AGROPHYSICS

Centre of Excellence for Applied Physics in Sustainable Agriculture 2003-2006

Institute of Agrophysics
Polish Academy of Sciences
Lublin

EC Centre of Excellence
AGROPHYSICS
Centre of Excellence for Applied Physics in Sustainable Agriculture

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Introduction

Agriculture has changed dramatically in the last few decades. Its productivity increased due to new technologies, mechanization, increasing use of chemicals, specialization and government policies favouring maximal production. Although these changes have had many positive effects and reduced many risks in farming, some harmful effects are still observed, including: topsoil depletion, groundwater contamination, decline of family farms, in living and working conditions of farmers, increasing costs of production, and disintegration of economic and social conditions in rural communities.

A growing movement, called sustainable development, has emerged during the past two decades that integrates three main goals: environmental health, economic profitability, and social and economic equity.

Sustainability rests on the principle that 'we must meet the needs of the present without compromising the ability of future generations to meet their own needs'. Sustainable agriculture as an element of sustainable development can be achieved through a system perspective, from the individual farm, to the local ecosystem, and to communities affected by this farming system both locally and globally. A system approach also implies inter-disciplinary efforts in research and education, including biological sciences playing a crucial role in engineering practice related to food, agricultural and biological systems.

The scientific activities at the Institute of Agrophysics of Polish Academy of Sciences in the field of sustainable agriculture have been recognized by EC experts and the Institute of Agrophysics (IA PAS) has become, since March 2003 for the following three years, the 'Centre of Excellence for Applied Physics in Sustainable Agriculture' with the acronym 'AGROPHYSICS'.

This publication presents the research potential of the Institute of Agrophysics PAS and the activity of the Centre of Excellence in the area of agriculture and environmental protection. We would like to share our knowledge and experience with scientists in the field of agriculture, the representatives of business enterprises and local authorities and to contribute in the stimulation of technological development as well as innovation in the region, country and Europe.

We invite senior and young scientists to participate in the activities of the 'AGROPHYSICS' Centre of Excellence and to join efforts promoting sustainable growth.

Prof. Ryszard Walczak
General Supervisor of the Centre

Lublin region

The Lublin region prides itself on lying at the crossroads of European history, it is also one of the least polluted areas of Poland. Traditional crafts, thatched houses, attractive unpolluted villages, ancient and historic monuments and a richly miscellaneous countryside provide the visitor with an intriguing insight into Poland's history and traditions.

The countryside of the Lublin region is rich and varied. In the south there are the fertile Lublin uplands and the Roztocze area, cut by numerous gullies. In the north-east you can find the Podlaskie lowland covered by dense forests. The Lublin region is the largest producer of high quality wheat, soft fruit, hop and sugar beet in Poland.

Lublin is the capital of the region and the university centre for this part of Poland. About 90000 students study in Lublin (17% of the town population) and 6000 academic teachers teach (600 professors) at its 5 universities: Maria Curie-Sklodowska Univ., the Catholic Univ., the Technical Univ., the Medical Univ. and the Agriculture University.

Geographic location of Lublin in the heart of Europe

The neo-gothic facade of the Lublin castle

Lublin received its City Charter in 1317, and after a few years the town was encircled with brick walls, surrounding what is now known as the old town of Lublin, undoubtedly one of the most attractive sights in the region. The visitors should also see the Gothic Royal Castle, with its late 14th century Holy Trinity Chapel housing one of the finest examples of medieval Byzantine-style poly-chromes in Europe.

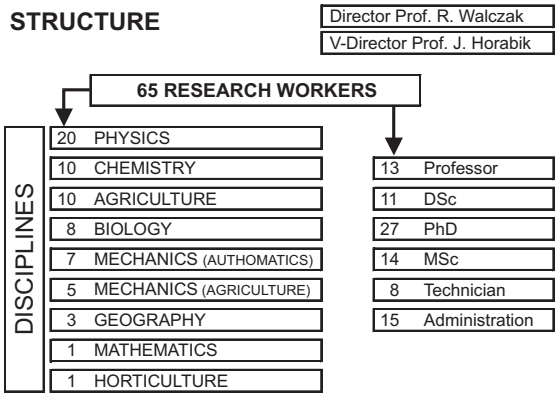
Lublin became famous in 1569, when the *Lublin Union* ratified the already 200 year old bond between Poland and its neighbour Lithuania, thereby establishing the largest empire in mainland Europe.

