologies and so-called „green chemistry” processes is the main research direction change. As examples, chemical intermediates for industrial production of polyurethanes were replaced with polyols from renewable natural resources, inorganic fertilizers with organic slow-release fertilizers and conventional pesticides with eco-friendly alternatives based on vegetal active principles and microbial strains with agricultural applicability as antagonistic agents against pests and diseases of cultivated plants.

New area of research explored

Techniques for restoration and conservation of cultural heritage and eco-efficient means of production and application of organic biocide compositions is a new area of research to find solutions for the treatment of biodeteriorated wood and stone monumental surfaces and their long-term protection against recontamination.

New interdisciplinary initiatives

As an applied research oriented team, we aimed to conceive and obtain new products and to develop transferable technologies for the manufacture of organic intermediates for polyurethane foams, biocides with multiple applicability, plant protection products and slow release fertilizers with lower impact on agro-ecosystems and minimal residuals in food chain. Collaborations with experts in biochemical and nanotechnologies are initiated for extraction and determination of trace elements in natural resources, nanofertilizers and vegetal active principles, electrochemical detector and means being also proposed for assaying traces of dangerous/hazardous substances. In order to increase the

competitiveness of manufacturing biofuels we proposed the total valorization of raw materials through the conversion of technological wastes and by-products to added value novel (bio)products useful for nutrition and protection of cultivated plants, which involved interdisciplinary approach: biology, microbiology, biotechnology, chemistry, biochemistry, physics, agronomy, physiopathology. Research partners in PNCDI projects: R&D Institute for Plant Protection - Bucharest, R&D Institute for Pedology and Agrochemistry - Bucharest, Research Center for Membranes and Macromolecular Materials - Bucharest, Research Institute for Organic and Auxiliary Products – Medias, IPROCHIM – Bucharest, Institute of Physico-chemical Research “I. Murgulescu” – Bucharest.

Entrepreneurship initiatives

Several significant results were considered able to generate start-up or spin-off project proposals such as the data included in Patent/Patent applications regarding microencapsulated fertilizers, biocides and microbial compositions. These data were constituted as deposits to Technological Transfer Department of ICECHIM to find potential beneficiaries for implementation. There were realised industrial research and experimental development to elaborate novel technologies based on direct contracts between ICECHIM and a representative unit of Romanian chemical industry, SC Oltchim SA Rm-Valcea. The main goal of implementing these technologies was to substitute petrochemically generated products with similar products with renewable natural origin. A strategy of development of national fertilizer industry, its present and future, was elaborated to be used by Ministry of Economy. Strategic elements to increase the competitiveness of fertilizer industry were proposed after a prospective outlook on world trends and evolution.

Visibility actions

Some of the most representative inventions were presented and awarded at International Fairs and Exhibitions of Inventions, Scientific Research and New Technologies such as: Innova Eureka, Nov. 13-15th 2008 and Nov. 17-19th 2011, Bruxelles, Belgium; IWIS 2011, Nov. 3-5th, Warsaw, Poland; The 37th Exhibition of Inventions, Techniques and New Products, April 3-5th, 2009, Geneva, Switzerland; Inventika in Oct. 28-31st, 2009 and Sept. 6-9th, 2010, Bucharest, Romania. There were obtained 3 gold medals, 5 silver medals, 1 bronze medal, The special prize of the Minister of Science and Higher Education, OMPI Award, Moldavian State University Diploma and important visibility, recognition and appreciation in the scientific international community. An International Exploratory Workshop was held at ICECHIM 16-18th November 2011, with a large international participation of PhD scientists and professors. Also, International Conference and networking "Diaspora in scientific research and higher education in Romania", Workshop: "Sustainable solutions to emerging challenges in agro-food with implications for human medicine", Bucharest, 21-24 September 2010; International Symposium of the Chemical Societies of Chemistry of the Southeastern Europe countries, Sofia – Bulgaria, September 2008 and every year in the last days of October, The Priochem Symposium of ICECHIM were scientific actions and meeting events for Romanian and foreign researchers to change and disseminate scientific information and to establish contacts for future collaboration.

Other significant aspects

Our team recruited three new members: three PhD researchers in chemistry, biochemistry and biotechnology and two young university graduate chemists. It participated with two researchers at training courses for high specialization and certification as Experts accessing EU structural funds and cohesion, and also it is training three PhD students to be specialized in the research domains of advanced methods of obtaining oils from renewable natural resources, modernization / improvement of the technologies for conversion of by-products from biofuels manufacture. All the R&D data obtained within the direct contracts was transferred as novel, modernized or improved technologies to the beneficiary SC Oltchim Rm-Valcea SA to be built on an industrial scale and to enhance the competitiveness of the company.

