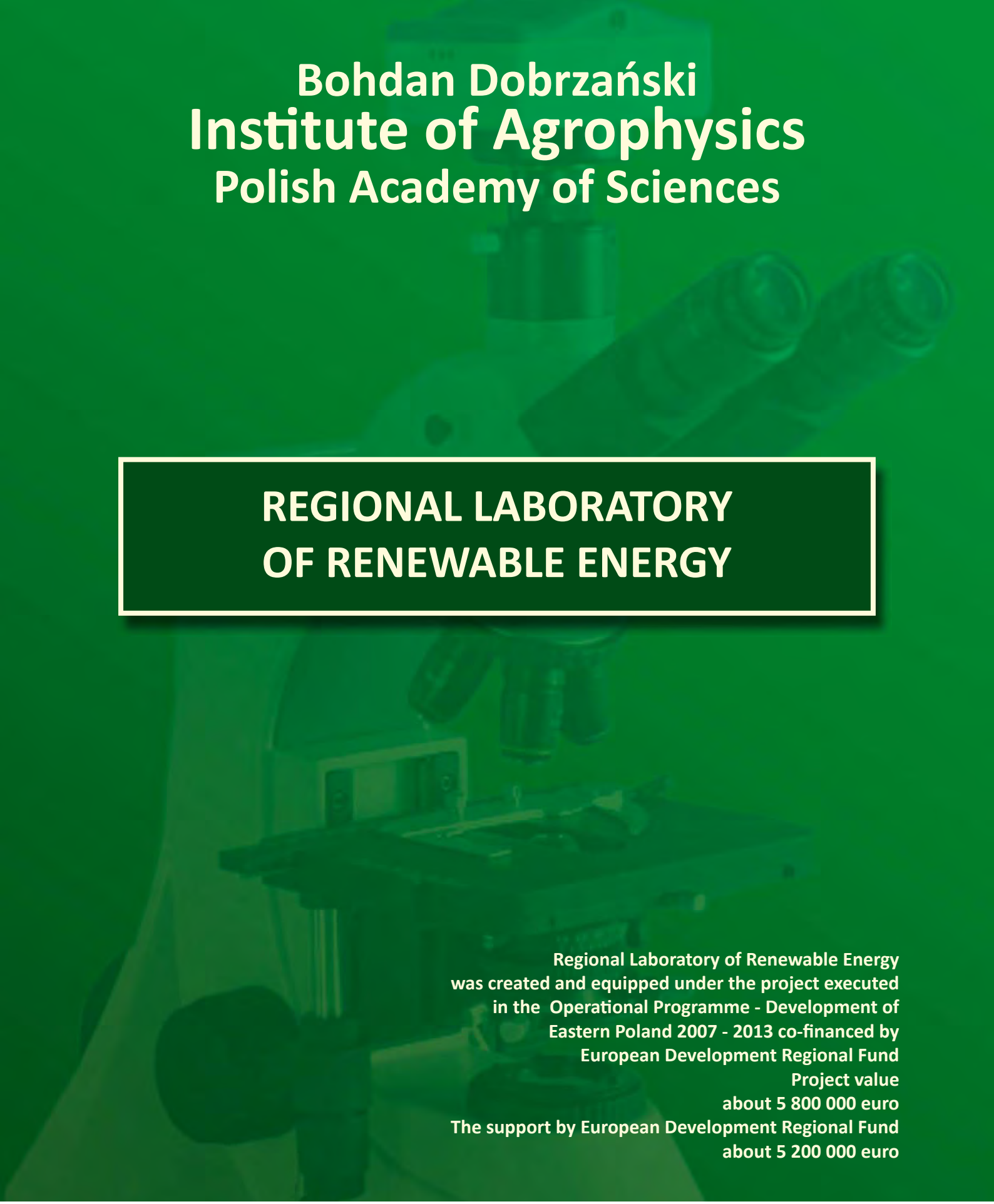
Bohdan Dobrzański
Institute of Agrophysics
Polish Academy of Sciences



REGIONAL LABORATORY OF RENEWABLE ENERGY

Regional Laboratory of Renewable Energy
was created and equipped under the project executed
in the Operational Programme - Development of
Eastern Poland 2007 - 2013 co-financed by
European Development Regional Fund
Project value
about 5 800 000 euro
The support by European Development Regional Fund
about 5 200 000 euro

DEVELOPMENT OF EASTERN POLAND
NATIONAL COHESION STRATEGY

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

European Funds – for Development of Eastern Poland

Bohdan Dobrzański
Institute of Agrophysics
Polish Academy of Sciences

ul. Doświadczalna 4, 20-290 Lublin 27
www.ipan.lublin.pl

DEVELOPMENT
OF EASTERN POLAND
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INTRODUCTION

Dear Ladies and Gentlemen,

The sector of power industry related to the production of renewable energy is and in the immediate future is bound to remain the most dynamically evolving sector of the world's economy. Provisions of the European Community's energetic policy assume the participation of renewable energy in the total energy production in the European Union to reach 21% in 2020. Moreover, the participation of biofuels in engine fuel consumption in transport has to amount to not less than 5.75%

It will be possible to reach such high ratios, inter alia, by implementing European Union directives concerning renewable energy sources, allocating considerable financial resources to the development of the renewable power industry, and prioritizing the research and new technologies that will enable large scale utilisation of renewable energy sources.

In the case of Poland, reaching the assumed ratios of renewable energy participation in the total energy production will constitute a major challenge. It is estimated that nowadays, the participation does not exceed 4%. Apart from adverse economical and legal conditions, one of the main barriers limiting the development of the renewable energy industry in Poland is the lack of a suitable research-development base to assist public and private sectors in developing and implementing new solutions and technologies that would utilize renewable energy sources. The above refers in particular to the areas of Eastern Poland, where the development of the renewable energy sector can constitute a real chance for changing the disadvantageous economic structure, and may facilitate the effective use of the existing potential for advancement. Regions of Eastern Poland have abundant resources for the development of renewable energy production, but due to their agricultural character, the production of renewable energy based on readily available reserves of biomass should be treated as a priority. The above pertains mainly to biomass derived from plants, be it produced especially for the purposes of energy production, or obtained otherwise (e.g. as a by-product of various forms of agricultural processing).

The Institute of Agrophysics of the Polish Academy of Sciences implements the project "Regional Laboratory of Renewable Energy" as part of the Operational Programme - Development of Eastern Poland 2007-2013, Task I.3- Supporting innovativeness. The Laboratory established in the course of the project's implementation conducts research in the following areas:

- innovative methods of biomass acquisition,
- processes of its gasification,
- methods of neutralization and utilization of post-fermentation wastes.

The project's aim is to set up modern laboratories and provide them with hi-tech equipment, which will allow the Institute to gain a strong and competitive position on the market of research for the purposes of agriculture, environmental protection and the food industry.

The Laboratory will have an open character, i.e. rather than being limited to the use by only IA PAN employees, it will be made available to any regional, Polish, European or even global scientific institution actively involved in the research on converting biomass into energy. A part of the Laboratory's function will be to foster joint scientific undertakings and research projects, as well as cooperation with private businesses.

As we present the below apparatus folder, we also wish to invite scientific institutions and businesses to consider cooperation with our Laboratory in the areas of general scientific research, R&D, implementation and education.

Prof. Józef Horabik, DSc
Director of the Institute of Agrophysics PAS

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REGIONAL LABORATORY OF RENEWABLE ENERGY

Regional Laboratory of Renewable Energy
Laboratory Supervisor: Prof. Jerzy Tys, DSc
Tel.: 81 744 50 61 ext. 162
Fax: 81 744 50 67
e-mail: j.tys@ipan.lublin.pl

Regional Laboratory of Renewable Energy (RLRE) was equipped with essential research infrastructure which allows it to conduct comprehensive studies in the areas of biomass production and processing for the purposes of the energy industry.

The Laboratory was provided with essential research and development facilities in order to enable comprehensive studies into three crucial and interconnected research areas:

- new methods and technologies of biomass production and acquisition,
- the processes of biomass gasification, including the analysis of methane fermentation and examination of biogas,
- methods of utilising post-fermentation waste, including technologies of producing fertilizer from waste material and examination of its effect on plant growth and soil quality.

