Cooperation of the Warsaw University of Life Sciences with Business




– An Offer of Solutions with Potential for Commercialization

Szkoła Główna Gospodarstwa Wiejskiego w Warszawie

INNOWACYJNA GOSPODARKA
NARODOWA STRATEGIA SPÓJNOŚCI

Ministerstwo Nauki i Szkolnictwa Wyższego

UNIA EUROPEJSKA
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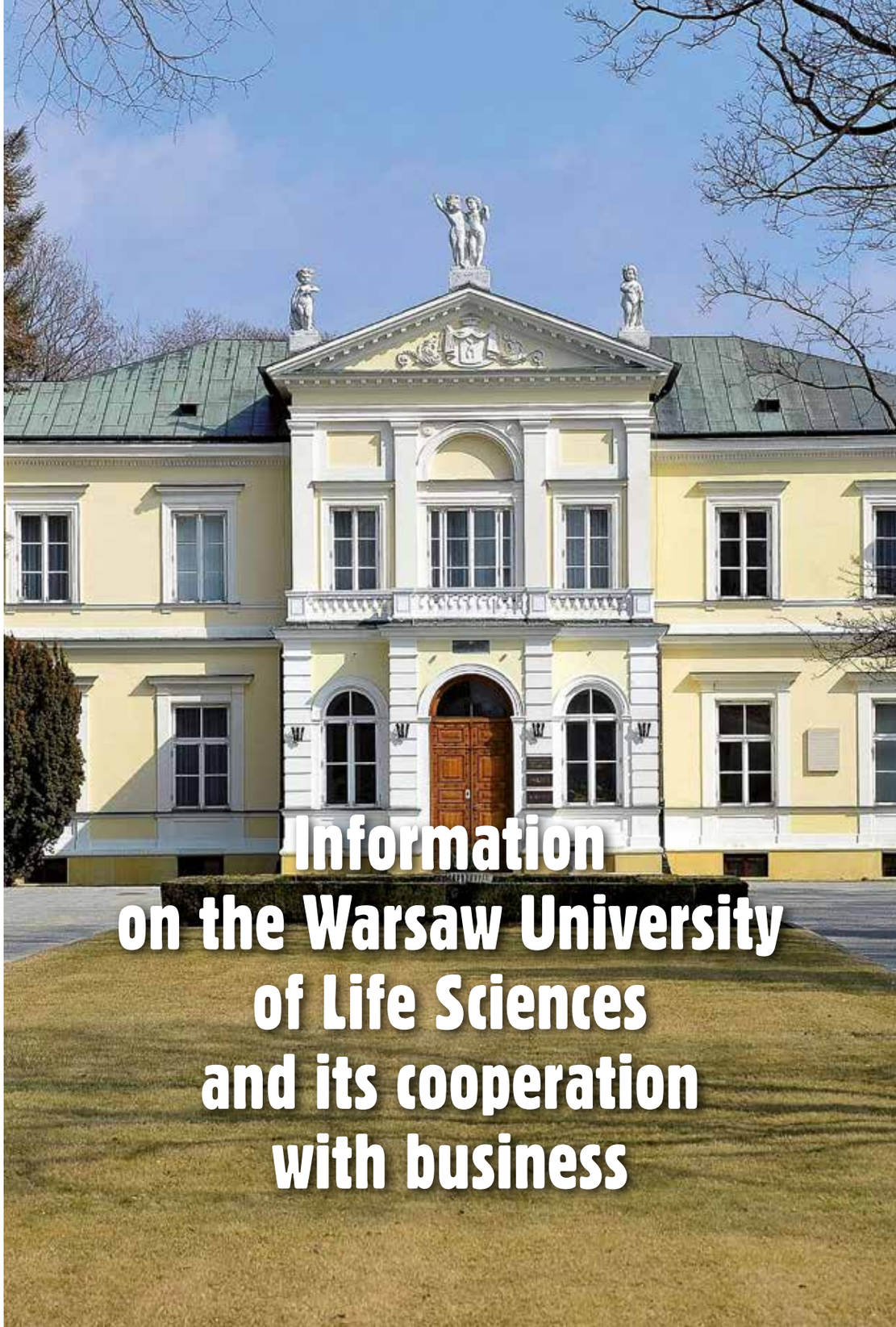

Information on the Warsaw University of Life Sciences and its cooperation with business

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HISTORY AND PRESENT DAY

The Warsaw University of Life Sciences (SGGW) is the oldest life sciences university in Poland. Its origins date back to 1816 and the foundation of the Institute of Agronomy in the area of today's Bielany (Warsaw). In 1916, the new Higher Agricultural School was founded which after its nationalization in 1918 acquired the current name of the university. A few years later, the Polish Parliament granted it vast lands in Mokotów (Warsaw), the place of construction of new university buildings. In the 1950s, the University acquired new lands in Ursynów (Warsaw). In the early 21st century, all University faculties were transferred to the campus in Ursynów and significantly expanded. Today, it is one of the most modern university campuses in Europe, with: 300 seminar rooms, 650 laboratories and 1,500 teaching rooms. 12 dormitories can accommodate 4,000 students. At their disposal are a complex of sports facilities including a European-class swimming-pool (the Water Centre) and tennis courts.

During the period of political transformation, the University gradually shifted its scope of specialization from a typically agricultural one to life sciences (including also social and technological studies). This was reflected in the newly assumed English name, i.e. the **Warsaw University of Life Sciences**. The University has also extended the scope of its courses and developed relations with its business environment.

The University has for years ranked high in Polish university league tables. In 2015, the University was recognized as one of the top 100 universities in the world for agriculture and forestry (QS World University Rankings – Top Universities, 2015). WULS won the first place in the competition of the Academic Centre of Information (ACI) for „The most innovative and creative university in Poland" (2010, 2011) and „The most innovative and creative university in Poland in creating career prospects" (ACI competitions in 2012-2014).

Currently, 13 faculties of the University employ c. 1,300 university teachers that train c. 27 thousand students and offer 37 courses that enjoy continuous popularity among the students. Many research projects are carried out in collaboration with other scientific institutions and the business sector both at home and abroad.

THE UNIVERSITY OF LIFE SCIENCES' COOPERATION WITH ITS ENVIRONMENT

The University of Life Sciences has two research laboratories accredited by the Polish Centre for Accreditation (i.e. the Laboratory of Food Evaluation and Health Diagnosis and the WULS Analytical Centre). Performed here are prestigious research projects, including qualitative assessment of products taking part in the „Poland Now" competition for the best products organized under the patronage of the President of Poland, and assessment of commercial products for consumer organizations, public prosecutors, customs office, etc. The laboratories are also used by the national health service (for health diagnostics).

The University has a strong commercial potential and capability of building relations between science and business. From January 2013 through May 2015, it has signed over 300 cooperation agreements with business support organizations, including Food Economy Bank, Centre for Banking Law and Information, Foundation for Small and Medium Enterprises, Podlaskie and Mazowieckie Agricultural Advisory Centres, Polish Federation of Food Industry, Association of Employers, the Polish Banks Association and other well-known companies, such as Danone, furniture manufacturer „FORTE", Azoty Group, IKEA Industry Poland, Propharma, SANTE A. Kowalski, Spomlek Cooperative Dairy, Tchibo Warszawa, Organika Sarzyna Chemical Plant, „Łmeat-Łuków" meat processing company and Żywiec Zdrój. Among the entities cooperating with WULS are both large companies (domestic and international corporations) and micro-enterprises. Moreover, the University is a member of nine clusters and networking agreements. One of the latter, is conducted by the Faculty of Economic Sciences, the cluster leader (Cluster of Innovation in Agribusiness).

In the years 2009-2014, 88 inventions and utility models (domestic and foreign) were patented. The patented solutions concerned e.g. improvement of the efficiency of cultivation of plants and animal husbandry, food technology and human nutrition, functional additives to animal feed, renewable energy development, construction and environmental engineering, materials science and solid wood and materials.

ORGANIZATION OF WULS'S COOPERATION WITH ECONOMY

The Centre for Innovation and Technology Transfer (CIiTT) has been established to enhance the institutional support for WULS's research implementation activities. Cooperation with business is also managed by the Rector's Attorney for Cooperation with Economy together with Faculty Deans' attorneys for Cooperation with Economy. Patent advisory services are outsourced to an external Patent Attorney.