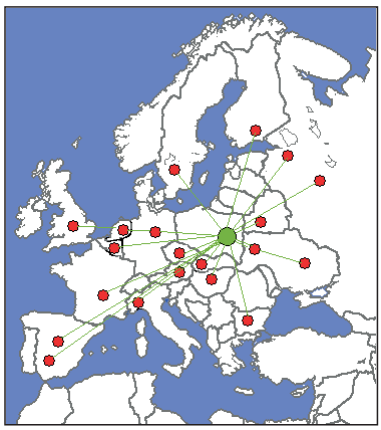
Institute of Agrophysics of Polish Academy of Sciences

The Institute of Agrophysics of Polish Academy of Sciences (IA PAS) was founded in 1968 on the initiative of Prof. Bohdan Dobrzański, a member of the Polish Academy of Sciences. The main research objectives of IA PAS are studies of the physical and chemical properties of materials and processes significant for the natural environment, sustainable agricultural production and processing of agricultural products with special attention paid to the quality of raw materials and food products.

Currently the Institute employs 65 researchers (13 full professors and 11 associate professors). The Institute is authorized to confer PhD and DSc degrees (doctor and doctor habilitatus) in agricultural science in agronomy-agrophysics. IA PAS is engaged in the founding of Lublin Science and Technology Park, which will serve as a centre for technology transfer from science to industry.

STRUCTURE





European scientific cooperation of IA PAS

The Institute is placed in two well-equipped buildings, with exhibition rooms, conference and catering facilities. With its multidisciplinary personnel, modern research equipment, easily accessible field plots and professional laboratories the Institute in addition to research activities, is also an educational centre.

The Institute has modern research equipment capable of conducting studies utilizing TDR, thermography, testing machine, microscopy, spectro-photometry, as well as chromatography. Currently over 60 scientific research institutions from Poland and abroad cooperate with the Institute.

View of the IA PAS main building

Organization and activity of the Institute of Agrophysics

Agrophysics is a branch of applied physics which investigates the properties of materials and processes involved in the production and processing of agricultural products. In particular, it deals with the relationships between *soil-plant-atmosphere* and *soil-plant-machine-agricultural products*, with special focus on the state of the natural environment and the quality of raw materials and food products.

The research activity of the Institute is organized as follows:

ORGANIZATION OF THE INSTITUTE OF AGROPHYSICS PAS

Department	**Head** (e-mail address)
Hydro-Thermophysics of Soil Environment and Agricultural Materials	Prof. Ryszard Walczak *rwalczak@demeter.ipan.lublin.pl*
Aeration and Gas Exchange in Soil Environment and in Agricultural Materials	Assoc. Prof. Teresa Włodarczyk *teresa@demeter.ipan.lublin.pl*
Mechanics of Agricultural Materials	Prof. Krystyna Konstankiewicz *konst@demeter.ipan.lublin.pl*
Physical Chemistry of Agricultural Materials	Prof. Zofia Sokołowska *sokolows@demeter.ipan.lublin.pl*
Agrophysical Bases of Soil Environment Management	Prof. Jerzy Lipiec *lipiec@demeter.ipan.lublin.pl*
Physical Bases of the Evaluation and Improvement of Plant Materials	Prof. Bogusław Szot *beszot@demeter.ipan.lublin.pl*

Journals edited by IA PAS

At present, 3 European and over 20 domestic grants are being carried out in the fields of the quality of agricultural products, sustainable agriculture, land preservation and environment protection.

Program of the Centre of Excellence 'AGROPHYSICS'

The main objective of the Centre is to contribute to sustainable development of the Institute of Agrophysics in three complementary areas: basic research, education and training as well as technology-oriented research. The status of the Centre of Excellence allows the Institute to receive funds from the European Union and the Polish State Committee for Scientific Research in order to support the innovative activities of the Institute, and to promote its research aimed at furthering the development of technologies and products both domestically and abroad. It is expected that scientists from the Centre will also receive grants from other sources (foundations: Ford, Fulbright, DAAD, European Science Foundation, Polish Science Foundation etc.). A considerable sum of money is expected to be received as remuneration for expertise commissioned by the local government, industry, etc.