Research studies resulting from the current scientific and statutory activity of the Institute, based on its experience as well as planned research and development directions, will also be carried out in the Laboratory.

In an effort to meet the latest trends in renewable energy production and as part of the project „Regional Laboratory of Renewable Energy", the following laboratories were set up and provided with hi-tech equipment:

1. Laboratory of New Technologies of Renewable Energy and Biomass Acquisition
2. Laboratory of Methane Fermentation
3. Laboratory of Biogas Analysis
4. Laboratory of Evaluation, Treatment and Utilization of Post-Fermentation Sludge
    - Research Lab of Chemical and Physicochemical Characteristic of Sludge
    - Research Lab of Recycling and Utilization of Sludge Solid Phase
    - Research Lab of Soil Improvement
    - Research Lab of Physical Characteristics of Modified Soils
    - Research Lab of Plant Growth
5. Laboratory of Biochemistry
6. Laboratory of Molecular and Environmental Microbiology.

Presented below is a diagram of the RLRE functional structure as well as individual characteristics of the particular RLRE laboratories and research labs.

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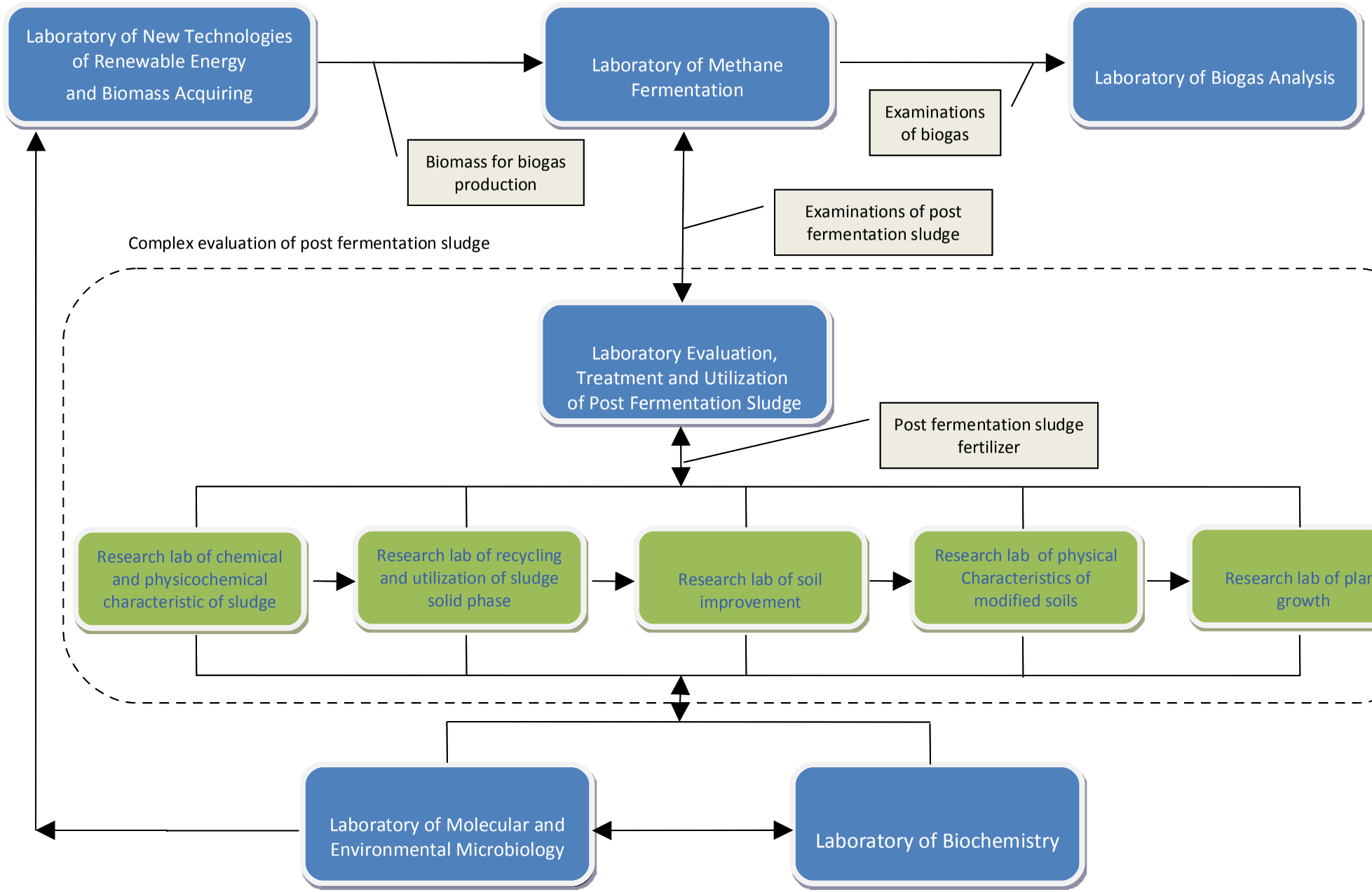
The scheme of functioning of Regional Laboratory of Renewable Energy



Laboratory of New Technologies of Renewable Energy and Biomass Acquiring

Laboratory of New Technologies of Renewable Energy and Biomass Acquiring
Laboratory Supervisor: Prof. Jerzy Tys, DSc
Tel.: 81 744 50 61 ext. 162
Fax: 81 744 50 67
e-mail: j.tys@ipan.lublin.pl

Research profile:

- The potential use of algal biomass in renewable energy production
- Determination of the optimal parameters to evaluate the potential of algae species for economical and ecological production of renewable energy
- Study of molecular level processes

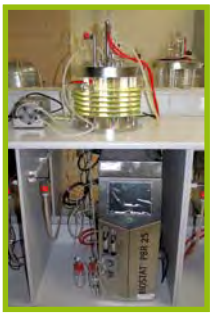
Analysis:

- Qualitative and quantitative analysis of bioproducts used for energy production
- Qualitative and quantitative studies of biomass content
- Analysis of the content and composition of lipids, products of combustion reactions, and technological by-products of biomass production

Equipment:

Photobioreactors (12 pcs.)
BIOSTAT®PBR 2S (2009)
Producer: SARTORIUS Stedim Biotech
Basic parameters:

- Graphic touch screen operation interface
- Control loops for pH, temperature, O_2, illumination level, recirculation rate, substrate addition, gas mixing, gas flow
- Automatic parameters recorder



Centrifuge (3 pcs.)
ROTANTA 460 RS, CEPA LE, CEPA Z41 (2009)
Producer: HETTICH Zentrifugen, New Brunswick Scientific
Basic parameters:

- Separation of biological and pharmaceutical mixtures
- Gravitational separation of two gases
- Segregation of liquid and solid material
- Emulgation of few liquids by violent mixing
- Fractionation of plasma and blood
- Concentration and extraction of viruses and bacteria
- Collection and separation of biomass

Steam sterilizers (3 pcs.)
VARIOKLAV 135S (2009)
Producer: Thermo Scientific
Basic parameters:

- Automatic steam sterilisation
- 4 preinstalled programmes for sterilisation of liquids, instruments, glassware and laboratory waste

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- Specific programs for special applications available on demand - 16 programs
- Temperature and time display
- Automatic water draft

Semi-Automatic Calorimeter
LECO AC600 (2009)
Producer: LECO
Basic parameters:

- Analysis of the organic and nonorganic materials, such as solid and liquid fuel, biomass and food
- Water system with temperature stabilization
- Pressure tube with a fixed or removable electrode
- Automatic filling of the calorimetric tube with oxygen
- Automatic discharge of gases from the calorimetric tube
- The bomb does not need to be cooled after tests
- Low costs of analysis

Liquid Chromatograph Mass Spectrometer
LTQ ORBITRAP VELOS (2009)
Producer: Thermo Scientific
Basic parameters:

- Qualitative and quantitative analysis of foodstuffs,
- Mass range m/z 15-200, m/z 50-2000, m/z 200-4000
- Ionization sources – ESI, H-ESI, APCI, APPI
- Resolution min. – 7500, max. >100 000
- Mass analyzers – linear ion trap LTQ, Orbitrap
- MS/MSn mode

Evaporator
Heidolph Hei-VAP Precision (ML) (2009)
Producer: Heidolph
Basic parameters:

- 4.3”Color LCD display
- Motor lift
- Lift speed 30 mm/s
- Hight adjustment 155 mm
- Thermal power 1300 W
- Temperature adjustment between 20°C and 210°C
- Resolution ± 1 °C
- Volume of heating compartment 4.5 l
- Remote control

Dryer
Venticell Comfort (2009)
Producer: MMM Group
Basic parameters:

- 6 programs
- Chip card system for individual program storage
- RS 232 PC or printer interface
- Delayed heating start and stop function
- Acoustic and visual alarm in error state
- Time range 0–16 years with 1 min-intervals
- Digital safety thermostat class 2
- Real time
- Selectable rate of temperature increase or decrease - RAMPS
- Programming of time segments - SEGMENTS
- Programme cycles
- Manual control of the air exhaust flap

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Laboratory of Methane Fermentation

Laboratory of Methane Fermentation
Laboratory Supervisor: Prof. Jerzy Tys, DSc
Tel.: 81 744 50 61 ext. 162
Fax: 81 744 50 67
e-mail: j.tys@ipan.lublin.pl

Research profile:
- Studies of the process of digestion of selected agricultural wastes
- Determination of the optimal charge to obtain the maximum biogas efficiency

Analysis:
- Methane digestion
- Determination of biogas quality
- Determination of biogas efficiency
- Determination of the quality and capacity of using charge for biogas production

Equipment:

Bioreactors (11pcs.)
BIOSTAT® B plus (2009)
Producer: SARTORIUS Stedim Biotech
Basic parameters:
- Digital control system
- Control of temperature, pH, O_2, foam and level
- Graphic touch screen operation interface
- Recirculation rate control

Portable gas analyser
Producer: GasData (2009)
Basic parameters:
- 4 wavelength optical infra-red analyser to measure gas concentrations (CH_4, CO_2 and O_2)

Set for BZT_5
Producer: WTW (2009)
Basic parameters:
The device measures:
- BZT
- Biological decay
- Oxygen consumption
- Soil respiration
- Biogas

Thermostatic cabinet
Producer: Pol-Eko (2009)
Basic parameters:
- Determination of BZT
- Microbiological studies
- Growing plants and culturing micro-organisms in controlled conditions
- Storage of plasma substitutes and samples for physico-chemical analysis
- Temperature adjustment between + 3°C and + 40°C

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Multimeter
Producer: Eutech (2009)
Basic parameters:

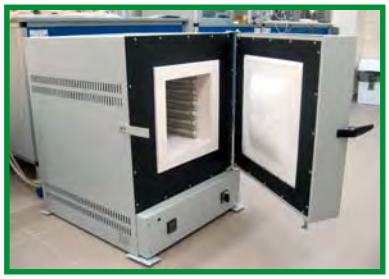
- Measures pH, ISE, mV, ORP mg/l, % oxygen saturation, conductivity, salinity, TDS, temperature

Thermoblock
Producer: AQUA-LAB (2009)
Basic parameters:

- Incubation of biological and chemical material in Eppendorf tubes
- Temperature adjustment between 30°C and 160°C (resolution 1°C)
- Time adjustment between 1 min and 100 h (resolution 1 min)
- Temperature and time display

Electric oven
Producer: SNOL (2009)
Basic parameters:

- Determination of organic dry matter content
- Temperature adjustment between 50°C and 1100°C
- Max temperature: 1100°C
- Time heating to nominal temp.: 50 min.
- Temperature stability: ± 2°C
- Temperature homogeneity: ± 10°C
- Volume: 8.2 dm^3



Refrigator
Producer: Pol-Eko (2009)
Basic parameters:

- Volume 145l
- Forced air circulation
- Temperature adjustment between 0 and +10°C
- Resolution 0.1°C

Ultrathermostat
Producer: JULABO (2009)
Basic parameters:

- Temperature adjustment between 5 °C and 100 °C
- Temperature stability: ±0.02 °C
- Cooling loop, Low water level detector
- Utility surface (W. x L.): 12 x 34 cm
- Bath depth 15cm; Bath volume: 17l

Homogenizer
Producer: Interscience (2009)
Basic parameters:

- LCD display
- Adjustment of frequency (3 - 12 /sec)
- Adjustment of impact force
- Adjustment of work time (from 1s to 1h or continuous work)

Tissues homogenizer
Producer: Interscience (2009)
Basic parameters:

- Capability of sample homogenisation, emulsifying and grinding
- Homogenisation in closed or open tubes
- Volume of homogenised samples from 50 to 2500 ml
- Adjustment of knife rotation velocity (resolution 100 rot/min, max 27 000 rot/min)
- Adjustment of homogenisation time (from 1 s)

Precision balance
Producer: RADWAG (2009
Basic parameters:

- Max capacity 6000 g
- Repeatability 0.1 mg
- Min. load 500 mg

Analytical balance
Producer: RADWAG (2009)
Basic parameters:

- Max capacity 220 g
- Repeatability 0.1 mg
- Min. load 10 mg

Ultrasonic cleaner - Producer: POLSONIC (2009)
Basic parameters:

- Cleaning of laboratory glass of complicated shapes and with small holes e.g. capillaries, pipettes, coils
- Cleaning of developing dishes of bioanalysers, sieves, filters and ceramic rings
- Degassing solutions; Dispergation of solid bodies in liquids
- Intensification of some chemical reactions
- Tank internal dimensions (LxWxD) 500 x 135 x 100 mm
- Volume 6l; Ultrasonic power (peak/period) 2x320 W
- Frequency 40 kHz; Heating power 300 W
- Temperature range 30-80°C; Timer 1-30 min

Ultra pure water system
Producer: Elga (2009)
Basic parameters:

- Resistivity 18.2 MΩ/cm, produces up to 2 l/min
- Conductivity 0.055 µS/cm
- TOC < 5ppb

Stirrer
Producer: IKA (2009)
Basic parameters:

- Stirring quantity max.: 40l; Viscosity max.: 50 000 mPas
- Motor rating input / output: 130 / 110W
- Speed range: 50-2000 1/min
- Torque max.: 60 Ncm

Water still
Producer: GFL (2009)
Basic parameters:

- Efficiency 4l/h
- Volume 8l
- Conductivity 2.3 µS/cm at temp. 20 °C

Incubator
Producer: POLLAB (2009)
Basic parameters:

- Volume 60l
- Temperature adjustment between +3°C and +40°C
- Temperature stability ±0.5 °C

Waterbath
Producer: AJL (2009)
Basic parameters:

- Temperature adjustment between 10°C and 99°C (resolution 0.1°C)
- Temperature stability precision: 0.2°C
- LCD display of current water temperature, set water temperature, set heating time

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Laboratory of Biogas Analysis

Laboratory of Biogas Analysis
Laboratory Supervisor: Paweł Szarlip, PhD
Tel.: 81 744 50 61 ext. 135
Fax: 81 744 50 67
e-mail: p.szarlip@ipan.lublin.pl

Laboratory of Biogas Analysis conducts research concerning the composition and quality of biogas produced in the process of methane fermentation, as well as the effect of soil enrichment with fermentation residue on the biological processes that result in gas emission and sink.

Research profile:

- Monitoring the composition and quality of biogas, especially in terms of methane and carbon dioxide content;
- Control of the biogas pollution (mainly sulfur compounds);
- Determination of total, organic and inorganic carbon content in material subjected to fermentation, and in soil enriched with fermentation residue;
- Determination of nitrogen content in material subjected to fermentation and in soil enriched with fermentation residue;
- Determination of the effect of soil enrichment with fermentation residue on gas production and uptake.

Analysis:

- Measurements of gas concentrations: methane (CH_4), carbon dioxide (CO_2), hydrogen sulfide (H_2S), hydrogen (H_2), oxygen (O_2)
- Analysis of total nitrogen
- Analysis of total, organic and inorganic carbon.