CIiTT supports the processes of the transfer of knowledge and technology from the University of Life Sciences by building strong relations between the University and its business environment. CIiTT's mission is to integrate the University community with the business environment and central and local governments, as well as to initiate and support implementation of university projects co-financed from external funds.

The Centre, in addition to current business consulting and information services, fulfils its mission by organization of such events as the monthly **"Open Meetings with Economy"** with the participation of representatives of science, business and administration. The Meetings include presentations of financing opportunities for research and establishment of innovative business initiatives, mainly in early stages of their development (*seeds, start-ups*). They also offer a venue for debates on the commercialization of the results of scientific research. The invited participants of the Meetings represent innovation centres (incubators, business incubators and accelerators), VC/PE funds and institutions involved in financing of projects from EU funds. This includes also business angels, managers of larger implementation projects, representatives of local government and other institutions relevant to the development of entrepreneurship at the University of Life Sciences.

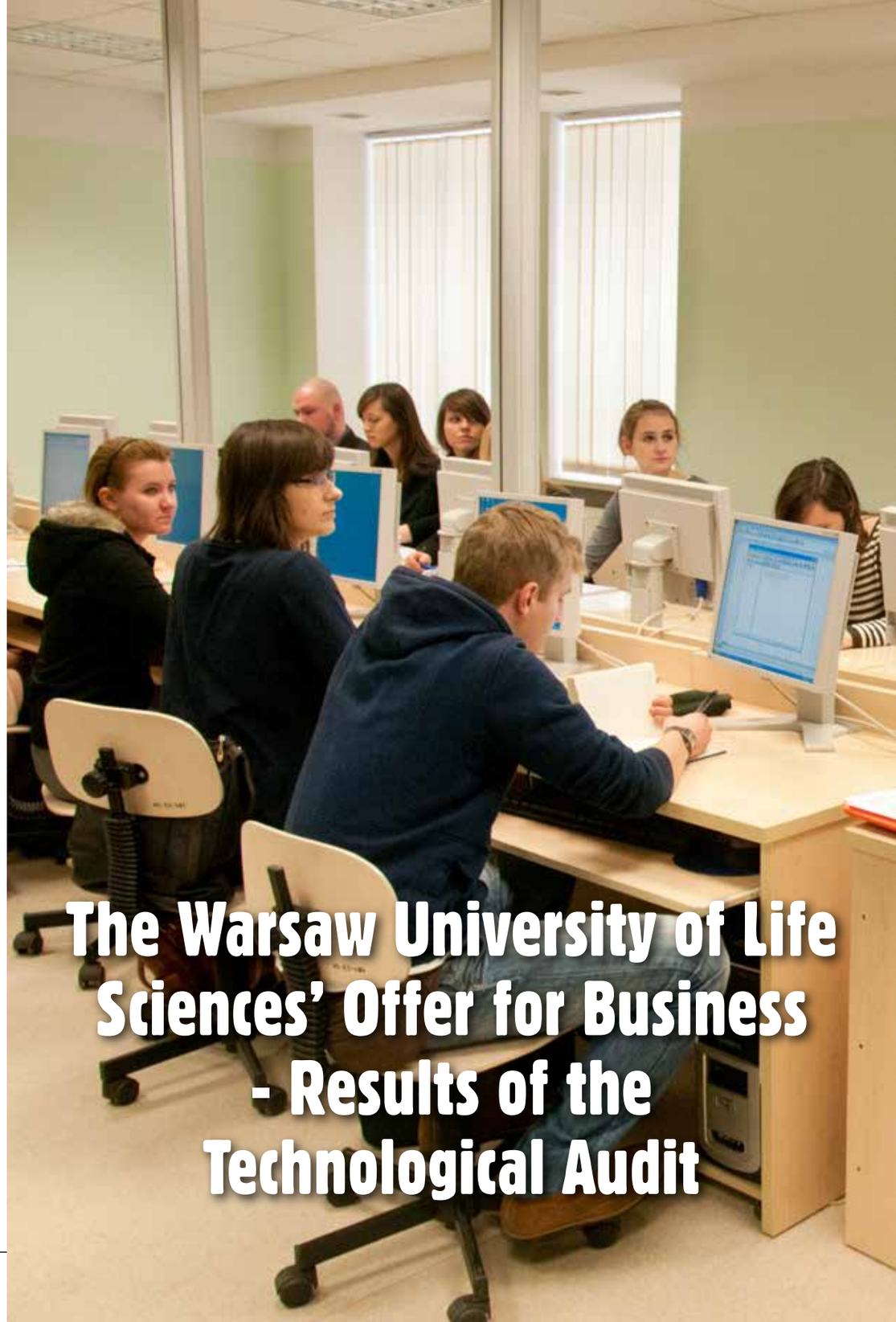
The Warsaw University of Life Sciences is one of 13 Polish universities selected by the Ministry of Science and Higher Education to implement the programme of **Innovation Incubator** whose objective is to support the process of management of implementation of research and development results, primarily with the aim of their commercialisation. The project includes such activities as carrying out a technological audit of the WULS, creation of a portfolio of implementation solutions, establishing links with entrepreneurs potentially interested in implementation of the University research results and investigation of key market demands in the field of life sciences, and analysis of selected solution with a view to their commercialization. At the end of May 2015, there was also held a conference with the participation of representatives of science and business during which some of the University R&D results were presented.

The project is implemented with the cooperation of 13 departmental technology brokers and two experts in commercialization of technology and innovation. The project has won recognition and in the 2014 publication of the Mazovia Woivodeship Marshal's Office „Innovation and Technology Transfer" was referred to as a model project.

CIiTT is also involved in the implementation of other government initiatives such as the **Brokers of Innovation** programme. Its aims also include improvement of the conditions of commercialization of research results of Polish universities, integration of the scientific community with its economic environment and dissemination of the research results in the business circles. One of the researchers from the Faculty of Wood Technology was awarded by the Ministry of Science and Higher Education under the Brokers of Innovation competition held by the Ministry.

The Centre also collaborates with the Mazovia Woivodeship Marshal's Office in monitoring the innovation processes in the province and with the Municipal Office of the Capital City of Warsaw in such projects as the establishment of the Warsaw Technological Space.

In the dissemination of the culture of entrepreneurship and setting up of start-ups, the University cooperates also with the Academic Incubators of Entrepreneurship Foundation. AIE at WUSL-SGGW support entrepreneurship by such activities as organisation of trainings and conferences and providing advice services for as many as **100 start-ups**.



The Warsaw University of Life Sciences' Offer for Business - Results of the Technological Audit

The Warsaw University of Life Sciences' Offer for Business - Results of the Technological Audit

METHODOLOGY OF THE TECHNOLOGICAL AUDIT

Cooperation between science and business is one of the essential elements of fostering innovation in the country and its particular regions. It becomes the so called university's third mission (next to teaching and science). This tendency is consistent with the objectives of the Warsaw University of Life Sciences' (WULS) Incubator of Innovation. One of them is to increase the scope of the implementation in business practice of the scientific (and other) ideas developed by the researchers and scholars of the WULS. However, to approach the issue of cooperation between science and business systematically we must first diagnose the current state of this type of cooperation and recognize the potential for its development. It has been one of the objectives of the project of the Technological Audit of WULS.

The first element of the Audit was carrying out of an inventory of possibly large number of ideas (business ideas) developed by the University staff (including doctoral students) that could eventually be successfully implemented in business. A relatively simple tool of data collecting was used, namely a survey (via Internet). The fruit was collection of **150 business ideas**. In the next step, we asked their authors to supplement the submitted information with more detailed data concerning the technological advantages, innovative content and business aspects of the submitted solutions. As a result, we obtained 50 **advanced descriptions** of the business ideas. Basing on multi-criteria ratings carried out by nearly 20 experts, the evaluation committee selected **eight "flagship" projects** of WUSL (SGGW). They will be presented (along with almost 40 other projects of high commercialization potential) in the later sections of this publication. Examined in this way was the supply-side of the projects with commercialization potential. For the cooperation with business to succeed we need, however, to learn the needs from the prospective demand-side for solutions developed by universities. Therefore, we conducted an analysis of the businesses from the WULS's environment from the point of view of the demand for building such relations with the University. We sent questionnaires (via Internet and regular mail) to almost 7 000 companies working in the sectors convergent with WULS and conducted interviews with representatives of **over 50 companies**, mostly already cooperating with the University (and signed cooperation agreements). The companies were pre-selected in such a way that at least three of them would cooperate with one WULS faculty.