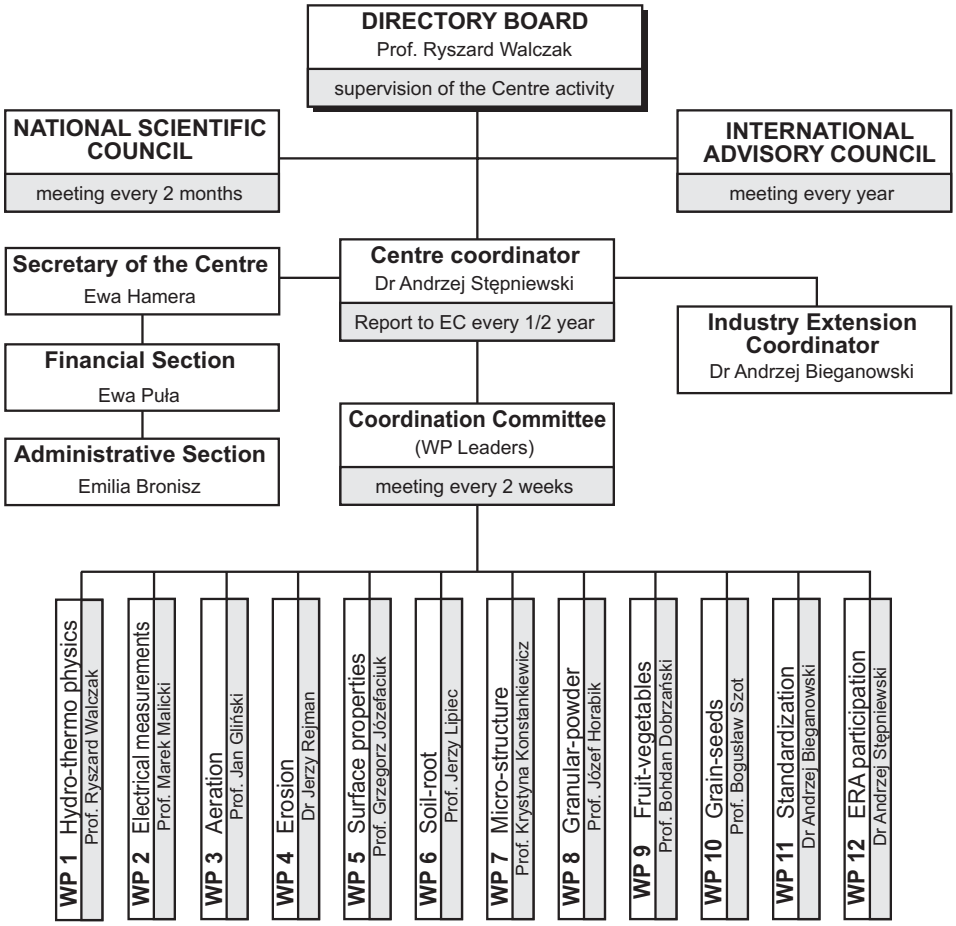
The overall research, educational and promotion objectives of the Centre involve:

- studies on various aspects of sustainable development of agricultural areas and the effective use of agricultural-food products – this part of the Centre of Excellence program is financed by the budget of the Institute of Agrophysics;
- support activities financed by EC:
  - organization of research workgroups, conferences, summer schools, lectures;
  - international cooperation: travel to other Centres in Europe to strengthen scientific links;
  - organization of international research consortia for participation of the Centre in projects of the 6th Framework Programme;
  - education – training young scientists;
  - development of agrophysics as a scientific discipline: exchange of experience, unification of research methods and terminology.

The research program of the Centre is focused on the following:

- physical, physicochemical and biological processes of mass and energy transport in the 'soil-plant-atmosphere' system;
- physical properties of agricultural materials and the processes influencing plant production;
- processes related to harvesting, transportation and storage of agricultural products.

Organization structure of the Centre



The National Scientific Council is represented by 5 members of Polish Academy of Sciences, 27 professors and 6 associate professors.

The International Scientific Council is represented by 40 prominent scientists from all over the world who are members of the Editorial Board of the journal 'International Agrophysics' – edited and published in the Institute of Agrophysics.

The Centre carries out its activities through so-called Work Packages, i.e. specialized thematic areas selected on the base of the Institute of Agrophysics internal organization structure. Each WP is headed by a person responsible for planning, organization and execution of objectives specific for the particular WP. The tasks proposed have a common aim – close integration with the European Research Area, which will have long term effects of participation in successive Framework Programmes.

WORK PACKAGE 1

Hydro- and thermo-physical characteristics of porous media as parameters of mass and energy transport models

Leader: Prof. Ryszard Walczak, rwalczak@demeter.ipan.lublin.pl

Objectives:

- promotion of European co-operation in the field of the determination of the hydro- and thermo-physical characteristics of porous media;
- standardization and generalization of the methods and methodology for determining the basic physical characteristics of porous media as parameters of equation describing mass and energy flow in isothermal and non-isothermal conditions.

Pressure chambers

TDR laboratory setup

Deliverables and milestones for the package:

- creation of unified procedures for determining the basic characteristics describing mass and energy flow in porous materials;
- better mutual recognition as well as exchange of experience and knowledge;
- collaboration towards common participation in FP6.

General activities:

- organization of workshops, conferences and summer schools;
- formation of a group of international experts in the field of WP1 research;
- visits to European research organizations to exchange experience;
- publication of related materials in the form of folders and application notes.

Agrometeorological station with thermovision set

Examples of research activities within WP1:

- development of measurement methods for determining water and thermal soil characteristics;
- development of algorithms (models) for estimating water and thermal characteristics of the soil from structural parameters.