Equipment:

Gas chromatograph:
Producer: Perkin Elmer (2010)
Study of the composition of gas mixtures in a wide range of concentrations (CO_2, O_2, CH_4, C_2H_2, C_2H_4, H_2S)

Basic parameters:
Detectors:

- FPD (Flame Photometric Detector)
- FID (Flame Ionization Detector)
- TCD (Thermal Conductivity Detector)
- Capillary column for determination of sulfur compounds
- Packed column for CO_2, O_2, CH_4, C_2H_2, C_2H_4, H_2 determination
- Adapter for headspace analysis
- Thermostatic control of samples and transfer line in the range of 35°C to 210°C
- Injection of air pressure compensation method - use of a syringe or a gas injector loop not required (the possibility of manual injection)
- Operating temperature range: from 4°C above ambient to 450°C programmed at 1°C
- Ability to work with temperature consisting of a minimum of 9 of the accretions and 10 of the plateau
- Maximum heating: 140°C / min.
- Cooling from 450°C to 50°C in less than 2 minutes

Set for nitrogen determination with Kjeldahl method
Producer: BEHR (2010)
Determination of total nitrogen
Basic parameters:
Digestion

- Equipped with an infrared radiant heater

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- Stand for 12 250 ml reaction vessels with a vapor extraction kit
- A set of 250 ml reaction vessels

Steam distillation with water vapor:

- Automatic generation of steam,
- Adjustable output of evaporation
- Automatic removal of sample residue
- Pressure switch control,
- Automatic control of filling tanks

TOC analyzer

Producer: Shimadzu (2010)

Determination of organic, inorganic and total carbon in liquid and solid samples, as well as total nitrogen in liquid samples

Basic parameters:

TOC analyzer, IC, TC, NPOC:

- Measuring range: 4 ppb - 25,000 ppm
- Infrared detection - NDIR
- Catalytic combustion on a platinum catalyst
- temperatures up to 720°C
- Analysis time: up to 3 min
- Injection volume from 10 to 2000 µl
- Automatic dilution of samples at the rates of 1:2 to 1:50 in the dosing syringe
- Washing the line with pure water or the analytical sample
- Autosampler for 72 samples of 40 ml, the dispensing needle washed inside and out by defoult
- Adapter for the determination of carbon in solid samples: the overall temperature of the determination of carbon: organic - 900°C, 200°C - inorganic., measuring the overall carbon to 30 mg C in the sample
- Adapter for the determination of total nitrogen: 0-4000 ppm chemiluminescence

Laboratory Dishwasher

Producer: Miele (2010)

Disinfector with a drying unit for the cleaning and disinfecting of various glassware

Basic parameters:

- Chamber with two cleaning programs

Laboratory dryer

Memmert UNE 500 (2010)

Producer: Memmert

Basic parameters:

- Heating system: a coat with natural air circulation
- Chamber capacity 108 l
- Operating Temperature Range: from ambient temperature + 10°C to +250°C

Incubator

Producer: Thermo Scientific – Heraeaus (2010)

Microbiological Incubator (Model BK 800) with a cooling system (RT)

Basic parameters:

- Chamber Capacity 220L
- Temperature range from 3°C to 40°C
- 2 electrical outlets inside the chamber
- Forced air convection
- Programmable time (1 min. - 7 days)

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- Cooling time (from 25 to 5 °C): 56 min
- Interior Lighting

Thermostatic cabinets
Thermostatic single-chamber cabinet ST 4 + (2010)
Producer: Pol-Eko-Aparatura
Basic parameters:

- Chamber capacity 250 l
- Temperature range from +3°C to +40°C
- Forced air circulation
- The heating and cooling system (the device maintains the desired temperature regardless of ambient temperature)
- RS 232 interface

Balance (2)
Producer: Acculab (2010)
Laboratory balance Atilon 623.I ATL and ATL Atilon 6202.I:
Basic parameters:

- capacity: 620 g, accurate to 0.001 g (ATL 623.I)
- 6200 g, accurate to 0.01 g (ATL 6202.I) with internal calibration

Laboratory of Evaluation, Treatment and Utilization of Post Fermentation Sludge
Research Lab of Chemical and Physicochemical Characteristics of Sludge
Research Lab of Recycling and Utilization of Sludge Solid Phase

Laboratory of Evaluation, Treatment and Utilization of Post Fermentation Sludge
Laboratory Supervisor: Associate Prof. Cezary Sławiński, DSc
Tel.: 81 744 50 61 ext. 127
Fax: 81 744 50 67
e-mail: c.slawinski@ipan.lublin.pl

Research Lab of Chemical and Physicochemical Characteristics of Sludge
Research Lab of Recycling and Utilization of Sludge Solid Phase
Laboratory Supervisor: Prof. Zofia Sokołowska, DSc
Tel.: 81 744 50 61 ext. 146
Fax: 81 744 50 67
e-mail: z.sokolowska@ipan.lublin.pl

Research profile:
- Study of the physicochemical properties of plant and animal material used as batch in to the methane fermentation process
- Study of the physicochemical properties of post-fermentation sediments
- Study of the potential use of post-fermentation sediments in agriculture

Analysis:
- Basic physicochemical characteristic: pH, mass, carbon content
- Heavy metal content
- Quantitative and qualitative analysis of humic acids content

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Equipment:

Particle analyzer
Producer: L.O.T.-Oriel GmbH & Co. KG (2011)
Basic parameters:

- Particle size analysis based on the phenomenon of sedimentation
- Measured particle size range from 5 nm to 100 µm
- Accuracy 0.5%
- Resolution 5%
- Maximum spin speed 24000 rpm
- Measurement possible in organic and inorganic solvents
- Possible measurements of solutions containing a mixture of particles of different sizes

Centrifuge
Producer: Hetting Zentrifugen (2011)
Basic parameters:

- Tank volume 750 and 250 ml
- Adjustable rotor speed
- Speed centrifugation up to 4600 rpm (750ml), 9000 rpm (250ml)
- Centrifuge is thermostated within <-20°C i 30°C <

Purpose: Separation of mixtures

Optical microscope
Producer: Conbest (2011)
Basic parameters:

- Standard Zoom from 40x to 1000x
- Planachromate infinity-corrected lens CCIS, 10x, 40x, 60x 100x
- Phase Contrast Kit
- Light polarization Kit
- Camera - 3.1 Mpix

Purpose: Microscopic analysis of plant and animal tissues, image analysis using specialized software

Set for HPLC
Producer: DIONEX (2011)
Basic parameters:
HPLC is equipped with the following detectors:
UV-VIS detector with a LED matrix

- wavelength 190-800 nm,
- the ability to collect data from one wavelength or performance spectrum

Fluorescence Detector

- collection of data at speeds up to 200Hz
- measurement range 220-700 nm
- the lowest detection limits of Raman S / N: > 550

Corona detector

- Measurement range from ng to u.g
- Vapor pressure of the analytes under 10-5 hPa

Conductivity Detector

- Measurement range mg/L
- Quantitative and qualitative analysis: fluorides, acetone, chlorine, nitrites, nitrates, bromides, phosphates, sulfates.

Purpose: Used in studies of food, drugs, cosmetics, water, soil solution, substances of vegetable origin.

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Microwave digestion
Producer: ANTON PAAR (2011)
Basic parameters:

- It is equipped with microwave generators (magnetrons), which generate microwaves at a frequency of 2.45 GHz, causing direct heating of samples
- This provides a quick and full digestion of organic and inorganic samples in high pressure and temperature
- The area of application is high-resolution wet samples prior to determination of trace elements with the use of AAS, ICP-AES or ICP-MS techniques, performed during the environmental analysis for the food, beverage, chemical and petrochemical industry

Vacuum drying
Producer: JEIO TECH (2011)
Basic parameters:

- Chamber drying - thermostated
- Vacuum pump
- Scope of the vacuum – 9 mbar

Demineralizator
Producer: LABPOL (2011)
Basic parameters:

- The device is designed to purify water in the highest degree
- Clean water according to PN-EN ISO 3696:1999 and FARMAKOPEI

Purpose: chromatographic studies

Weight analytical (2 pcs.)
Producent: RADWAG (2011)
Basic parameters:
Weight 1:

- Load – 1.5 kg
- Sensitivity– 0.01 g
- Automatic internal calibration
- Repeatability – 0.01 g
- Stabilization time – 1.5 s

Weight 2:

- Load – 200 g
- Sensitivity – 0.001 g
- Ability to control the process of drying a sample to the required mass loss per time unit
- Ability to determine the drying process time

Research Lab of Soil Improvement

Research Lab of Soil Improvement
Laboratory Supervisor: Artur Nosalewicz, PhD
Tel.: 81 744 50 61 ext. 158
Fax: 81 744 50 67
e-mail: a.nosalewicz@ipan.lublin.pl

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Research profile:

- Evaluation of the use of organic amendments applied in soil remediation, with a particular emphasis on surface quality and drainage outflow. Studies are carried out in the laboratory equipped with a rainfall simulator and perforated flume floors. During a rainfall simulation performed on flumes containing soil and various amendments, samples of surface and drainage water and sediment are collected. The quality of water is determined with the use of a photometric analyzer.