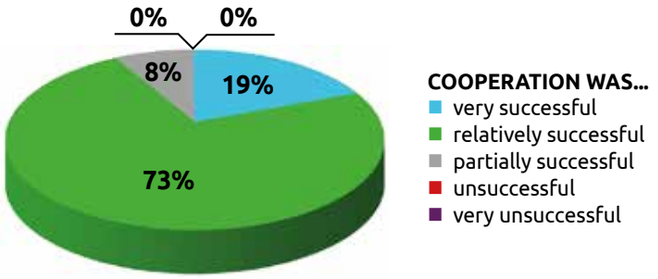
It was the first such comprehensive analysis of the needs of the companies from the University business environment. Presented below you will find a summary of the main conclusions of the analysis. The full report is available at the office of the WULS Incubator of Innovation.

THE KEY NEEDS OF THE COMPANIES AND OPPORTUNITIES FOR COOPERATION WITH UNIVERSITIES

The results of our research showed that the most important problems the companies have are of **financial** nature. They would be happy to acquire new sources of financing or funding for their investments. Another important issue was **shortage of personnel**. Here the needs vary: some of them seek experienced specialists, some other students willing to start with them their internship or professional practice. The third, not less important group, expressed their technological demands for such developments as updating of their production lines or access to laboratories. Relatively less important turned out to be for the companies the issues connected with organization and marketing. Still fewer indicated demand for training or counselling.

Moreover, the companies were slightly more likely (17% more) to expect of a university cooperation in matters relating to the implementation of new or improved methods of production or distribution of services (i.e. introduction of process innovation) than other types of innovation (product, organisational or marketing innovations). When asked about the envisaged methods of cooperation with a university, they indicated their desire to employ students, promote their company and acquire access to the university resources (laboratories, equipment and software). The latter three ideas were indicated by nearly every second respondent.

THE LEVEL OF SATISFACTION OF COMPANIES COOPERATING WITH SCIENTISTS



Almost half (47%) of the companies that responded to the survey, expressed their interest in establishing contacts with the Warsaw University of Life Sciences (only every fifth respondent stated that for the moment they can see no possibility for their company's cooperation with a university). Most of the surveyed companies stated that their needs may be met by the faculties of: **Applied Informatics and Mathematics**, Civil **and Environmental Engineering** and the **Faculty of Economic Sciences**.

An interesting finding concerned the assessment of the ongoing cooperation with researchers and universities. The companies that had already started such cooperation for the most part were satisfied with such cooperation. None of the surveyed entities had any reservations concerning such cooperation.

THE NEEDS OF THE COMPANIES COOPERATING WITH THE WARSAW UNIVERSITY OF LIFE SCIENCES

In line with the objectives of the research project, the group identified the most important needs of companies cooperating with the Warsaw University of Life Sciences. These were: (in the order of the frequency of the needs reported and their importance for companies):

1. attracting apprentices and trainees,
2. training and courses,
3. commissioning of university research - obtaining opinions and expertise
4. implementation of projects in collaboration with university scientific staff,
5. technical consultations,
6. access to university resources,
7. adaptation of curricula to the needs of entrepreneurs,
8. enabling exchange of experiences between companies and academics,
9. company recognisability among students and employees of the company - company promotion at universities,
10. Attracting qualified workforce.

Most often cited by the respondents was their desire to attract apprentices and interns from the university. Such identified need was expressed by almost half of the companies. Such signals absolutely dominated the sphere of cooperation between enterprises and universities. Entrepreneurs indicate their eagerness to create internship programs whose objectives would aim at development of the graduates' qualifications. Part of the surveyed companies seek potential interns and employees by contacting friendly tutors or by direct contacts with students. Highly appreciated in that respect is the activity of Career Offices However, companies' needs go much further. Commissioning research and expertise with the university staff as well as willingness to participate in joint projects was indicated by 25% of the companies. Companies most frequently indicate the necessity of conducting laboratory tests (e.g. research of feed components and meat, molecular biology, soil moisture, nutrient analysis of submitted extracts of growth media and efficiency of machines). Such need was expressed by the companies cooperating with the faculties of: Agriculture and Biology, Economic Sciences, Horticulture, Biotechnology and Landscape Architecture, Forestry and Animal Sciences. Entrepreneurs point also to some specific difficulties encountered when commissioning university research (details can be found in the Technological Audit's report). Apart from commissioning research, companies were quite eager to engage in collaboration with the academic staff of the University to build joint projects teams or employing academics with PhD degree (or higher degrees). Such wish was expressed by the companies from the environment of the faculties of Social Sciences, Food Sciences and Faculty of Applied Informatics and Mathematics. However, establishing such cooperation is perceived by entrepreneurs as complicated.

Some companies signalled the need for technical consultations - usually in terms of support in implementation of new technological solutions or new product specifications. Willingness for this type of cooperation was mostly expressed by companies cooperating with the Faculty of Animal Sciences.

The Flagship Projects of the Warsaw University of Life Sciences

Faculty of Animal Science

Nano-agent for improving muscle growth in poultry

Prof. Ewa Sawosz-Chwalibóg, Marta Grodzik, PhD, Marlena Zielińska, PhD, and Prof. Tomasz Niemiec

NEEDS

Major companies in the poultry industry seek an answer to the question: „How to grow better poultry in a more beneficial way?" In this case, „better" means a higher proportion of more valuable parts i.e. breast and thigh muscles, and a more optimal body structure that will provide meat more elastic, compact and richer in nutrients. A beneficial method would bring a positive effect on animal's health, but would not interfere with the taste, smell or health value of the meat. Additionally, it would be more cost-effective for the manufacturer, lowering the cost of feed and veterinary treatment and reduce incidence of falls among the birds. The method will also allow to reduce environmental pollution by reducing the release of nitrogen, phosphorus and trace elements excreted by birds to the atmosphere. Given the number of broiler chickens produced, the amount of these elements is substantial.

SOLUTION

The solution is based on injecting of the complex containing heparan sulphate on a carrier of **nanoparticles of gold** and **nanoparticles of silver** into the egg air cell of the egg with a developing chicken embryo. The complex has a multifunctional effect, combining nutrition with optimization of the transport within the body of the embryo, and has antimicrobial and immunomodulatory properties. The concept combines two key physiological mechanisms: the first concerns the development of the chicken's organism, while the second - the unique properties of nanoparticles.

The physiological process of a chicken development depends on the fact that during its embryonic development, the embryo is dependent solely on the supply of the substances accumulated in the egg. The modern chicken breeds are not able to accumulate in the egg satisfactory amounts of substrates that would ensure an optimal development of the embryo. This concerns deficiencies of the substrates responsible for the production of muscle tissue and sulphur-containing compounds. Moreover, the key mechanism determining the muscle development is proliferation i.e. proliferation of muscle cells. This process, intensive during the embryonic development, declines with the hatching of the chicken rendering any efforts aiming at increasing the number of muscle cells chickens ineffective.

The proposed solution takes into account the supply of potentially deficient substances and will enhance the immune and antioxidant systems with many extremely important metabolic compounds that enter the air cell of the egg **prior to its incubation**. A substance administered to the egg will be thus available from the first day of life of the growing embryo i.e. the moment when the process of proliferation and differentiation occurs at an extremely fast pace.

The supplement is attached to **nanoparticles of gold** serving both as a carrier and protection against degradation in the egg. The particles provide then an effective and wide distribution in the embryo of the addition that is released gradually, in small portions. **Nanoparticles of silver** will have both the function of an antimicrobial agent and a stimulant for the immune system. The greater muscle yield should reduce both the consumption of the feed and excretion into the environment of nitrogen, phosphorus and other ingredients contained in the feed.

POSSIBILITIES OF COOPERATION

The use of the nano-agent does not present a microbiological risk with in ovo interference. The producers of chicks may count on better breast muscle yield of broilers, improvement of the quality of poultry meat and its immunity parameters and thus a better production efficiency. By using the technology, the **poultry muscle yield may be increased by up to 25%**. Such increase should translate into much higher earnings of the poultry producers.