WORK PACKAGE 2

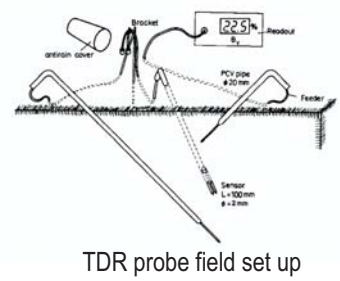
Electrical measurements methods of porous material properties

Leader: Prof. Marek Malicki, mmal@demeter.ipan.lublin.pl

Objectives:

- promotion of European cooperation in the field of the electrical measurement of porous material properties;
- development and implementation of modern techniques and methods for monitoring physical and chemical properties of the environment.

Field installation of TDR data logger



TDR probe field set up

Deliverables and milestones for the package:

- widening the scope of the research on the selective methods for the measurement of the electro-physical processes of porous media;
- contribution in the research consortia to the submission of proposals in FP6;
- verification, standardization and generalization of the existing conversion functions of electrical voltage or current in respect to the physical properties of porous media.

General activities:

- organization and participation at workshops, conferences and summer schools;
- visits to European research organizations for the exchange of experience;
- preparing the Centre to enter key research programmes for the measurements of environmental variability;
- publication of related material in the form of folders and application notes.

Portable TDR soil moisture, salinity and temperature meter

Examples of research activities within WP2:

- development of the Time Domain Reflectometry method for simultaneous measurement of soil moisture and salinity;
- adaptation of measurement methods and instruments currently used for soil to other porous materials used in food, storage and building industries;
- improvement of existing measurement devices used to monitor soil, plants and the atmosphere by the application of wireless communication.

WORK PACKAGE 3

Soil-plant-atmosphere aeration problems

Leader: Prof. Jan Gliński, jglinski@demeter.ipan.lublin.pl

Objectives:

- measurement of the macro- and microdiffusion of oxygen in soil profiles;
- investigation of the influence of moisture tension and redox conditions in soils, specially in those of wetland regions, on the emission of the gases CO_2, CH_4, N_2O into the atmosphere;
- establishing the consequences of soil anoxia in plants.

Collection of gas samples for analysis

Battery of rhizotrons

Deliverables and milestones for the package:

- widening of knowledge of the role of oxygen in soil processes and its effect on the environment;
- international cooperation and the formation of oxygenology networks as a new discipline in science;
- presentation of measurement techniques for the rhizosphere and the aeration of the soil with special reference to their resistance to redox and gas emissions.

General activities:

- participation of post-graduate students and young scientists in summer schools and workshops on the techniques for measuring aeration and the rhizosphere in soils with special attention to their resistance to redox and gas emissions;
- holding - in Poland and abroad - oxygenology seminars, with particular reference to soil aeration - an important problem in the evaluation of soil processes - and the prediction of biomass production and the formation and gas emissions;
- joint scientific publications and the production of training manuals on methods for the measuring and interpretation of the results of soil aeration.

Examples of research activities within WP3:

- presentation of the role of redox processes in the transformation of nutrients and the estimation of greenhouse gas emissions from soils of different moisture and nutrient compositions;
- production of maps of Polish soil resistance to redox conditions;
- use of soils and rock materials as a 'sink' for greenhouse gases.

WORK PACKAGE 4

Control measures against topsoil degradation due to erosion

Leader: Dr Jerzy Rejman, rejman@demeter.ipan.lublin.pl

Objectives:

- improvement of links with outstanding scientific centres within the EU for sustainable development of areas susceptible to erosion;
- exchange and comparison of the methods used to evaluate erosion and establish standardized procedures and indices;
- promotion of modern methods for assessing soil erosion and the subsequent application of control measures.

Experimental site with run-off plots

Rill network after intensive rainfall

Deliverables and milestones for the package:

- enlarging the capacity of the Centre within soil erosion;
- setting up of a scientific network of leading institutions within the EU;
- sharing of knowledge and experience;
- submission of proposals to the European FP6.

General activities:

- establishing of a national network for the assessment of soil erosion;
- organization of a seminar on the comparative methods at different scales applied in the study of soil erosion (the output will be given in a publication form);
- short scientific missions to foreign research units;
- organization of visits to the Institute of Agrophysics for foreign researchers;
- organization of a summer school for young researchers in order to bring the methods into general use through a national network (the output will be given during the proceedings at the Conference).

Rainfall simulator

Examples of research activities within WP4:

- assessment of the balance of soil erosion in small loess catchments on the basis of a detailed soil map presenting the combined effect of water erosion and tillage translocation (analyzed with GIS);
- evaluation of the effectiveness of plant canopy stages in soil erosion control;
- assessment of antecedent soil moisture content on the generation of run-off (laboratory experiments with rainfall simulator and plot studies).