Analysis:

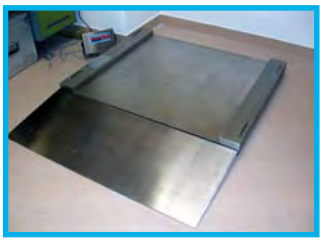
- Quantity of sediment, surface runoff and drainage water
- Quality of water, wastewater, saline, process water, effluents and soil/sludge digests (Aluminium, Ammonia, Nitrite, Nitrate, Calcium, Chloride, Copper, Ferrous iron, Fluoride, Magnesium, Cyanide, Chromium, Manganese, Molybdenum, Reactive P, Silica, Sulphate, Sulphate, Thiocyanate, Total Phenols, Zinc, Alkalinity, Hardness)
- Waterstability of soil aggregates in high energy test with the use of a rainfall simulator

Equipment:

Water Deionizer of High Productivity
Producer: Polwater (2011)
Basic parameters:

- Efficiency: 50 dm^3/h;
- Productivity: >500 $dm^3/24$ h
- Water quality: <0.05µS/cm; TOC <10 ppb; microbes <1 cfu/ml

Electronic Platform Scale TP300/4
Producer: FAWAG S.A. (2011)
Basic parameters:



- Pan size: 1000x1000 mm
- Capacity: 300 kg
- Minimum display: 100 g
- Accuracy class: III

Heating oven with forced convection FD115
Producer: BINDER (2011)
Basic parameters:

- Interior volume: 115 L ; Quantity of racks: 6; Load per rack: 20 kg
- Temperature range: 300°C
- Temperature uniformity at 70°C (± 0.7°C); 150°C (± 1.8°C); 300°C (± 3.9°C)
- Time of heating up to 70°C (7 min), 150°C (28 min), 300°C (49 min)

Electronic Balance UW4200H-V
Producer: SHIMADZU (2011)
Basic parameters:

- Automatic calibration at temperature change; Specific gravity measurement kit
- Main body dimensions (w/h/d): 190x317x78 mm
- Pan size: 170x180 mm
- Capacity: 4200 g
- Minimum display: 0.01 g
- Accuracy class: II

Automated discrete Photometric Analyzer for water and environmental samples
Producer: Thermo Scientific (2011)
Basic parameters:

- Analyzes: Aluminium, Ammonia, Nitrite, Nitrate, Calcium, Chloride, Copper, Ferrous iron, Fluoride, Magnesium, Cyanide, Chromium, Manganese, Molybdenum, Reactive P, Silica, Sulphate, Sulphate,

Thiocyanate, Total Phenols, Zinc, Alkalinity, Hardness

- Analysis type: colorimetric end-point, linear and non-linear reactions, turbidimetric and bichromatic with or without sample blanking
- Light source: Halogen lamp with linear absorbance range of 0-2.5 A, resolution of 0.001 A and reproducibility of SD ≤0.005 A at 2 A
- Spectral range: 340-880 nm
- Analytical rate: 175 tests/hour

Water Deionizer of High Water Quality
Producer: Polwater (2011)
Basic parameters:

- Efficiency: 30 dm^3/h
- Water quality: <0.05u.S/cm; TOC <3 ppb; microbes <1 cfu/ml

Research Lab of Physical Characteristics of Modified Soils

Research Lab of Physical Characteristics of Modified Soils
Laboratory Supervisor: Associate Prof. Cezary Sławiński, DSc
Tel.: 81 744 50 61 ext. 127
Fax: 81 744 50 67
e-mail: c.slawinski@ipan.lublin.pl

Research profile:

- Monitoring of environmental parameters
- Development of measurement methods and performance characteristics of porous media, in particular soils
- Measurement of water and thermal characteristics of porous media
- Development of methods for evaluating the parameters of the soil medium

Analysis:

- Determining the course of the hysteresis curve of retention in porous bodies
- Research: Investigations of dependency between moisture and water potential of porous media
- Application: Determination of water contents useful for plants and characteristic points of the water retention curve in the processes of sorption and desorption

Equipment:

Set for determination of the water hysteresis effect
Producer: SOILMOISTURE Corp (2010)
Basic parameters:

- Set for ceramic plates for measuring range from 0 to 2 Bars

Set for collecting soil samples
Producer: Eijkelkamp (2010)
Basic parameters:

- soil samples: 53, 60 and 84mm depth of sampling 2.5 m
- cassette for 24 samples

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Set for heat properties determinations
Producer: Hukseflux Thermal Sensors, Decagon (2010)
Basic parameters:
KD2 Pro

- heat conductivity from 0.02 to 4 $Wm^{-1}C^{-1}$
- heat diffusivity from 0.1 to 1.0 $mm2s^{-1}$
- heat resistancefrom 0.25 to 50 mCW^{-1}
- specific heat from 0.5 to 4 $MJm^{-3}C^{-1}$

FTN01

- Heat conductivity from 0.1 to 6 $Wm^{-1}C^{-1}$
- Length of probe 1.5m

X-ray microtomograph
Producer: General Electric (2011)
Basic parameters:

- X-ray source max.: 180 kV, 15W
- Max. scanning resolution: <0.5 µm
- Digital detector resolution: 5 Mpx
- Maximum size of scanned object: diameter – 120 mm, heigh – 150 mm
- Maximum mass of scanned object: 2 kg
- Option of cooling and stressing the samples

Research Lab of Plant Growth

Research Lab of Plant Growth
Laboratory Supervisor: Artur Nosalewicz, PhD
Tel.: 81 744 50 61 ext. 158
Fax: 81 744 50 67
e-mail: a.nosalewicz@ipan.lublin.pl

Research profile:

- Studies on the effect of water and nutrients accessibility on leaf spectral characteristics
- Researches related to the impact of soil conditions, light intensity, CO_2 concentration on plant photosynthetic activity, function of photosystems I and II in leaves and suspensions
- Measurements of the water flow within the soil - plant - atmosphere system

Analysis:

- Measurements of the absorption and reflection of light by biological substances in the wavelength range of covering visible and Near Infra-Red (NIR) light,
- Chemical detection or monitoring of N, sugar and water in leaves
- Measurements of plant sap flow using non-invasive methods in 2-7mm stems

Equipment:

Spectrometer for leaf chlorophyll concentration analyses
Producer: CI-710, CID Bio-Science Inc. (2010)
Basic parameters:

- Lightweight, portable spectrometer for the measurements of the transmission, reflection and absorption spectra in the 400-1000nm range, white light provided by Dual light source - Halogen/LED
- resolution 0.3-10nm
- time of integration up to 10s
- sensitivity 130 photons/count at 400nm, 60photons/count at 600nm

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Plant growth Chambers (2pcs.)
Producer: KK 1200. Pol-EKO (2011)
Basic parameters:

- internal volume 1365l (height 151cm)
- temperature range -10-60°C, air humidity 30-90%,
- 2 light shelves with regulated light intensity up to 15 000LUX

Set for photosynthesis analyses
Producer: DualPAM 100, GFS-3000. Heinz Walz GmbH (2011)
Basic parameters:
A portable system for photosynthesis and chlorophyll fluorescence measurements with environmental chamber

- measurement area of 8 cm^2
- range of CO_2 measurement 0-3000ppm, H_2O 0-75 000ppm
- range of CO_2 regulation 0-2000ppm, H_2O 0-100%rh
- range of temperature regulation -10-50°C from ambient temperature
- light source LED 0-2000µm $m^{-2}s^{-1}$
- head for fluorescence measurements at daylight with blue light source 8 000µm $m^{-2}s^{-1}$ PAR
- Laboratory system for the measurement of fluorescence in leaves and suspensions
- Hades for PSI and PSII fluorescence measurements

Apparatus for sap flow measurements
Producer: Dynamax Inc. (2010)
Basic parameters:

- non-invasive, direct measurement of sap flow in stems 2-7mm diameter range
- Real-time monitoring of from 16 sensors reading