Quantitative approach

For the period 2007-2011, the main indicators of the team R&D activities are:

- Direct research contracts : 6 contracts with beneficiary SC Olchim Rm.-Valcea (550.000 RON + VAT)
- Budget founded contracts: 11 contracts (2079308 RON)
- Articles in ISI Papers: 8 (6 published and 2 submitted)
- Articles in non-ISI Papers: 7
- 1 book and 2 book chapters about fertilizers
- 40 scientific communications at national conferences and 25 international events
- 4 project proposals for PCCA 2011(2 of them with ICECHIM=Coordinator of the Project)
- 1 Manunet 2011 Bilateral project RO/Spain accepted for funding starting with 2012 (ICECHIM=Coordinator of the Project)
- Patents: 11 OSIM patents, 2 international patents, 35 OSIM patent applications to protect the intellectual property on the novel microbial agrouseful strains, (bio)products and technological processes of obtaining the same.

As illustrated in the next figures, the most important number of patent applications resulted after the best financially sustained period (2008-2009) from the PNCDI projects. Thus, as an indisputable evidence of achieving the national project objectives, from the R&D activities resulted 7 patent applications in the year 2007, 6 in 2008, increasing to 12 in 2009, recording the best results with 18 patent applications in 2010, and decreasing to 5 patents applications in 2011. Among these, OSIM granted a number of 4 patents in 2009, 2 patents in 2010 and 5 patents in 2011, the remaining ones being in present within the evaluation process.

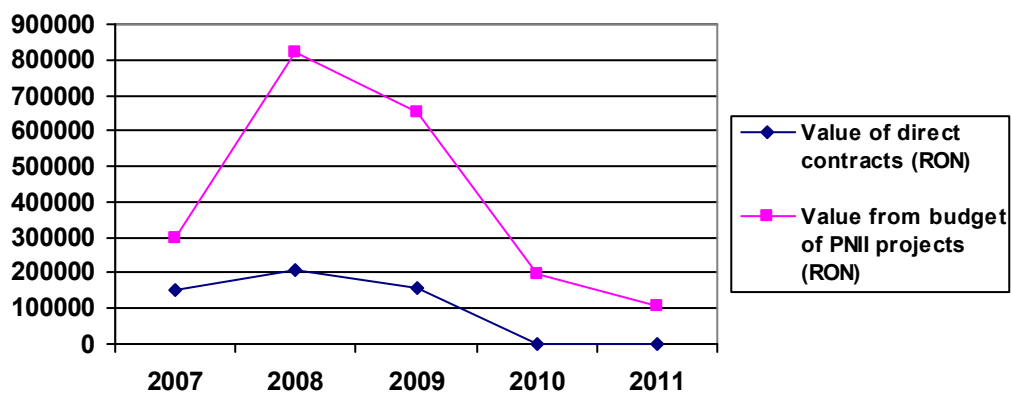


Figure 1. Evolution of financial resources attracted by team members through direct contracts and from the state budget through national projects other than “Sectorial” and “Nucleu”

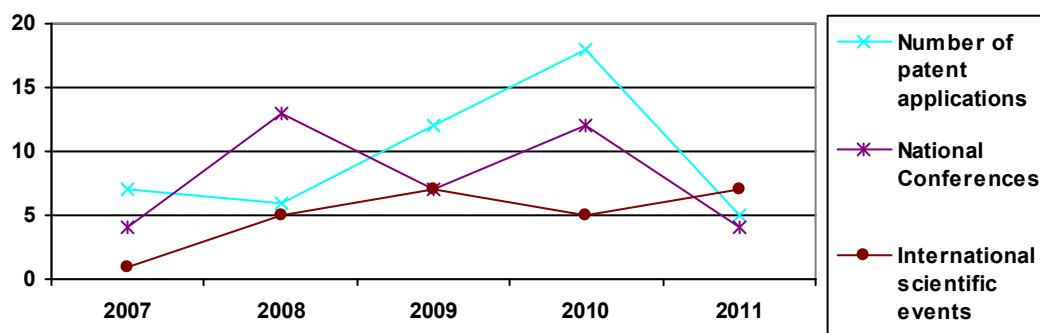


Figure 2. Dynamic of the dissemination actions and patent applications resulted from R&D activities of national projects