WORK PACKAGE 5

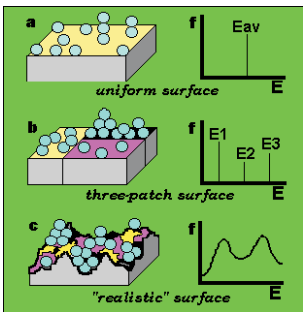
Surface physical chemistry of soil and plant

Leader: Assoc. Prof. Grzegorz Józefaciuk, jozefaci@demeter.ipan.lublin.pl

Objectives:

Mercury intrusion porosimetry

- increasing networking and links with outstanding centres within the EU, Candidate Countries and Associated States (Russia) in research and development of methods for examining physicochemical properties of soil and plant materials;
- increasing participation in FP6 of the EU;
- featuring new disciplines in soil and plant chemistry;
- attracting new researchers to investigate current soil-plant topics.



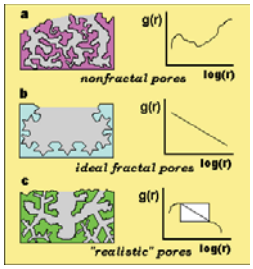
Adsorption and its energy

Deliverables and milestones for the package:

- establishing new links and improving recently established links with other institutions by organizing seminars and mutual research;
- joint scientific publications;
- linking theory to practice;
- holding of training courses for young researchers on the physical chemistry of plant and soil;
- organizing workshops.

General activities:

- introducing new approaches to the theoretical and practical studies of plant and soil specific surfaces;
- evaluation of closer interdisciplinary links between the physical chemistry of the soil and plants and other scientific disciplines to broaden knowledge and develop new experimental techniques;
- increasing understanding of physicochemical processes in the soil to find new possibilities to protect the soil from degradation (acidification, heavy metal and organic pollution, alkalization, salinization and soil structure destruction).



Fractal pore structures

Examples of research activities within WP5:

- organizing seminars and invitation of scienitists from Budapest, Hungary and Minsk, Belarus to scientific cooperation;
- the young researchers' training course entitled 'Physico-chemical and physical methods for studying soil and plant materials. Theory and practice' for foreign and domestic PhD and MSc students and researchers.

WORK PACKAGE 6

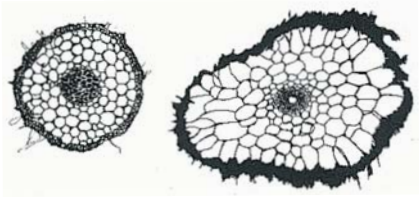
Relationship between soil physical characteristics and root and shoot growth and plant water use

Leader: Prof. Jerzy Lipiec, lipiec@demeter.ipan.lublin.pl

Objectives:

- to improve the methods for studying root growth and functions in relation to the soil physical behaviour;
- to strengthen cooperation with foreign research centres;
- to evaluate the relationship between the spatial distribution of roots and the physical conditions of the soil.

Image analysis system



Barley root sections

Deliverables and milestones for the package:

- better understanding of the ways in which agriculture can be managed in an environmentally friendly manner;
- proposals to the European FP;
- introduction and use of modern methods at the Centre's laboratory;
- scientific publications of the work financed by the program.

General activities:

- a workshop to compare methods for assessing the physical characteristics of the soil and crop responses;
- visits of foreign scientists to the Institute of Agrophysics PAS;
- organization of a workshop and training graduate students;
- participation of foreign researchers in the project.

Examples of research activities within WP6:

- evaluation of the spatial distribution of the soil strength and the water content in relation to machinery traffic;
- determining root water uptake depending on spatial distribution of the physical soil conditions;
- assessment of the effect of the soil macro-pores on the growth of the roots and shoots of the plants and of the infiltration of water into the soil.

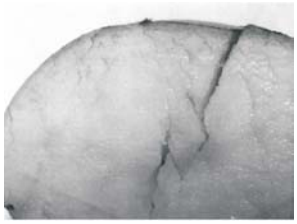
WORK PACKAGE 7

Mechanics and micro-structure of agricultural plant materials

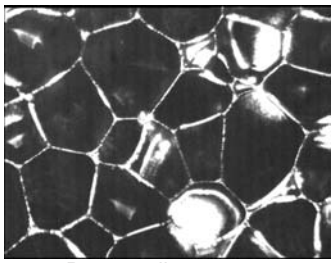
Leader: Prof. Krystyna Konstankiewicz, konst@demeter.ipan.lublin.pl

Objectives:

- to improve networking with centres of excellence and laboratories in the EU and Candidate Countries;
- to establish a training centre at IA PAS, ensuring access to the latest knowledge and data available in EU laboratories;
- to attract young researchers into the field of mechanics and the study of the micro-structure of agricultural plant materials.