Laboratory of Biochemistry

Laboratory of Biochemistry
Laboratory Supervisor: Justyna Cybulska, PhD
Tel.: 81 744 50 61 ext. 145
Fax: 81 744 50 67
e-mail: j.cybulska@ipan.lublin.pl

Research profile:

- Biochemical analysis of plant materials, especially cell walls
- Evaluation of physiological state of fruits and vegetables based on the key compounds
- Investigation of quality of food-plant products and semi- products
- Modelling using physical analogues of plant cell walls

Analysis:

- Quantitative evaluation of pectin, calcium and nitrogen in biological samples, mainly in plant tissue
- Quantitative evaluation of starch by means of polarimetric and enzymatic methods, and quantitative marking by the starch index method
- Quantitative evaluation of polysaccharides of plant cell walls by sequential extraction
- Sample preparation for biochemical analysis by accelerated sol vent extraction
- Determination of total soluble solids, total titratable acidity, dry mass and water activity in plant tissues and food products

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Equipment:

Accelerated Solvent Extractor ASE 150
Producer: Dionex Corporation (2011)
Basic parameters:

- Single-cell system for the extraction of solid and semisolid samples using common solvents at elevated temperatures and pressures.
- It runs faster than classical extraction methods, requires less solvent and labor, and ensures repetitive results

Continues Flow Analyser (CFA) SanPlus
Producer: Skalar Analytical B.V. , Holandia (2011)
Basic parameters:

- Automatic analyser for the determination of pectin, calcium and nitrogen content in biological samples by means of the continuous flow analysis method
- Range in water extracts: pectin 1– 100 ppm $C_6H_{12}O_6$, calcium 1-100 ppm Ca, nitrogen after mineralization 0.1 – 10 ppm N

Analytical balance ABT 220-5DM
Producer: KERN (2011)
Basic parameters:

- Range: 220g
- Readout 0.01mg / 0.1 mg

Laboratory homogenizer
Producer: NEOLAB (2011)
Basic parameters:

- Rotary speed: 10.000 rpm and 14.000 rpm
- Power: 140 Wats

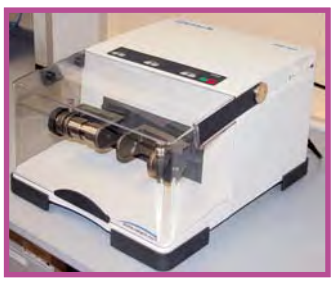
Vacuum oven OV-11
Producer: Jeio Tech Co. Ltd. (2011)
Basic parameters:

- Temperature range: 5°C above room temperature to 250°C
- Accuracy 1°C
- Vacuum range: 0 - $1*10^{-2}$mbar

Cooled vacuum centrifuge Mikro 220R
Producer: Hettich (2011)
Basic parameters:

- Max. 18 000 rpm
- Temperature regulation from -20 to +40°C

Mixer mill MM400
Producer: Retsch (2011)
Basic parameters:



- The mill enables grinding of different materials, including plant and animal tissues
- Possibility of cryogenic grinding
- Final fineness: 6 µm, grinding in 25 ml steel cells and 1.5 ml test-tubes

Tubes rotator
Producer: Falc Instruments (2011)
Basic parameters:

- Rotatory shaker with a disc suitable for 1.5 ml test-tubes

Automatic polarimeter AP -300
Producer: Atago, Japan (2011)
Basic parameters:

- Measurement Scales : Angle of Rotation, International Sugar Scale
- Range: ± 89.99°
- Accuracy 0.01°.

Laboratory of Molecular and Environmental Microbiology

Laboratory of Molecular and Environmental Microbiology
Laboratory Supervisor: Magdalena Frąc, PhD
Tel.: 81 744 50 61 ext. 156
Fax: 81 744 50 67
e-mail: m.frac@ipan.lublin.pl

Research profile:

- Study of microbial and enzymatic soil activity
- Evaluation of the microbiological state of soil and microbial diversity of soil, organic waste and sewage sludge, air, water
- Microbial diagnostics - identification of microorganisms using the BIOLOG system and modern techniques of molecular biology in environmental samples
- Mycological research and expertises

Analysis:

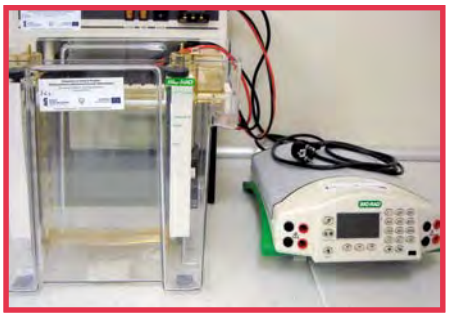
- Quantitative and qualitative investigation of microbial pollution
- Evaluation of bacterial total number
- Evaluation of the total number of fungi and yeast
- Microbiological evaluation of the air
- Bacteria, yeast and fungi identification using DNA analysis
- Mycological analyses of soil and waste

Equipment:

Genetic analyzer (sequencer)
Producer: Applied Biosystems (2010)
Basic parameters:

- 4-capillary analyzers for electrophoretic separation of DNA fragments using the capillary method for sequencing and sample fragment analysis
- Basecalling accuracy for sequencing - 98.5%
- Basecalling accuracy for fragment analysis - 99.99%
- Software for:
  - Data collection and reporting,
  - Microbial identification of bacteria and fungi based on rDNA sequence,
- Validated libraries of known microorganism sequences of for the identification of unknown microorganisms.

The DCode System for DGGE analysis
Producer: BIO-RAD (2010)
Basic parameters:



- A system for DNA mutation analysis using the DGGE technique (denaturing gradient gel electrophoresis)
- The system consists of a temperature control module, two electrophoresis tanks, one with ceramic cooling fingers and core
- The system allows for two gel electrophoresis
- The control module contains a stirrer for buffer mixing and a heater for temperature control 45-70°C
- Powered with programmable voltage

Apparatus for DNA extraction
FastPrep®-24 (2010)
Producer: MP Biomedicals
Basic parameters:

- Work time from 1 to 60 second with increase as 1s
- Speed 4.0–6.5 m/s, with increase as 0.5 m/s
- Adapter with 24 positions for 2 ml tubes
- Cryogenic adapter holds 24 2-ml tubes

Agarose gel electrophoresis system (2 pcs.)
Sub-Cell GT Agarose Gel Electrophoresis System (2010)
Producer: BIO-RAD
Basic parameters:

- Apparatus for nucleic acids electrophoresis in agarose gel
- Systems for separation of DNA restriction digesting and polymerase chain reaction-amplified fragments systems with UV-transparent plastic trays
- Powered with programmable voltage

Autoclave
FVG2 (2010)
Producer: Fedegari
Basic parameters:

- Capacity 75 l
- Range of temperature: 105-138 °C
- Autoclave chamber made of stainless steel

Gel documentation system
GelDocXR+ Imaging System (2010)
Producer: BIO-RAD
Basic parameters:

- System for visualization, saving and analysis of fluorescent and colorimetric labelled samples
- System with mini-darkroom with UV transilluminator and white light epi-illumination
- Transilluminator equipped with UV lamps (302 nm UV-B)
- System with filters for using ethidium bromie and Sybr-Green
- Software allows image analysis, automatic identification of bands, and preparation of dendrograms

Spectrophotometer for DNA concentration analysis
NanoDrop2000 (2010)
Producer: Thermo Scientific
Basic parameters:

- Spectrophotometer UV/VIS for measurement samples in micro-volume
- Sample volume – 0.5 µl
- Wavelength range - 190-840 nm
- Measurement without cuvette, micro-cuvette and tips
- Range of DNA concentration measurement: 2-15 000 ng/µl
- Time of measurement cycle ≤ 5 sec.

