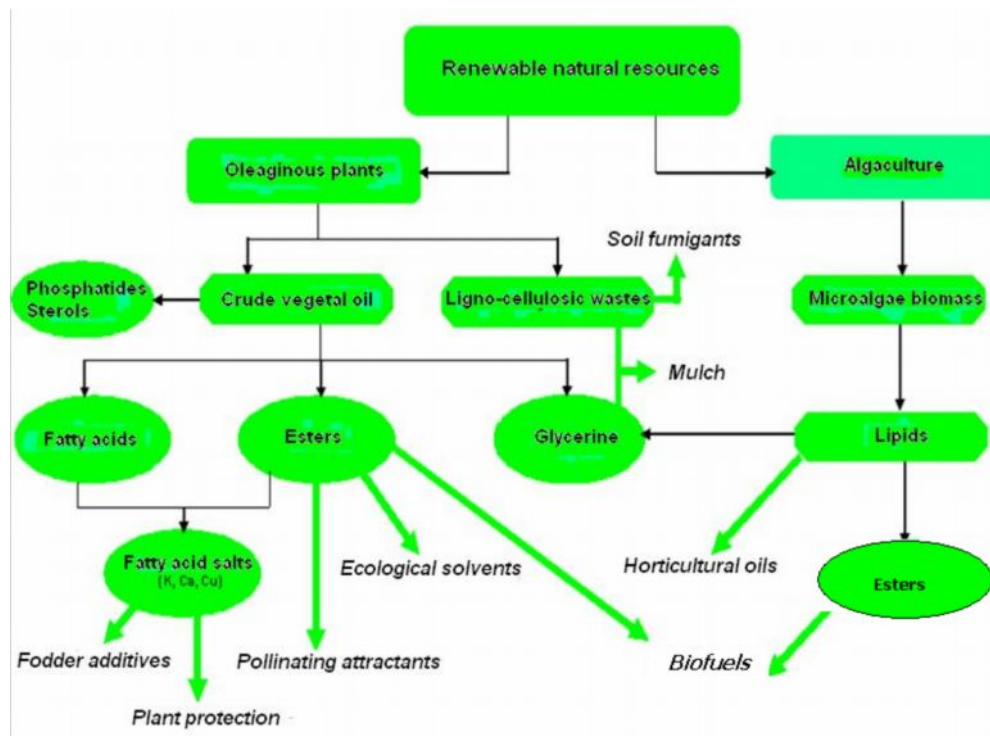


## E 2: ALTERNATIVE BIORESOURCES AND BIOREFINING

**Research team** is formed by 9 member: 7 Senior scientific researcher (2 PhD ) , 2 Scientific researcher ( 1 PhD student); team leader is Sanda VELEA, PhD, Senior scientific researcher.

**The research domain:**



- Sustainable biosequestration of GHG in microalgal photosynthetic systems with high algal biomass productivities in order to complete valorisation such as: algal oil for biofuels and horticultural oils; antioxidants as food additives, food dyes and dietary supplements; fluorescent pigments for medical use; polysaccharides as biopolymers; coproducts such as feeds, fertilizers and soil conditioners.
- Processing and refining of vegetable oils with obtaining of high value added products such as: biofuels; ecofriendly solvents for industrial applications; fatty acids salts (potassium, calcium, copper) as ecological crops protection agents and feed additives; pollinator attractants;