Cross-section of potato tuber



Potato cell structure

Deliverables and milestones for the package:

- strengthened links with European laboratories through the sharing of experience, 3 missions to EU countries;
- one workshop and lab-training for young researchers, joint scientific publications, arrangement for participation in the new proposal of the R&D project in FP6.

General activities:

- to increase understanding of the interaction between the micro- and macro- properties of agricultural plant materials;
- presentation of the new techniques used for the investigation of micro- and macro-cracking;
- better understanding of experimental results and considering their practical application.

Testing machine with accoustic emission setup

Examples of research activities within WP7:

- micro-structure and the mechanical properties of plant tissue as crucial importance in the control and promotion of high quality of fruit, vegetables and other food products.

WORK PACKAGE 8

Characterization of granular agro-materials and food powders for safe and efficient storage, handling and processing and on-line quality control

Leader: Prof. Józef Horabik, jhorabik@demeter.ipan.lublin.pl

Objectives:

- to improve links with outstanding centres within the EU and Candidate Countries in the field of mechanics of particulate solids;
- to establish a training centre at IA PAS, in order to ensure access to the latest knowledge and data existing in EU laboratories;
- standardization of terminology, measurement methods and test procedures in the field of the mechanics of particulate solids;
- implementation of European Standards for the testing of bulk solids in order to determine the physical properties of agro- bulk materials and food powders.

Particle sizing

Deliverables and milestones for the package:

- increased networking by organizing three visits to EU countries;
- joint scientific publications;
- a workshop for post-graduate students and industrial engineers in the field of granular mechanics;
- publication of a training manual on the measurement and test procedure methods for evaluating the mechanical properties of particulate solids.

General activities:

- increasing understanding of the physical properties of granular materials in order to design efficient handling and processing systems;
- standardization of the terminology and measuring methods used in order to better understand and compare the results of different, interdisciplinary laboratories;
- closer collaboration with centres of excellence in EU countries in order to ensure compatibility of approach to the subject of the mechanics of bulk solids.

Stand for accoustic waves in granular materials

Examples of research activities within WP8:

- evaluation of physical properties of granular materials and food powders important for storage, handling and processing.

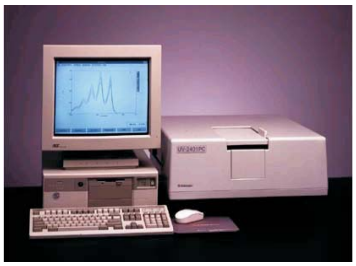
WORK PACKAGE 9

Physical methods of evaluation of fruit and vegetable quality

Leader: Assoc. Prof. Bohdan Dobrzański, bdob@demeter.ipan.lublin.pl

Objectives:

- improvement and promotion of cooperation with EU and Candidate Countries in the field of evaluation of fruit and vegetable quality;
- establishing a training centre at IA PAS, ensuring access to the newest knowledge and data existing in EU laboratories;
- unification of measurement techniques and methods of quality estimation of fruits and vegetables;
- implementation of the European Standards of physical properties important for the quality of fruit and vegetables.



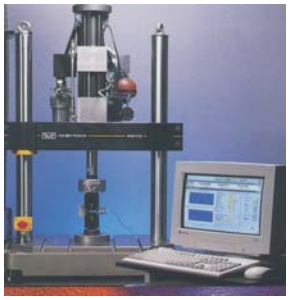
Spectrofotometer

Deliverables and milestones for the package:

- increased networking achieved through organizing three missions to EU countries;
- joint scientific publications;
- a workshop for post-graduate students and industry engineers in the field of fruit and vegetables;
- publication of a training manual on methods of measurement and test procedures for evaluation of the quality of fruit and vegetables.

General activities:

- better understanding of the physical properties of fruit and vegetables in order to design efficient handling and processing systems;
- unification of terminology and standardization of measuring methods for better understanding and comparison of results from different, interdisciplinary laboratories;
- closer collaboration with outstanding centres in EU countries to assure compatibility in approach to mechanics of fruit and vegetables over the partners network.



Dynamic and fatigue testing machine

Examples of research activities within WP9:

- physical methods of evaluation of fruit and vegetable quality important for storage, handling and processing.