Gradient thermal cycler
9901 Veriti 96 well Fast Thermal Cycler (2010)
Producer: Applied Biosystems
Basic parameters:

- Thermal cycler with 96-well block (format 96 x 0.1 ml) comprising 6 different areas controlled through the application of the Peltier effect
- Homogeneity temperature in the block +/-0.5°C
- Possibility of regulating temperature between particular areas by 4°C, and possibility of setting the same temperature in all areas of the block
- Temperature range from 4.0°C to 99.9°C with a possibility of setting the accuracy to 0.1°C

Centrifuge
Eppendorf 5424 (2010)
Producer: Eppendorf
Basic parameters:

- Speed to 14 680 rpm (20.238 x g)
- Possibility of reading rpm or rcf
- Function of continuous or short centrifugation
- Rotors:
  - 24-place for 1.5/2.0 ml tubes with aerosol-tight lid and adapters for 0.2 ml tubes, - 24 pcs.
  - 18-place for spin columns tubes
  - Rotor for PCR-strip (min. 4 x 8 strips = 32 x 0.2 ml)

Centrifuge
Eppendorf 5417R (2010)
Producer: Eppendorf
Basic parameters:

- Speed from 500 rpm, as 100 to 16 400 rpm (25.000 x g)
- Temperature range from -9 to 40°C
- Rotors:
  - fixed-angle rotor 30 x 1.5/2.0 ml with aluminium lid and adapters for 0.2 ml tubes
  - fixed-angle rotor with aerosol-tight lid 24 x 1.5/2.0 ml
  - PCR-strip rotor (6 x 8-tube strips 0.2 ml)

Preparative centrifuge
Eppendorf 5810R (2010)
Producer: Eppendorf
Basic parameters:

- Capacity up to 4 x 400 ml
- Speed range from 200 to 14 000 rpm (20.800 x g)
- Temperature range from -9 to +40 °C
- Rotors:
  - Swing-bucket rotor 4 x 400ml with adapters for 48 Falcon 15 ml tubes, 20 Falcon 50 ml tubes, 4 bottles 400 ml, 4 bottles 180-250 ml,

64 tubes 7-17 ml, 4 plate buckets and adapters for 96-well PCR plates, adapters for slides and aerosol-tight lids
- Fixed-angle rotor 6 x 85 ml with adapters for 6 Falcon 15 ml tubes, 6 Falcon 50 ml tubes, 6 tubes of 7-15 ml, 6 tubes of 20-30 ml

Multi-purpose centrifuge
Eppendorf 5804R (2010)
Producer: Eppendorf
Basic parameters:

- Capacity up to 4 x 100 ml
- Temperature range from -9 to +40°C
- Speed range from 200 to 14 000 rpm (to 20.800 x g)
- Rotors:
  - Swing-bucket rotor 4 x 100 ml with adapters for 4 Falcon 50 ml tubes, 16 Falcon 15 ml tubes, 24 tubes of 7-17 ml, 28 tubes of 3-15 ml, 36 tubes of 2,6-7 ml
  - PCR-strip rotor (6 x 8 PCR-strips 0.2 ml or 48 single tubes for PCR 0.2 ml)

Freezer
Q-Cell80ZN (2010)
Producer: Poll Lab
Basic parameters:

- Capacity 80 l
- Temperature range from 0 to -25°C
- Temperature accuracy 0.1°C
- Calibrated system for wireless monitoring and registration of data

Ultra-low-temperature freezer
MDF-U5386S (2010)
Producer: SANYO
Basic parameters:

- Temperature range from -50°C to -86°C
- Temperature accuracy +/-1°C
- Capacity 480 l
- Calibrated system for wireless monitoring and registration of data

Water purification system
Direct-Q 3UV (2010)
Producer: Millipore
Basic parameters:

- System with 6 l of tank for RO water storage
- System with UV lamp (185/245 nm)
- Pure product water quality:
  - Ionic rejection 94-99 %
  - Organic rejection ≥ 99 %
  - Particulates ≥ 99 %
- Ultrapure product water quality:
  - Resistivity 18,2 Mohm/cm
  - Bacteria ≤ 1 cfu/ml
  - Membrane filter 0.22 µm

Microplates counter
INFINITE M200PRO (2010)
Producer: TECAN
Basic parameters:
- Apparatus with function of fluorimeter, photometric system and luminometer

- Detection methods: absorbance with light source – UV xenon flashlamp, fluorescence
- Absorbance from 230 nm to 1000 nm
- Reader for plates from 6 to 384-well plates
- Read time of 96 –well plate – 20 sec
- Reader with quarto plate for 16 measurement of DNA, RNA and protein concentration in 2 ml
- Apparatus with shaker

Thermal cycler for Real-Time
PCR 7500 Fast (2010)
Producer: Applied Biosystems
Basic parameters:

- Thermal cycling system based on the Peltire system for 96-well plates or strip-tube - volume 0.1 ml
- System with a camera for fluorescence image registration
- Detection in 5 channels: -FAM/SYBR Green I, -VIC/JOE, - NED/TAMRA/ Cy3, - ROX/Texas Red, - Cy5
- Passive reference dyes: ROX or any calibrated dye

Automatic system for Fast microorganisms identification
Turbidimeter, Microstation, OmniLog, Microscope, Anoxomat, AeroSpray (2010)
Producer: BIOLOG, Opta-tech, Mart Microbiology, ELITech
Basic parameters:

- System for automatic identification of bacteria: gram (-), gram (+), *Bacillus*, anaerobic bacteria, yeast and fungi
- System for microbial identification on 96-well microplates with database containing 2000 of bacteria, yeast and fungi species
- System with microstation reader for 96-well plates for identification and characterisation of microorganisms (anaerobic bacteria, yeast, fungi)
- System with automatic station of bacteria identification (gram (+), gram (-)), for incubation, reading and results analysis for 50 microplates 96-well (temperature incubation range from 22 to 45 ^{o}C)
- System equipped with turbidimeter, apparatus for Gram method staining, apparatus for microaerofiles and anaerobes incubation, optical microscope

Ice machine
ZBE-30-10 (2010)
Producer: Ziegra
Basic parameters:

- Apparatus for ice production, ice temperature -0.5 ^{o}C
- Capacity 10 kg
- Low level of noise – to 45 dB
- Cover - INOX

Thermostat – microbiological incubator (2 pcs.)
BD400, BD240 (2010)
Producer: Binder
Basic parameters:

- Incubators 240 and 400 l
- Temperature range from 30 to 100°C
- Temperature accuracy 0.1°C
- Function of setting speed heating in the time

Microwave
Zelmer 292016 (2010)
Producer: Zelmer
Basic parameters:

- Microwave for preparation, heating and dissolution of agarose gels
- Capacity 23 l
- Microwave power 900 W
- Electronic control

Laboratory refrigerator (2 pcs.)
Q-Cell 140/2/CHL, Q-Cell 60/CHL (2010)
Producer: Poll Lab
Basic parameters:

- Refrigerators for storing reagents and samples: double chamber refrigerator - capacity 140 l, single chamber refrigerator - capacity 65 l
- Temperature range: 0-10 °C
- Forced air
- Calibrated system for wireless monitoring and registration of data

Minicentrifuge (2 pcs.)
MiniSpin Plus, 5418 (2010)
Producer: Eppendorf
Basic parameters:
MiniSpin Plus

- Rotor capacity: 12 x 1.5ml / 2.0 ml
- Equipped with autoclavable rotor
- Max. speed 14 500 rpm
- Function of continuous or short centrifugation
- Equipped with: -fixed angle rotor 12 x 1.5/2.0 ml – 1 pcs., -adapters for this rotors for 0.2 ml tubes - 12 pcs., -rotor for strips – 1 pcs.