### Brief quantitative and qualitative presentation

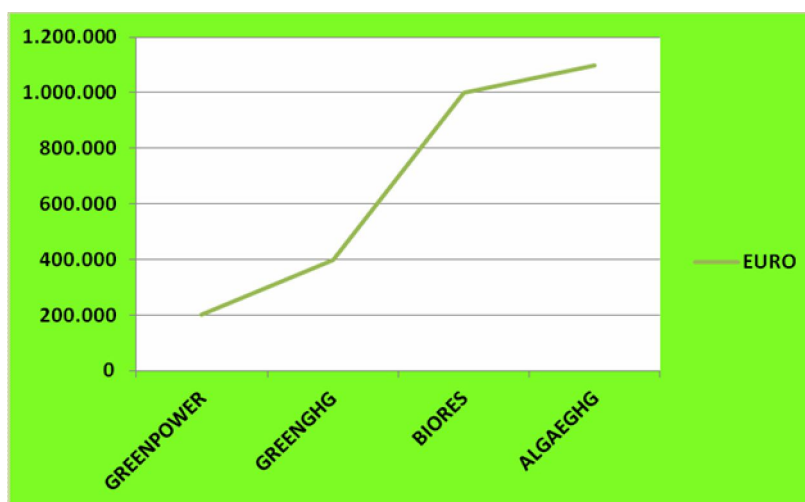
During the last years, the economic factors generated by the alarming increase in the price of oil and in close connection with the possible exhaustion of mineral resources, and also for environment related reasons, such as the negative impact of CO<sub>2</sub> emissions, have lead to a reconsideration of interest towards renewable natural resources as raw materials for biofuels, bioenergy (heat and electricity) and chemical products.

Bioresources are a sustainable alternative as raw materials for achieving environment-friendly products with “clean” processing and production techniques with a positive impact on the environment.

Development of the Bioresources Department by creating of 4 modern laboratories, equipped with high-performance research equipment, was performed in the framework of BIORES Project.

By this modern infrastructure was possible to develop new projects and partnerships based on the valorization of renewable natural resources for environment protection, energy and sustainable development:

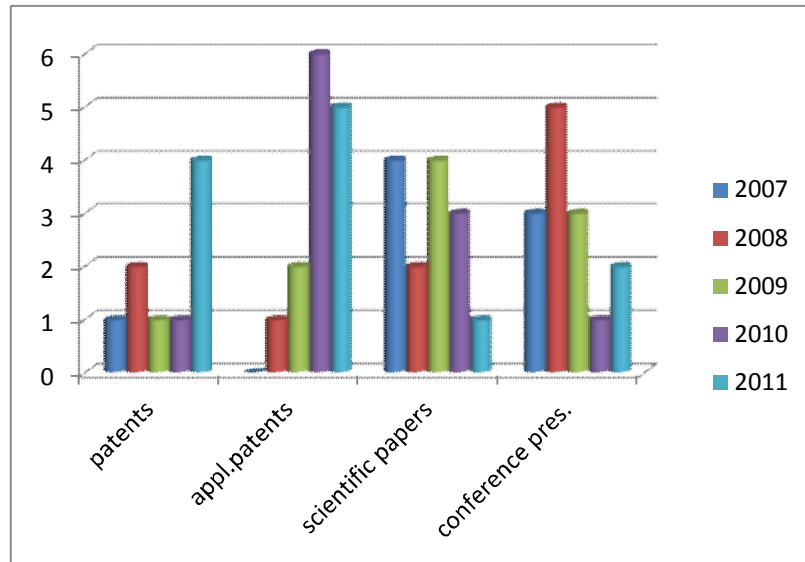
- National Project CEEEX " Bio-fuels and horticultural oils by means of controlled cyanobacterial photosynthesis" ; 2006-2008; Project Manager Sanda VELEA
- National PNII Project „Sustainable carbon dioxide sequestration from thermal power plant emissions by algal photosynthesis” 2009 -2011; Project Manager Sanda VELEA
- National Capacities Project „Development of the bio-resources department by upgrading the R&D infrastructure’ ; 2009 -20011; Project Manager Sanda VELEA
- European Project LIFE10 ENV/RO/734 : ” Carbon dioxide mitigation from greenhouse gases in algal photosynthetic systems”; Project Manager Lucia ILIE; 2011-2014
- European COST CM0903: „Utilisation of biomass for sustainable fuels & chemicals” ; 2009-2013
- European Project Application „Hydrocarbon-enriched feedstocks by combined bio-chemocatalysis”  
Coordinating organisation : University of Nottingham, United Kingdom, Nov.2011



Evolution of financial resources attracted in national and international projects.