WORK PACKAGE 10

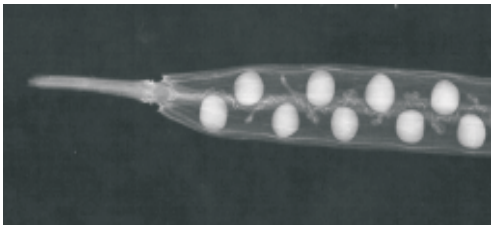
Applied physics in assuring good quality of grains and seeds

Leader: Prof. Bogusław Szot, beszot@demeter.ipan.lublin.pl

Objectives:

- growth of scientific potential of the Centre staff assuring postharvest quality;
- presentation of achievements and exchanging experience with specialists from the West;
- closer collaboration with outstanding research organizations in EU;
- further development of measuring methods and deepening knowledge of physical properties of grains and seeds.

Rapeseed harvesting



X-ray image of rape pod

Deliverables and milestones for the package:

- two common projects to FP6;
- creation of a Network on postharvest operations of agricultural products;
- introduction and application of modern physical methods into the laboratories of the Centre.

General activities:

- mission to EU Centres in order to widen and strengthen cooperation links;
- networking with potential partners for FP6 participation;
- lectures of visiting scholars to increase knowledge base about physical properties of plant material.

Strength testing

Examples of research activities within WP10:

- introduction of novel investigation methods to Centre laboratory as well as training of the staff;
- exchange of experiences within open network of professionals in the field of physical properties of agricultural materials;
- creation of long lasting links and improvement of knowledge flow between persons engaged in the topic.

WORK PACKAGE 11

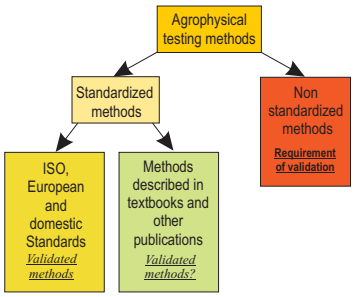
Validation and standardization of agrophysical measuring methods

Leader: Dr Andrzej Bieganowski, biegan@demeter.ipan.lublin.pl

Objectives:

- promotion of European cooperation in the validation and standardization of agrophysical measuring methods;
- training young researchers in validation procedures;
- assessment of the test methods used in the validation and standardization of agrophysical measurements.

Soil material collection



Deliverables and milestones for the package:

- visits to leading centres in Europe to discuss validation and standardization problems;
- validation procedure workshop for agrophysical measuring and test methods;
- international conference on the measuring and testing methods used in agrophysical investigations;
- summary of the previous stages - the European agrophysics authorities will be invited to summarise the current state and indicate future undertakings.

General activities:

- increased activity in:
  - developing new agrophysical methods,
  - validation of the existing physical and chemical methods applicable to agrophysics;
- standardization of the terminology and measuring methods in order to better understand and compare the results of the different, interdisciplinary laboratories (see other WPs);
- formation of a closer association with centres of excellence in EU countries in order to ensure compatibility of approach to the different measuring and test methods by the network partners.

TDR sample holder

Examples of research activities within WP11:

- participation in setting new ISO standards and assessing those already in operation within the field of soil physics.

WORK PACKAGE 12

Rules of participation in European research programmes - increasing active participation in ERA

Leader: Dr Andrzej Stępniewski, astep@demeter.ipan.lublin.pl

Objectives:

- improvement of knowledge of European FP participation rules;
- distribution of the knowledge on current calls of European FP;
- improvement of proposals prepared by Centre employees and collaborators;
- encouragement to prepare more proposals to European FP;
- training and information distribution to partners of the Centre from the East.

Deliverables and milestones for the package:

- two proposals to FP6 prepared together with partners of the Centre;
- improving quality of proposals to FP6;
- better understanding of European research programmes by the whole staff of the Centre;
- creation of data base on topics of research interest of each partner of the Centre.

General activities:

- seminars in order to improve number and quality of proposals from the Centre;
- lectures on specific aspects of European research programmes;
- trainings of the Centre staff to increase skills in writing proposals.

Examples of research activities within WP12:

- distribution of information packages about current opportunities in the FP6;
- training on proper preparation of proposals to FP6;
- organizing meetings with National Contact Points experts;
- current consultation for the staff of various aspects of FP6 participation;
- participation in tuitions for trainees and brokerage events.

Activities of the Centre

The Centre of Excellence for Applied Physics in Sustainable Agriculture 'AGROPHYSICS' is active in reaching the planned objectives. Some of the activities, both completed and planned, are given below so that future participants wishing to cooperate with the Centre could adjust their timetable. The Centre's future activities in the years 2004 and 2005 have not been determined yet, the detailed information on these are available from the leader of the relevant WP.