AUTHORS

Prof. Sawosz-Chwalibóg received her doctoral degree in 1992. Since 2002 she holds the position of the Director of the Department of Nutrition and Animal Biotechnology of the Warsaw University of Life Sciences, in 2001-2004 she was the head of the WULS Analytical Centre. One of her major research projects was the international project ERA-NET titled: „New, multifunctional nano-powder of carbon". During the current cooperation with business Prof. Sawosz-Chwalibóg has developed and implemented for production new recipes of feeds for cats and dogs.

Snap-lock chain saw

Jacek Brzózko, PhD, Eng.

NEEDS

In the world of industry and individual equipment products distinguish themselves with a number of important features. Still, hardly anyone could have a problem pointing to the most important one: efficiency. Most of the solutions aiming at its improvement are related to innovative concepts that quickly find their envoys and reach the market.

SOLUTION

The idea of the snap-lock chain saw was born during the development of courses for students. To improve the chain saw efficiency and simultaneously reduce the operating costs, a solution was suggested consisting in stiffening of the connection of the cutters and their links during the movement along the straight portion of the guide bar. Following a feasibility study, the solution was **patented.**

WAYS OF COOPERATION

Cooperation with the author of the project is possible by becoming its co-investor. We mean here particularly a company that could first develop prototypes and then full products that can be launched onto the market. In the long term, the project produce income from the sale of licenses.

AUTHOR

The author of the project obtained his doctorate degree in 2004. In 2009-2013, he was head of the research project titled „Analysis of factors affecting productivity, unit costs and job security during acquisition of wood from the areas that suffered ecological disasters" funded by the Ministry of Higher Education.

In May 2014, he started his own economic activity. In September of the same year, at the Forest Fair in Mostki (Poland), he presented prototypes of two simulators for indoor felling and limbing tree training.

The use of drones to assess the needs of plant fertilization

Dariusz Gozdowski, PhD

Adequate fertilization of crops is for farmers a matter of great importance. This is particularly true during the growing season when plants grow intensively. Accurate determination of the moment when they will need another dose of fertilizer proves to be difficult - especially on farms with a large acreage. Some farmers use satellite pictures which is a very expensive solution. Some others use devices mounted on agricultural machinery, actually providing only point observations.

SOLUTION

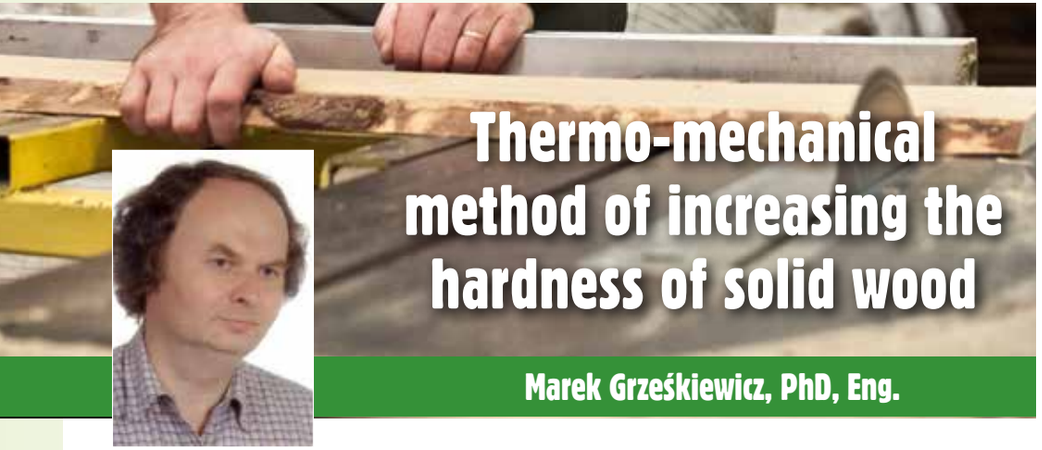
An excellent way out of this situation may be the **use of drones** - small, unmanned airborne vehicles that quickly cover long distances and record the necessary data. Thanks to them, farmers may examine the **needs of their plants** without incurring high costs. Such a solution is much more **effective** due to a shorter time required to carry out the examination.

WAYS OF COOPERATION

Introduction of this type of solution to the market will bring substantial gains, especially if we manage to launch the product on the international market. The use of drones for this purpose is not widespread which guarantees ample opportunities.

AUTHOR

The author of the project obtained his doctorate degree in 2005. In 2013-2015, he participated in a research project titled „BIOPRODUCTS: innovative technologies for healthy bakery products and calorie reduced pasta". While cooperating with business, the author designed a web application www.agrolicznik.pl for the Zakłady Azotowe Kędzierzyn SA and a similar application for the Belarussian Potash Company. He has also conducted research collaborating with the companies: Fotoraporty, Wasat and the Polish Farmer (Polski Farmer).



Thermo-mechanical method of increasing the hardness of solid wood

Marek Grześkiewicz, PhD, Eng.

NEEDS

Most domestic wood shows low hardness in comparison with exotic wood. Even during a normal usage, wooden floors show dents on the surface. Exotic hardwoods used for flooring are much more expensive.

Another issue concerns the suitability of wood in the case of the use underfloor heating systems: due to its high thermal insulation, wood seems unsuitable for this purpose (it takes much more energy to heat such premises).

SOLUTION

The idea is based on thermo-mechanical compaction of wood by veneer, facing board or sawn timber. As a result of modifications we obtain a material of significantly increased density and consequently with a significantly increased hardness and better heat conductivity. Obtaining thus, a more suitable flooring material.

WAYS OF COOPERATION

The new wood material in the form of concentrated thermo-mechanically will be of interest to companies producing wood floorings for demanding clients who can appreciate their higher parameters and longer product life without a need for renovation.

Some interior designers seek wood flooring materials suitable for their customers in the sector of housing and public utility buildings. Such customers demand better technical and utility characteristics of wood, such as higher hardness and more efficient thermal conductivity.

AUTHOR

The author obtained his doctorate degree in 1999. In 2009-2012, he was head of the Department of Construction and Technology of Wood Products at WULS. Since 2013 he also acts as Innovation Broker at the WULS Faculty of Wood Technology. He has been selected as one of the winners of the nationwide "Brokers of Innovation" competition held by the Ministry of Science and Higher Education. He has co-authored three patents and authored one patent application, and won the „**Top 500 Innovators** Science – Management – Commercialization" Competition. He completed a 2-month internship at the University of Berkeley (USA).

Marek Grześkiewicz co-authored the **Polish version of the sports floor** and the **Polish chamber for thermal wood modification**. He cooperates with Bełchatów-Kleszczów Industrial And Technological Park and Małopolska Regional Development Agency as an advisor for companies from the sector of wood industry. He also prepares appraisals of innovative solutions for companies from this sector.

Universal starter cultures for meat processing

Katarzyna Neffe-Skocińska, PhD, Eng.

NEEDS

Food is not only satisfy hunger, but also to provide adequate quantity and quality of the ingredients needed for the proper functioning of the organism. Consumers increasingly rely in their choice of cured meats on their shelf life, chemical composition and nutritional value. The meat industry sector introduces thus **new strategies** for the production of products with reduced or no addition of substances such as sodium chloride, pickling salts or chemical antioxidants.

SOLUTION

For several years, there has been a growing consumer interest in **functional foods**. A new solution is presented by **slowly ripening meats** with a high level of health safety and long shelf-life, cured with probiotic culture starters. Fermented meat products are among the most valued and valuable food products.

Industrial scale production of ripened meats vaccinated with probiotic starter cultures is not widely practised in the meat processing sector due to the lack of development of specific technologies. It is possible to develop a technology that could utilize probiotic cultures for meat fermentation and have a positive impact on human health. Under the planned project we shall develop special culture starters that will provide products with a particularly high number of lactic acid bacteria, good sensory quality and long shelf life.