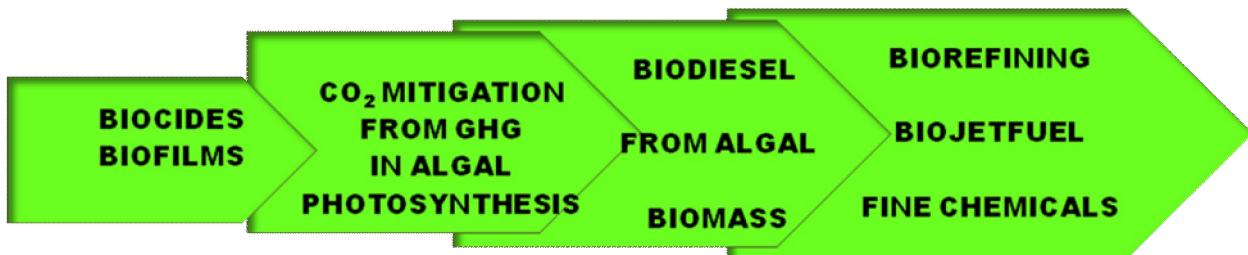
**The most important achievements** was in the field of carbon dioxide biosequestration from industrial emissions by photosynthetic integrated systems, by selection of some algal strains able to capture significant quantities of carbon dioxide, monitoring and optimization of growth processes, identification, isolation and characterization of useful products from algal biomass. Experimental studies have been accomplished for five domestic algal strains: *Chlorella homosphaera* 424, *Scenedesmus opoliensis* 141, *Chlorobotris simplex* 15, *Synechocystis sp.* 51, *Porphyridium purpureum* 337, with high growth potential in complete mineral nutritive media, allowing to use high concentrations of  $\text{NaHCO}_3$ / $\text{Na}_2\text{CO}_3$ , with high yields in algal biomass and with high content in useful products (lipids, polysaccharides, pigments, etc). It was conceived and achieved a „prototype model”- the integrated photosynthesizer system - adapted for carbon dioxide capture and bio-sequestration from industrial emissions, through specialized algal strains.

In this period reserch team members published 14 scientific papers in ISI journals and non-ISI journals, **registered 7 patents and 13 patent applications**, and presented 14 communications at international symposia / conferences.



Dynamic of scientific team results

### Dynamic research topics and directions



### Interdisciplinary and entrepreneurial initiatives:

LIFE 10 ENV/RO/734 European project: „Carbon dioxide mitigation from greenhouse gases in algal photosynthetic systems” is devoted the development of a demonstrative integrated photosynthetic system at CET VEST Bucharest

### Other significant aspects for scientific development of the team:

- Patent RO 123,178 “Process for obtaining of diesel biofuel from wastes”, **Gold Medal** and **Special Prize of OSIM**, International Exhibition of Inventions, Bucharest, October 7-10, 2008,
- Patent RO 121,913 “Diesel biofuel and process for obtaining the same”, - EUREKA INNOVA Energy Exhibition, Brussels, November 24<sup>th</sup>, 2007, **Gold Medal with mention**;
- RO Patent 121,859 2008, “Ecological solvent and process for preparing the same”, 35<sup>e</sup> Salon International des Inventions des techniques et produits nouveaux, Geneve 18-22 avril 2007, **Gold Medal** and **IFIA ECO PRIZE, 2007**; 8<sup>th</sup> International Saloon for Industrial Property , Moscow, march 14-18, 2005, **Excellence Diploma** awarded by Russian Office of Intellectual Property, Patents and Marks
- RO Patent Applications A00288-2009 „Process and photobioreactor for carbon dioxide biofixation, from greenhouse gases” INVENTIKA- Bucharest, October 28-31, 2009, **Gold Medal**
- RO Patent 123027, 2010, Sanda VELEA, **WIPO Prize for the best women inventor**, INVENTIKA, Bucharest, October 2011.