5418

- Rotor capacity 18 x 1.5/2.0 ml
- Speed to 14 680 rpm
- Function of short centrifugation
- Possibility of using adapters for 0.2 ml tubes

pH-metr
CP-502 (2010)
Producer: Elmetron
Basic parameters:

- pH measuring in the range from -2.000 to 16.000 pH
- Temperature measurement in the range from -50.0 to +199.9°C

Laboratory dryer
SLN 115 STD (2010)
Producer: POLEKO
Basic parameters:

- Capacity 112 l
- Temperature range from 30 to 300°C
- Equipped with calibrated system for wireless monitoring and registration of data

Precision balance (2 pcs.)
PS1200/C/2, AV513CM (2010)
Producer: Radwag, OHAUS
Basic parameters:

- Balances with internal calibration

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PS1200/C/2

- Max. capacity 1200 g
- Minimum capacity 500 mg
- Readability 10 mg

AV513CM

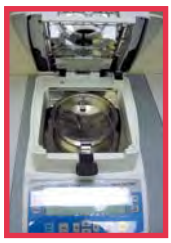
- Maximum capacity 510 g

Analytical balance
AS60/220/C/2 (2010)
Producer: Radwag
Basic parameters:

- Analytical dual band balance with internal calibration
- Maximum capacity: 60g / 220g with readability of 0.01mg / 0.1mg
- Minimum capacity 1 mg

Moisture balance
MAX50/1/NP (2010)
Producer: Radwag
Basic parameters:

- Maximum capacity 50 g
- Reading unit 0.1 mg
- Drying profiles: standard, ramp, fast, step
- Accuracy of moisture reading 0.01/0.001% (0.001% for samples of up to 1.5g)
- Maximum drying temperature 160 °C



Ultrasonic cleaner
SONIC-6 (2010)
Producer: POLSONIC
Basic parameters:

- Capacity 5.7 dm^3
- Heating elements power 300 W
- Ultrasonic generator power 2x240 W

Laboratory labwasher
G7883CD typ GG04 (2010)
Producer: Miele Professional
Basic parameters:

- Washing and disinfecting machine with a drying agregate equipped with 8 standard washing programs
- Function of control and safety: two temperature sensors inside the machine, electrical door lock
- Machine with two levels of washing

Shaking water bath
GFL 1092 (2010)
Producer: GFL
Basic parameters:

- Temperature regulation in the range from +10 to +80 °C
- Orbital shaking
- Shaking frequency from 10 to 250 min^{-1}
- Calibrated system for wireless monitoring and registration of data

Transilluminator
GelVue GVM20 (2010)
Producer: Syngene
Basic parameters:

- Transilluminator for gels 20x20 cm
- Wavelength 302 nm
- Lighting regulation in the range 50-100 %
- Protective cover against UV

Automated screening
AS200 Control (2010)
Producer: Retsch
Basic parameters:

- Maximum capacity - 3 kg
- Amplitude range from 0.2 to 3.0 mm
- Dry and wet sieving

Shaking Incubator
GFL 3032 (2010)
Producer: GFL
Basic parameters:

- Temperature range from 8°C to +70°C
- Temperature setting at 0.1°C
- Orbital shaking, shaking frequency 10-250 min^{-1}
- Platform capacity to 12 kg

Colony counter
Easy Count2 7510/AES (2010)
Producer: AES Laboratorie
Basic parameters:

- Automatic counting of colonies from Petridish (90mm) from pour, deep and spiral plate colonies
- Possibility of counting colonies from each type of agar
- Possibility of designating areas where colonies will be counted
- Automatic colony classification depending on the color
- Automatic separation of overlapping colony
- Possibility of recording results

Magnetic stirrer
MR-Hei Standard (2010)
Producer: Heidolph
Basic parameters:

- Speed regulation from 100 to 1400 rpm
- Temperature regulation from 20 to 300°C
- Equipped with a digital thermometer

Vortex stirrer (2 pcs.)
Reax control (2010)
Producer: Heidolph
Basic parameters:

- Maximum diameter of samples 20 mm
- Speed regulations in the range 0-2500 rpm
- Amplitude 5 mm
- Short and continuous working function

Sampler for microbiologiacl analysis of the air
Sampl'air (2010)
Producer: AES Laboratorie
Basic parameters:

- Capacity 100 l for minute
- For standard Petridish 90mm
- Possibility of delayed work: 00:00 to 00:59

The autopreparator and sterilizer of microbiological media
Masterclave 09 (2010)
Producer: AES Laboratorie
Basic parameters:

- The machine for media and diluents preparation in the range from 1 to 9 l
- The machine equipped with a magnetic stirrer - continuous work 40 rpm

- Sterilisation temperature in the range of 95-125°C
- Sterilisation time in the range of 1-180 min.
- Dispensing temperature 25-80°C
- Constant temperature, during supplement addition

Peristaltic pump
PM05 (2010)
Producer: AES Laboratoire
Basic parameters:

- Manual and automatic mode during media dispensing
- Volume in the range from 0.1 to 9999.9 ml
- Speed: 30-500

Automatic diluter
Dilumat S (2010)
Producer: AES Laboratorie
Basic parameters:

- Dispensing speed – to 200 ml/min
- Automatic distribution nozzle
- Range of dilution: from 1:2 to 1:99
- Weight of the sample 0 – 2500 g

Automatic Petri dish filling system
APS One (2010)
Producer: AES Laboratorie
Basic parameters:

- Flow rate: to 650 dishes during 1 hour
- Dispensing volume in the range from 1 to 30 ml
- Manual dispensing from 1 to 1000 ml
- Equipped with a cooling system
- Dispensing in sterile UV-chamber
- Opening time of the plate < 3 sec.
- Medium mixing during dispensing

The instrument for the preparation of samples for microbiological analysis
Pulsifier PUL100E (2010)
Producer: Microgen Bioproducts
Basic parameters:

- Equipped with a stainless steel beater ring that vibrates to produce a vigorous stirring which drives microbes into suspension
- Sample volume up to 250 ml

The membrane filter system
AS220 (2010)
Producer: Whatman
Basic parameters:

- Equipped with 2-place vacuum manifold
- Appropriate for 47mm and 50 mm diameter filter
- Equipped with funnels and filter feeder

Homogenizer
AESAP1064 Smasher (2010)
Producer: AES Chemunex
Basic parameters:

- The blender for homogenization of samples
- Homogenization time from 10 sec. to 3 min.
- Function of continuous homogenization

Gel dyder apparatus
MG-2131 (2010)
Producer: Biocom Direct
Basic parameters:

- Thermal accuracy 0.1°C
- Drying time from 1-999 minutes
- For gel dimensions 21x31 cm

Thermoblock
ThermostatPlus (2010)
Producer: Eppendorf
Basic parameters:

- Temperature range from -5 °C to 99 °C
- Equipped with thermal blocks for: 0.5, 1.5, 2, 15 and 50 ml and microplates

Redestilator
Rel 5 (2010)
Producer: Polna
Basic parameters:

- Efficiency 4.5 l/h

Shaker
MR-12 (2010)
Producer: BIOSAN
Basic parameters:

- Shaker provides adjustable soft biological media, solutions mixing in vessels or single use plastic bags, tubes or Petridishes
- Possibility of speed and angle regulation
- Speed range 1 - 99 rpm

Rotator Multi
RS-60 (2010)
Producer: BIOSAN
Basic parameters:

- Available settings: rotational motion, reciprocal motion, vibro motion
- Speed range 1-100 rpm

Pipetting stadion for PCR
EPMotion 5070 (2010)
Producer: Eppendorf
Basic parameters:

- Automated pipetting system to dispense quantities of liquid in the volume 1 µl to 1000 µl
- System for 24, 48, 96 i 384-well plates and 0.5, 1.5, 2.0 and 0.2 ml tubes

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8-channel pipette
Research Pro Multi (5-100µl) (2010)
Producer: Eppendorf
Basic parameters:

- 8-channel electronic pipette
- Volume range 5 – 100 µl
- The lower half of the pipette can be steam-autoclaved
- Mode of operation: aspirating and dispensing, reverse pipetting

12-channel pipette
Research Pro Multi (0.5-10µl) (2010)
Producer: Eppendorf
Basic parameters:

- 12-channel electronic pipette
- Volume range 0.5-10 µl
- The lower half of the pipette can be steam-autoclaved
- Mode of operation: aspirating and dispensing, reverse pipetting

Set for autoclavable pipettes
Multi 1-channel: -0.5-10µl, -5-100µl, -20-300µl, -50-1000µl, -100-5000µl (2010)
Producer: Eppendorf
Basic parameters:

- Set for autoclavable pipettes included 5 1-channel electronic pipettes in the volume range 0.5-10 µl, 5-100 µl, 20-300 µl, 50- 1 000 µl, 100- 5000 µl
- The lower half of the pipette can be steam-autoclaved
- Mode of operation: aspirating and dispensing, reverse pipetting

Cooling cabinet
GKV-6460 (2010)
Producer: Liebherr
Basic parameters:

- Capacity 660 l
- Temperature range: +1 +15°C
- Forced air
- Calibrated system for wireless monitoring and registration of data

INSTITUTE OF AGROPHYSICS
PAN
LUBLIN POLAND




Bohdan Dobrzański
Institute of Agrophysics
Polish Academy of Sciences

ul. Doświadczalna 4, 20-290 Lublin 27
www.ipan.lublin.pl

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