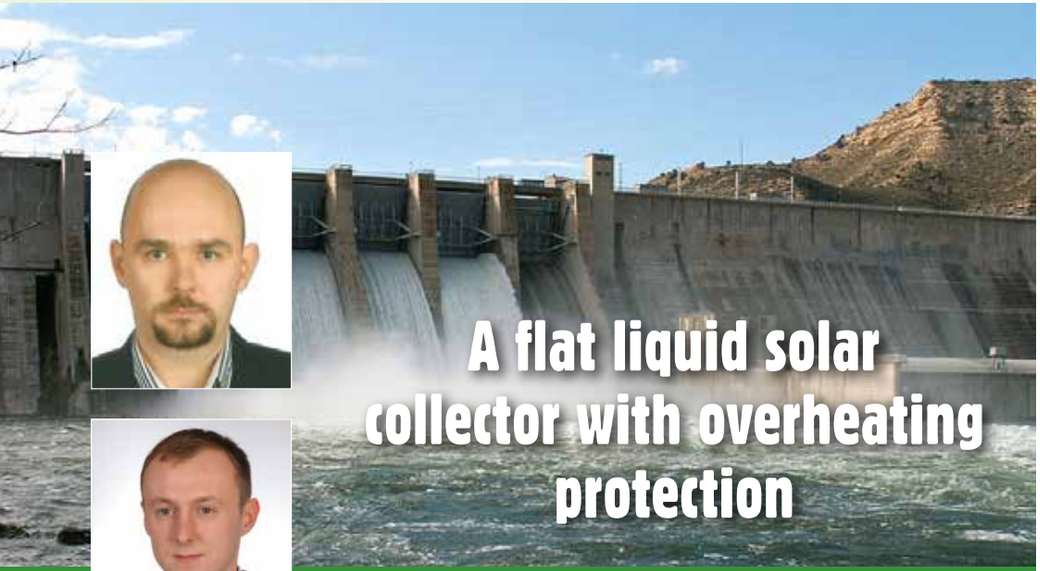
WAYS OF COOPERATION

Potential recipients of the solution would be companies engaged in the industrial production of starter cultures and meat processing plants interested in the production of high-quality cured meats ripened with the addition of probiotic bacteria. Consumers will have access to a new high quality product with health promoting and probiotic properties with a known level of health safety.

AUTHOR

The author of the project obtained her doctorate degree in 2014. She was head of the research project „Identification of the probiotic strain of Lactobacillus casei ŁOCK 0900 used for the production of raw ripening loins." She has also participated in four research projects on the development of a production technology for ripening of raw meats including probiotic bacteria additions.

She has filed a **patent application** for the technology of production of **frozen culture starters**. She has participated in the implementation of the technology of production of raw ripening meat products using probiotic starter cultures in several companies.



A flat liquid solar collector with overheating protection

Prof. Paweł Obstawski, Eng. and Marcin Tulej, MA, Eng.

NEEDS

Flat plate collectors are liquid converters of solar energy into heat. When designing a solar heating system, it is assumed that throughout the year it will cover from 40% to 50% of the domestic demand for hot water. Larger batteries are used to improve their efficiency. This, however, can cause overheating of the installation during summer months.

Repeated overheating can result in unsealing and appearance of air pockets in the installation. The innovative design concept of a flat plate solar collector effectively **eliminates the problem of overheating** in the solar heating systems.

SOLUTION

The authors of this project have developed the concept of **a flat solar collector** that will be capable of protecting the solar heating system against overheating and adjust its performance to the current demand for heat.

WAYS OF COOPERATION

With the implementation of the proposed solution it will be possible to meet the demand for utility hot water produced via the solar heating system without the risk of overheating. This will limit the consumption of the conventional energy carrier. The potential users of the solution will be companies manufacturing and distributing flat plate solar connectors, such as: Viessmann, Buderus, Ariston, Vaillant, Wolf and Hewalex.

AUTHORS

Prof. Paweł Obstawski obtained his doctorate degree in 2007 and the habilitation degree in 2013. In 2009-2012, he participated in the research project „Parametric identification as a method of diagnosis of hybrid renewable energy power systems"; in 2010-2011 he led the project „Research of the thermal flat liquid collectors," and in 2011-2012, the project „The use of the PID controller to control the operation of a solar system."

Marcin Tulej obtained his master's degree in 2014. He currently works on his doctoral thesis at the Faculty of Production Engineering. He conducts research on the phenomenon of overheating in the solar heating systems.

Insecticidal nematode formulation for control of crop pests

Dorota Tumialis, PhD, Eng. and Anna Mazurkiewicz-Woźniak, PhD

NEEDS

Protection of plants is an important element of agricultural production. To ensure a proper high level of yield and improve the profitability of crop production it is necessary to use available **protection methods.** The problem farmers usually face is the need to control pests with a possibly limited use of chemicals.

SOLUTION AND BENEFITS

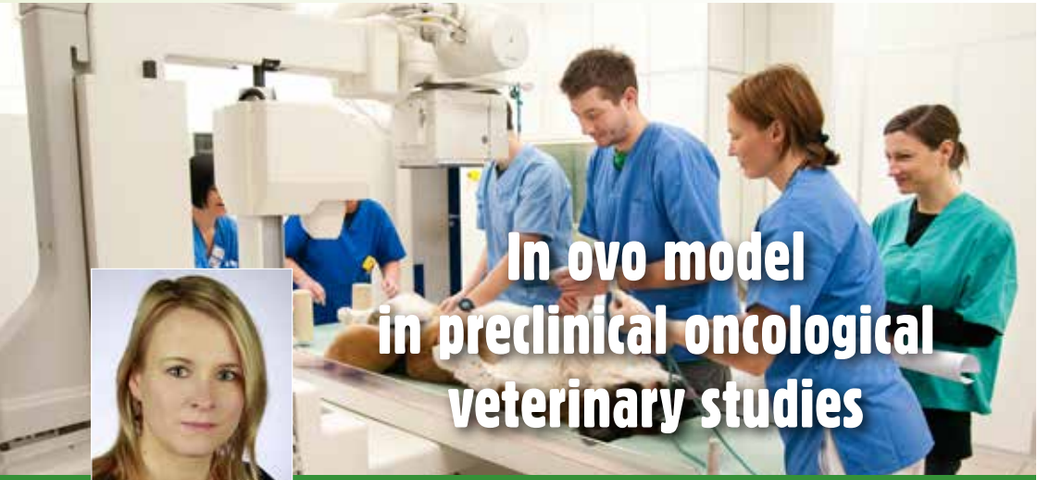
Nematode preparations are not currently produced in Poland - those available in the market are imported from abroad. Their mass production (as it happens e.g. in the Netherlands) would bring many potential benefits. The most important benefit is the reduction of the costs of the preparations by domestic production. This would also allow maintaining their high quality and effectiveness. Another advantage is the protection of biodiversity through the use of the proposed product composed of native strains of nematodes.

POSSIBILITIES OF COOPERATION

The growing demand for environmentally friendly formulations offers an opportunity of introducing the first Polish nematode formulation on the local market. The authors' contribution is the concept, production technology and contact with the distributor. In exchange for investment in the project development in its seed stage, we would like to offer a share in future profits.

AUTHORS

Dorota Tumilas and Anna Mazurkiewicz-Wozniak received their doctoral degrees in 2006 and in 2000, respectively. They have been involved in a research project „Optimization of the conditions of the production of liquid cultures of entomopathogenic nematodes *Heterorhabditis megidis*" and received a scholarship in the Netherlands for the project „Extrapolation of shaking flask culturing of *Heterorhabditis megidis* to a liquid state bioreactor".



In ovo model in preclinical oncological veterinary studies

Katarzyna Zabielska, DVM

NEEDS

Cancer affects not only people but also our companion animal friends, such as cats and dogs who may also suffer from it. Studies on the development of methods to combat the disease meet many obstacles: there are many potential substances whose effects should be explored, but experiments carried out on living organisms (e.g. mice) are expensive, time consuming, and in addition require approval of an ethics committee.

SOLUTION

Laboratory studies on animals are expensive, take a long time and require an approval of the ethics committee. A solution to these problems may be the proposed by the author idea of research in ovo. It is a model intermediate between the studies *in vitro* (outside the body) and in vivo (on laboratory animals). It allows to pre-evaluate which anti-cancer substances are potentially likely to be effective and worth further research in a mouse research model. It enables a relatively **cheap and quick analysis** of individual substances and identification of those that could later be used for *in vivo* tests.

The *in vivo* model proposed by the author involves the use of the chorioallantoic membrane of chicken embryos. This does not require the ethical committee approval, thus studies can be conducted on a large scale.

POSSIBILITIES OF COOPERATION

Thanks to faster and larger scale preliminary analyses, the chances of finding **the most effective anticancer substances** will be much higher. This obviously increases the cost-effectiveness of conducting such research. The recipients may be primarily pharmaceutical companies producing cytostatics and conducting research on new anticancer agents.

A cooperation may be based on commissioning research by companies or providing them with material (tumours) for biological tests. Such tests could also be performed by employees of the university - depending on individual needs of the companies.