Type and place of activity	Actions performed	Time
Workshop: '*Procedure of making new ISO standards in soil physics',* IA PAS Lublin, Poland.	Organized by WP11, lectures given by representatives from Polish Standardization Committee to the employees of IA PAS.	May 16, 2003
International Conference for conveying and handling of particulate solids, Budapest, Hungary.	Meeting of the Working Party on the Mechanics of Particulate Solids. Presentation of WP8.	May 27-30, 2003
Seminar, University Maria-Sklodowska-Curie, Lublin, Poland.	Training students on methods for root system studying in relation to soil physical conditions, WP6.	May 29, 2003
2nd International Workshop for Young Scientists BioPhys Spring' 2003, Czech University of Agriculture in Prague, Technical Faculty, Department of Physics.	Lectures and presentations, WP7 and WP8.	May 30, 2003
Visit to Research Institute of Soil Science and Agricultural Chemistry, Hungarian Academy of Sciences, Budapest.	Seminar on the Centre activity and lecture on surface properties of soils and plants, WP5. Formation of a research team.	May 20-June 02, 2003
Conference on FP6 priority *'Quality and Safety of Food',* Lublin, Pulawy, Poland.	Lectures and discussion on CoE project realization, WP12.	June 3, 2003
Conference of Polish Agrophysical Society, '*Geometrical, mechanical and structural properties of agricultural materials and products*', Olsztyn, Poland.	Lectures and seminars, WP1 and WP7.	June 12-13, 2003
Visit to Centro Ricerche Bonomo, Italy.	Consultation on further cooperation within coming call for proposals in FP6, presentation of WP10.	June 25-30, 2003
Visit to Lithuanian Agricultural University, Raudondvaris.	Forming international group (Poland, Lithuania, Germany) for future cooperation in research area, WP9.	Sep. 18-23, 2003
2nd International Workshop '*Applied Physics in Life Science',* Czech University of Agriculture in Prague, Technical Faculty, Department of Physics.	Promotion of CoE, WP1, WP2, WP3 and WP8 objectives.	Sep. 25, 2003
International Workshop on Soil Physical Quality, PROLAND CoE, IUNG, Pulawy, Poland.	Lectures, seminars, presentations: WP1, WP3, WP6.	Oct. 2-4, 2003

Workshop, Belorussia Academy of Sciences, Minsk.	Presentation for students and scientists: WP3, WP5.	Oct. 9, 2003
Workshop, Ukrainian Academy of Sciences, Lvov.	Presentation for students and scientists: WP3.	Oct. 21-27, 2003
'Validation and standarization of testing method' - Workshop with the representatives laboratories from different parts of Poland, IA PAS, Lublin, Poland.	Organized by WP11, presentations of IA PAS laboratories, participation of WP1, WP2.	Oct. 27-28, 2003
Meeting in GMES, Poland Information Centre, Space, Research Centre PAS, Warsaw, Poland.	Formation of Polish research consortium to prepare proposal to FP6, subject: Soil pollution assessment from satellite data, concerns all WPs.	Oct. 28, 2003
International Conference: '*Transport of water, chemicals and energy in the soil-plant-atmosphere',* Slovak Academy of Sciences, Institute of Hydrology and Geophysical Institute in Bratislava.	Promotion of CoE, WP1, WP2, WP3, WP5, WP6 objectives.	Nov. 20, 2003
Training Course for Young Research Workers '*Physicochemical and Physical Methods of Studies of Soil and Plant Materials. Theory and Practice'*, IA PAS, Lublin, Poland.	Organized by WP5, activities of WP1, WP2, WP3, WP8, WP11 - lectures, presentations, training.	Nov. 27-Dec. 02, 2003
Workshop, University of Nijmegen, Holland.	Presentation '*Oxygenology in wetlands'*, WP3.	Dec.13-18, 2003
Conference: *'Method and methodology for determination of basic physical characteristics of porous media with application of TDR technology',* IA PAS, Lublin, Poland.	Organized by WP1 in collaboration with WP2, construction of International Expert Group of TDR users as a research network, lectures, presentations, training.	Feb. 2004
Summer School, University Hohenheim, Stuttgart, Germany.	Lectures, presentations on: '*Soil-plant-atmosphere areation problems*', organized by WP3, activities of WP1, WP2, WP6.	Aug. 2004
Workshop on '*Applied physics in assuring good quality of grains and seeds'*, IA PAS, Lublin, Poland.	Organized by WP10 - lectures, presentations,	Sep. 29-30, 2004
Workshop '*Characterization of granular agro-materials and food powders'*, IA PAS, Lublin, Poland.	Lectures, seminars, presentations, WP8.	Sep. 29-30, 2004
Institute of Agrophysics PAS, Lublin, Poland.	Organization of conferences, lectures, seminars, summer schools, workshops, actions apply to all WPs.	2003-2005
Visits to European and Polish Scientific Centres.	Formation of joint research groups responding for FP6 calls of proposals, participation in scientific activities in Europe, actions apply to all WPs.	2003-2005

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