AUTHOR

The author obtained a doctorate degree in 2013. She has received a research grant of the National Science Centre for the project titled „The effect of biocomplex of colloid gold nanoparticles with doxorubicin on feline injection-site fibrosarcoma. Studies *in vitro* and *in ovo*."

Solutions with high potential for commercialization

Solutions with high potential for commercialization

Faculty of Production Engineering

A SYSTEM OF SIMULATION-TRAINING STATIONS FOR SAFE TRAINING IN SALVAGE LOGGING

JACEK BRZÓZKO, PHD, ENG.

The aim of the project is to develop a set of stations used both to teach safe techniques of salvage logging (mainly using chainsaws) and to analyse the phenomena occurring in such raw material, e.g. The size of stress, strain, etc. Simulators allow work on a wide range of issues: from felling of tilted trees, through bucking of the bolt, to cutting off the stump from the butt. The value of the system is **preparing people to work in a salvaging situation** before such conditions occur.

ELECTRICAL GARDEN VEHICLE

RAFAŁ KORUPCZYŃSKI, PHD, ENG.

Currently operated **garden tractors** mainly use combustion engines that emit noise and exhaust fumes. This happens in a stark contrast to the basic function of gardening: clean air, peace and quiet.

A new hope in that matter is the dynamically growing market of electric vehicles. Motors powered by electricity can be utilized also in gardening. Due to the introduction in the EU increasingly stringent standards for **pollution and noise emissions**, the introduction of electric vehicles will reduce the level of these disturbances. As a result the vehicles can in the future become cheaper than the currently dominant combustion-powered solutions. The electric vehicles would be quieter and environmentally friendlier without losing all the functionalities of their combustion predecessors.

The offer of electric vehicles can provide for the future success of the company producing tractors for gardening. Such devices are likely to find application not only in large private gardens, but also in the maintenance of public green areas, such as parks and squares.

SIGNAL CONTROLLED MILKING MACHINE

PROF. ADAM KUPCZYK

Every organism functions much better if it operates in favourable conditions. This concerns also animals and their biological functions. It is also the basic observation behind the project of the signal controlled milking machine.

Sensors monitoring the vital functions of cows will be installed in the milking cluster. On the basis of the obtained data they will define the state and well-being of the animal and the apparatus will dynamically adapt to them in order to increase efficiency. Another advantage of this solution is that the automatic milking is controlled in real time, taking into account the cows' welfare and thus reducing the negative stimuli received by the animal during the milking cycle. The concept has a long history, but has only recently been **patented**.

OPTIMIZATION OF THE MILKING CLUSTERS USING THE FINAL ELEMENTS METHOD

KAROL TUCKI, PHD, ENG.

The idea involves a transfer of knowledge from the field of aerodynamics, fluid mechanics and materials science to agriculture. New models of milking will be developed using the Finite Element Method (used in the design of jet engines and turbines).

The proposed modification would include optimizing the shapes of particular components of the machine and testing of innovative materials. The advanced technology available at the university allows to develop 3D models and use them to check the effectiveness of the modified devices. If successful, the invention shall become an object of interest of the dairy industry around the world.

ALTERNATIVE METHODS OF ESTABLISHING AND TENDING OF OAK PLANTATIONS

PROF. TADEUSZ ANDRZEJCZYK

The oak is regarded as one of the noblest species of trees. However, it is much more demanding than other more common species. The best conditions for oak growth are still haven't been identified. Studying experimental plantations and using group and row (corridor) methods should give us tree stands with a composition and structure fully addressing the needs of the oak. As a result, it will be possible to reduce costs, use less soil interference and mechanize the tending procedures.

QUANTIFICATION OF THE GUIDELINES FOR TENDING PROCEDURES IN THE FOREST

PROF. STANISŁAW DROZDOWSKI

To grow a forest relatively immune to disturbances that occur in nature one needs to conduct proper **tending procedures**. They have an impact on improvement of the tree growth conditions and thus on the forest durability. After carrying out tending procedures a tree stand can be described in a measurable way using the taxonomic features of the trees (height, density, slenderness ratio, breast height diameter etc.) The project aims to develop models to implement tending procedures in forests

that will support decision-making for the planning and conduct of thinning procedures in forest holdings.

The main customers may be PGL Lasy Państwowe (the National Forests) and other forest holdings (private, companies and associations of forest owners).

CHECKLIST OF OFFICE WORK STATIONS

PROF. WIESŁAWA Ł. NOWACKA, ENG.

The project involves updating of the developed years ago Checklist of Office Work Stations. The project assumes simple measurements that allow assessment of an office work station and its adaptation to the needs of the user ergonomics.

ASSESSMENT OF THE MUSCULO-SKELETAL RISKS AT A WORK STATION

ASSOCIATE PROF. ENG. WIESŁAWA Ł. NOWACKA

In the era of ever-increasing occurrence of MSD health problems (Musculo-Skeletal Disorders), resulting from the dominant now **seated position** at the workplace, there is a need to provide workstations adjusted to the needs of the workers. The project involves the use of the tool developed by the author (consisting of proven solutions) capable of assessing a work station and the risks it involves. The use of the integrated tool will allow a choice of effective preventive and rehabilitation actions.

A NON-DESTRUCTIVE METHOD FOR ASSESSMENT OF TREES AND TREE STANDS

MICHAŁ ORZECHOWSKI, PHD, ENG.

The increasing average age of the forests in Poland coupled with and increasing acreage of forest stands that have already reached their harvest maturity suggest that we need to develop advanced methods identifying the level of their depreciation. They should allow to assess the state of forest resources for the periodic large-scale forest inventories, and may be helpful in the evaluation of the resources for the **wood industry**.

According to the author of the project it is possible to integrate the existing methods of determining the depreciation of trees and tree stands and to enrich them with innovative ways of diagnosing the internal rot of the trees. Development of the proposed method will increase the efficiency of forest management and safety of forest users.

COMPUTER-AIDED REGENERATION OF TREE STANDS

JACEK ZAJĄCZKOWSKI, PHD, ENG. (COORDINATOR) AND THE TEAM OF THE DEPARTMENT OF SILVICULTURE

The long production cycle of wood makes planning in forestry tied in with uncertainty about the future conditions of the industry dependent on climate change, environmental and social preferences. Adaptation of forests to these conditions is implemented, inter alia by increasing the number of species of trees and shrubs and diversification of their age, as well as optimizing the size and arrangement of the regenerated areas.

We propose to use the **available resources of knowledge on nature and forestry** together with the data from Europe's largest, unified **System** of National Forests (SILP), to build an innovative decision-making support system. The solution in the form of "an overlay" on the SILP website would provide the employees of the forestry administration with a convenient and objective tool to support the identification of microhabitats, locate patches of regeneration, control the size of cuts, select a composition of species and to produce necessary documentation, e.g. plans, sketches and reports.

Faculty of Veterinary Medicine

DIETARY PREVENTION OF MUSCULAR DYSTROPHY

PROF. PIOTR OSTASZEWSKI, DVM

The problem of muscular dystrophy affects today tens of thousands of people and animals throughout the world. The ailment **reduces mobility**, and no effective treatment has been developed so far to combat it.

The currently administered medicine decreasing the discomfort associated with muscular dystrophy are steroids. Their application, however, can adversely affect patients' health. A new hope is presented with the possibility of replacement of the steroid therapy with a dietary supplement of 3-hydroxy-3-methylbutyrate. The results of its application are very promising – the symptoms occurring in people using this food additive are much reduced - **offering a chance** of significant **health improvement**.

Faculty of Economic Sciences

PRESS KIT IN RURAL TOURISM FACILITIES AND IN AGENCIES SUPPORTING THE DEVELOPMENT OF TOURISM

EWA JASKA, PHD, ENG.

Even the most interesting event may be deemed unworthy of attention if there is not enough information available about it. Ideally, this information has a written form and is ready for dissemination. The basic justification for the press kit's existence is its image-building function. It should contain **information materials** for journalists and representatives of other media.

Currently, such a tool is missing among Polish farms and rural tourism facilities. In addition to press releases the kit could include pictures, brochures and leaflets promoting the area or even audio and video material. It will certainly affect positively the **image and brand building** of the local attractions among other regions.

OPTIMIZING DECISION MAKING IN FARMS AND AGRICULTURAL ENTERPRISES UNDER RISK CONDITIONS

PIOTR SULEWSKI, PHD, ENG.

Optimization models allow determination of the appropriate structure and size of agricultural production in deterministic conditions (assuming access to precise information and its constancy). Taking into account risk assessment and variability, however, requires a more sophisticated approach.

It is difficult not to agree with the statement that changes in agricultural policy or factors such as weather and climate strongly influence farmers' decisions. The project aims to develop a system that will be able to take into account these uncertainties and help in **optimal farm management**.

FARM OPTIMIZATION MODEL

ADAM WAS, PHD

Questions, such as: "What?", "How much?" and "How to produce?" determine business competitiveness. More and more often, help in answering those questions, can be found in optimization models. They are able to provide key information and **improve the structure** of production or predict changes that will be taking place in the market.

Currently, decision-making problems are solved by using linear models. The author of the idea proposes to develop **nonlinear models** applying the method of Positive Mathematical Programming. It enables **more accurate forecasting** of directions of adjustments of enterprises and farms to their changing micro- and macroeconomic environment.

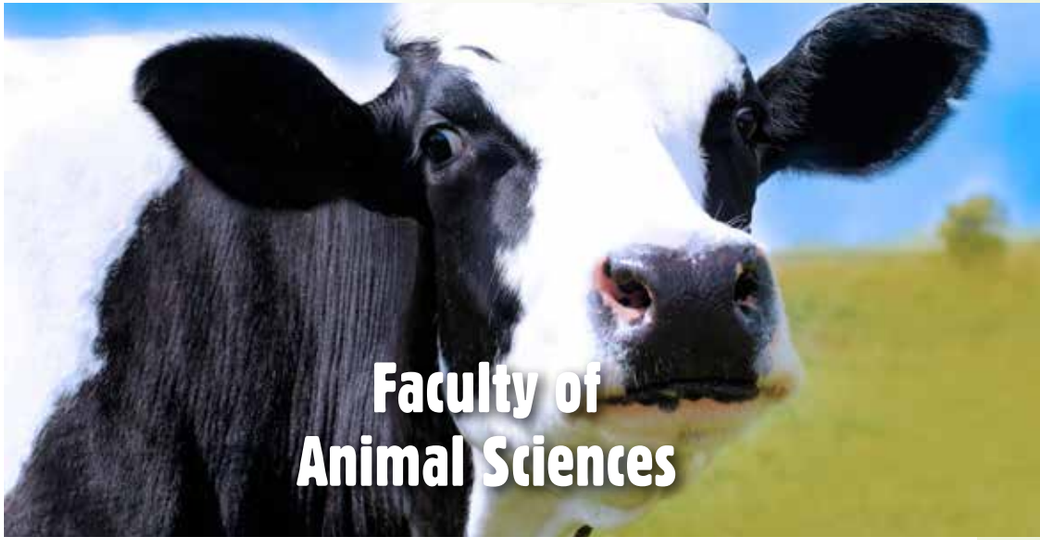
PROMOTION IN PUBLIC TRANSPORT

AGNIESZKA WERENOWSKA, PHD, ENG.

Advertising, as a form of promotion, has become a common tool used in all areas of economic activity. One of the least used is advertising on public transport. In Warsaw alone, 90 buses contain 950 pieces of media carriers. One of the least used is **advertising on public transport**. In Warsaw alone, 90 buses contain 950 pieces of media carriers.

One bus a day services approx. 1,000 passengers. Limited freedom of movement makes passengers more susceptible to messages advertised on the buses, trams and subway. According to the data collected by New Media (www.reklamanatelebimach.com) agency, up to 67% of passengers questioned about what they occupy themselves with when using public transport, mentioned reading information displayed on the digital signage displays.

The use of advertising in public transport on a large scale can bring measurable benefits to regions. According to a study by the author of the idea, as many as half of the respondent-users of urban transport were interested in the content related to **regional promotion**, especially that displayed on LCD screens. Such potential should not be wasted.



Faculty of Animal Sciences

GRAPHENE PLATELETS IN THE TREATMENT OF GLIOBLASTOMA MULTIFORME IN HUMANS

PROF. EWA SAWOSZ CHWALIBÓG, SŁAWOMIR JAWORSKI, MSC, MARTA GRODZIK, PHD, MATEUSZ WIERZBICKI, PHD, AND MARTA PRASEK MA

The project combines the use of two technologies which are perceived as the future of science and technology. **Nanotechnology** allows manipulation of objects with dimensions expressed in nanometres i.e. the size of individual atoms and molecules. Graphene is one of the technology's achievements, a flat structure composed of a single layer of carbon atoms combined in a manner resembling a honeycomb. It shows remarkable electrical and mechanical properties.

Graphene platelets have low toxicity and property of strong adhesion to the plasma membrane of the glioblastoma multiforme cells. The proposed method of treatment will minimize toxic side effects on healthy tissues. Administration of graphene platelets induces **death of the glioma cells** and reduces the tumour's weight. The application of this method should extend patients' lives by many months.

GENETICS TO AID BREEDERS

PROF. JOANNA GRUSZCZYŃSKA, BEATA GRZEGRZÓŁKA PHD, ENG. AND PROF. WIESŁAW ŚWIDEREK

Basing on our current long-term cooperation with the breeders of the companion animals, we have concluded that equally to scientists they are interested in the solution of problems occurring in small animal populations.

Using for that purpose appropriate methods of molecular biology and relevant genetic markers, it will be possible to:

- genotype animals (individual identification)
- determine their origin and degree of kinship,
- estimate the genetic variability of the animal population,
- work out appropriate mating plans.

Such information shall enable preservation of maximum genetic diversity, and prevent the growth of genetic similarity in a population that is especially difficult to avoid in small or enclosed populations.

Faculty of Human Nutrition and Consumer Sciences

IMPROVING THE FUNCTIONALITY OF BUTTER BY THE ADDITION OF PUMPKIN SEED OIL

AGATA ADAMSKA, PHD

Consumption of butter in Poland falls steadily. Mainly due to high prices and significant amounts of saturated fatty acids content. Addition of pumpkin seed oil will enrich the product with **unsaturated fatty acids** and other valuable ingredients with proven health-enhancing agents (phytosterols, carotenoids). It will also increase its spreadability, the characteristic that will make butter more attractive to some fans of margarine. The solution will increase the nutritional value of butter and its functionality.

Companies that could be interested in this solution include: Szarłat, Oleofarm, HerbaNord-Pol, Eurolen, OSM Sierpc, Turek, OSM Koło, OSM Piątnica, SM Hajnówka, Spomlek and Mlekpol. They are the leading Polish market producers of both pumpkin seed oil, and butter. Some of the mentioned above companies have in their offer also butter with plant oil additions.

ENRICHING NUTRITIONAL CONTENT OF PASTRY GOODS FOR CHILDREN

MAŁGORZATA BIAŁEK, MSC, ENG.

The development of civilization and the increasing pace of life are related to the growing

demand for ready-made foods with higher nutritional value. This is accompanied by a growing public awareness of the foods' advantages. Surprisingly, the current market offer of such products for children is rather poor.

The author of the project proposes development of pastry goods with increased content of bioactive components with **beneficial effect on health**, currently consumed in relatively small quantities. Visually, they should resemble existing products, to encourage their consumption by (usually picky) children.

Companies that could be interested in this solution include: Tago, Mondelez, Flis, Cukry Nyskie, Wedel, Wawel, Jedność, Jago and Terravita. The companies are market leaders in the production of pastry goods and confectionery in Poland, with a wide range of products and therefore likely be interested in the introduction of new, innovative products to the market.

MINCED RABBIT MEAT TECHNOLOGY FOR CATERING SECTOR

EWA RUTKOWSKA, MSC, ENG.

Commonly produced minced meats are composed of poultry and pork and their mixes and usually use low-quality ingredients. Due to the addition of chemicals, preservatives, stabilizers, and other additives for improving its colour, **minced meat** can also be harmful to consumers' health.

The author of the idea proposes to develop a technology for popular use of minced rabbit meat in catering. Rabbit meat is characterized by: low content of fats, cholesterol and sodium, and a high content of polyunsaturated fatty acids and valuable essential amino acids. Use of herbal extracts as natural antioxidants would ensure that such meat could be used **in many diets**, e.g. weight-control and low-fat diets, diets for children, elderly people and for those suffering from allergies.

The technology of the production of the semi-product rabbit meat may be of interest to companies in the food processing industry and those seeking extension of the range of their products. The direct beneficiaries of the minced rabbit meat semi-product will include catering companies (those specializing in foods for health-conscious consumers), restaurants, and canteens in hospitals, nursing homes, kindergartens and nurseries.

SOLUBLE PACKAGING FOR LOOSE PRODUCTS

SABINA GALUS, PHD, ENG.

The volume of **litter** rises dramatically unlike litter storage space. Therefore, there is an urgent need to **reduce the amount of litter** produced and design new methods of its **utilization**. One of such ideas is the project of designing water-soluble packaging that would be produced from natural polymers.

DRIED FRUIT SNACKS

MAŁGORZATA NOWACKA, PHD, ENG.

The author of the project proposes a new approach to fruit drying. It involves the use of an innovative method of ultrasound pre-treatment. The next step is selection of an appropriate **method of drying** that will allow modification of the properties of the fruit tissue. Benefits of such approach are twofold:

1. Reduction of time needed to obtain the product
2. Better physico-chemical properties of the final product.

BIOTRANSFORMATION OF GLYCEROL INTO DIHYDROXYACETONE

LIDIA STASIAK-RÓŻAŃSKA, PHD, ENG.

Although the name of this substance is somewhat exotic, dihydroxyacetone (DHA) is a friendly substance to many of us - used e.g. in self-tanners. Its production is by no means a fast or cheap process. The proposed by the author method of utilizing glycerol dehydrogenase offers a chance to change that situation. Its use shall **shorten** the time needed for DHA production and **lower its cost**.

A SPECTROSCOPIC ANALYSIS OF THE QUALITY OF VODKA AND WHISK(E)Y

KATARZYNA SUJKA, MSC, ENG.

Polish regulations concerning the production of spirits are very restrictive. Lacking are methods that would easily determine whether a product comes from a legal source and has been manufactured with legal raw materials. The author of the project proposes to use FTIR spectroscopy for the analysis vodkas and whisk(e)ys. The method is fast, non-invasive and does not involve the use of chemicals. It can provide a wealth of information based on **infrared spectra**. It can be applied directly on the production line, and without the need of sampling. The identification (registration of the spectrum) requires no special sample preparation and takes only 3-5 minutes.

Implementation of the method will increase consumer safety. It will be possible to develop a system for monitoring and control of spirits as accurate as in the case of standard methods, obtaining a precise description of the composition of the product in a short time. The results of the research may be used in distilleries for product control.

COMPUTER VISUALIZATION OF THE PROCESSES USED IN FOOD TECHNOLOGY

MACIEJ WAWRZYNIAK MSC, ENG.

The project is to offer technological support to small and medium-sized enterprises acquiring agricultural raw materials for the manufacture of food products. Some of them may need to introduce IT solutions in order to survive in the market economy. Beneficial in that respects seems to be gaining access to a computerized system of easily configurable **visualization** and control.

The proposed by the author workstations would enable entrepreneurs to e.g. test certain **computer programs** prior to their introduction. Another feature of the computerized workstation will be its ability to visualize the processes of SCADA-class software.

SUPPORTING THE PROCESSES OF HEAT AND MASS TRANSFER IN FOOD TECHNOLOGY

ARTUR WIKTOR, MSC, ENG.

The project plans to use innovative sequential pulsatile application of electric field (PEF) and ultrasound (US) to support processes based on the transfer of heat and/or mass commonly found in food technology (e.g. drying, freezing or juice pressing). While there are some reports on the use of PEF and the US in these processes, the utilization of the sequential method in this respect is rather original. The research is partly funded by the LIDER programme subsidized by the National Centre for Research and Development.

Faculty of Social Sciences

AUDIO EQUIPMENT BASED ON CUTTING-EDGE COMPONENTS

MICHAŁ WĘSIERSKI, PHD

The author of the project proposes the use most up-to date available components (e.g. converters, speakers, capacitors and coils) to create a product that will satisfy the most demanding **audiophiles**. Ultrahard carbon casings, aluminium frames and components produced by world's best factories should guarantee audiophile consumers an offer of a high-end final product.

WOOD INDUSTRY CENTRE FOR INNOVATIVE EDUCATION AND VOCATIONAL TRAINING

IWONA BŁASZCZAK, PHD

Today's structural transformations in the wood industry and efforts to catch up with the technical and technological progress, demand continuous adaptation of qualifications and skills to market needs and specific expectations of employers. A helpful solution could be the establishment of a Centre for Innovative Education and Vocational Training. Its main task will be promotion of efficiency, creativity and competitiveness of enterprises through promotion of content, services and best practices in improvement of the quality of education.

The Centre is to be designed specifically for the employees of wood industry. This would allow their continuous professional development that would benefit both them and their employers. The purpose of the Centre will be, in particular, development of employee competencies in the area of tools, technologies, materials, raw materials and innovations used in the wood industry.

SOCIAL POSITION BUILDING - SUPPORTING THE DEVELOPMENT OF PERSONAL IMAGE AND CORPORATE REPUTATION

WOJCIECH POŁEĆ, PHD

The author of the project proposes the introduction of consultancy services connected with the development of the social image of persons or companies who want to popularize their **social or economic success**. The consultancy would include such elements as:

- image building through the selection of suitable premises / residence, its furnishing and design emphasizing the social and economic success,
- image building through leisure activities,
- assistance in the selection of non-governmental initiatives that are worth supporting,
- consultancy in the field of life-wide learning.

Proposed under the project activities will include **individual training** sessions.

Faculty of Horticulture, Biotechnology and Landscape Architecture

TECHNOLOGY OF *EX VITRO* ROOTING AND ACCLIMATIZATION OF MICROCUTTINGS OF DECIDUOUS SHRUBS

AGNIESZKA ILCZUK, PHD, ENG. AND ANDRZEJ PACHOLCZAK, PHD, ENG.

A lot of progress has been made in Poland in the recent years as regards the development of ornamental plants nurseries. However, with the Polish accession to the European Union, they had to be adapted to new standards. The number of species of plants propagated in vitro on a commercial scale grows year by year. Still, most people in the nursery industry remain sceptical about such solutions. The reason is the limited effectiveness of applications of plants propagated in the laboratory conditions and the high cost of such production.

It is possible to reduce production costs and the time needed for shoot elongation, rooting in vitro and acclimatization to outside-glass conditions by the use of simultaneous rooting and acclimatization *ex vitro*. Another solution could be rooting of the "microcuttings", taken from mother plants grown in the nursery or in the field, in controlled *in vivo* conditions. In both cases plants produce **good quality root systems** and are **resistant to stress factors** during acclimatization.

The aim of the authors is to develop a technology providing highest quality propagating material that will be available for nursery producers (nurseries, or commercial *in vitro* laboratories).

A UNIVERSAL FLORAL PRESERVATIVE FOR CUT FLOWERS

AGATA JĘDRZEJUK, PHD, ENG., JULITA RABIZA-ŚWIDER, PHD, ENG., EWA SKUTNIK, PHD, ENG. AND PROF. ALEKSANDRA ŁUKASZEWSKA

The demand for ornamental plants is forecast to increase steadily. The reason is the increase of the living standards in many countries of the world.

Cut flowers or plants' green elements used by bouquet makers, such as stems or leaves, after cutting off remain living plant organisms. They are subject of the same basic processes of ageing as whole plants, additionally aggravated by the stress of having been cut off from the plant and by external conditions influencing them during the length of the distribution and marketing chain.

However, it is possible to delay the appearance of certain symptoms that reduce the **decorative value** of cut flowers. There are special flower foods produced for particular stages of trading - from the stage of production to the final consumer purchase. There are several companies in Poland that offer them for wholesalers and individual consumers. However, these are foreign products, often dedicated to the most popular species of cut flowers only.

The aim of the project is to develop a **universal floral preservative** for the greatest number of species of cut flowers that could be used mainly in the final, individual **customer** phase of distribution. Currently conducted are tests on

various antibacterial substances preventing the growth of bacteria in the water, as well as the formation of blockages in the stems.

The effect of the authors' work may be of interest to the companies that wish to produce media suitable for mass utilization in the case of most species of cut flowers. The composition and the formula of the preservative will be proposed and tested by the team of the WULS Department of Ornamental Plants.

SOFTWARE FOR DIAGNOSIS AND MANAGEMENT OF TREE STANDS

MARZENA SUCHOCKA, PHD, ENG.

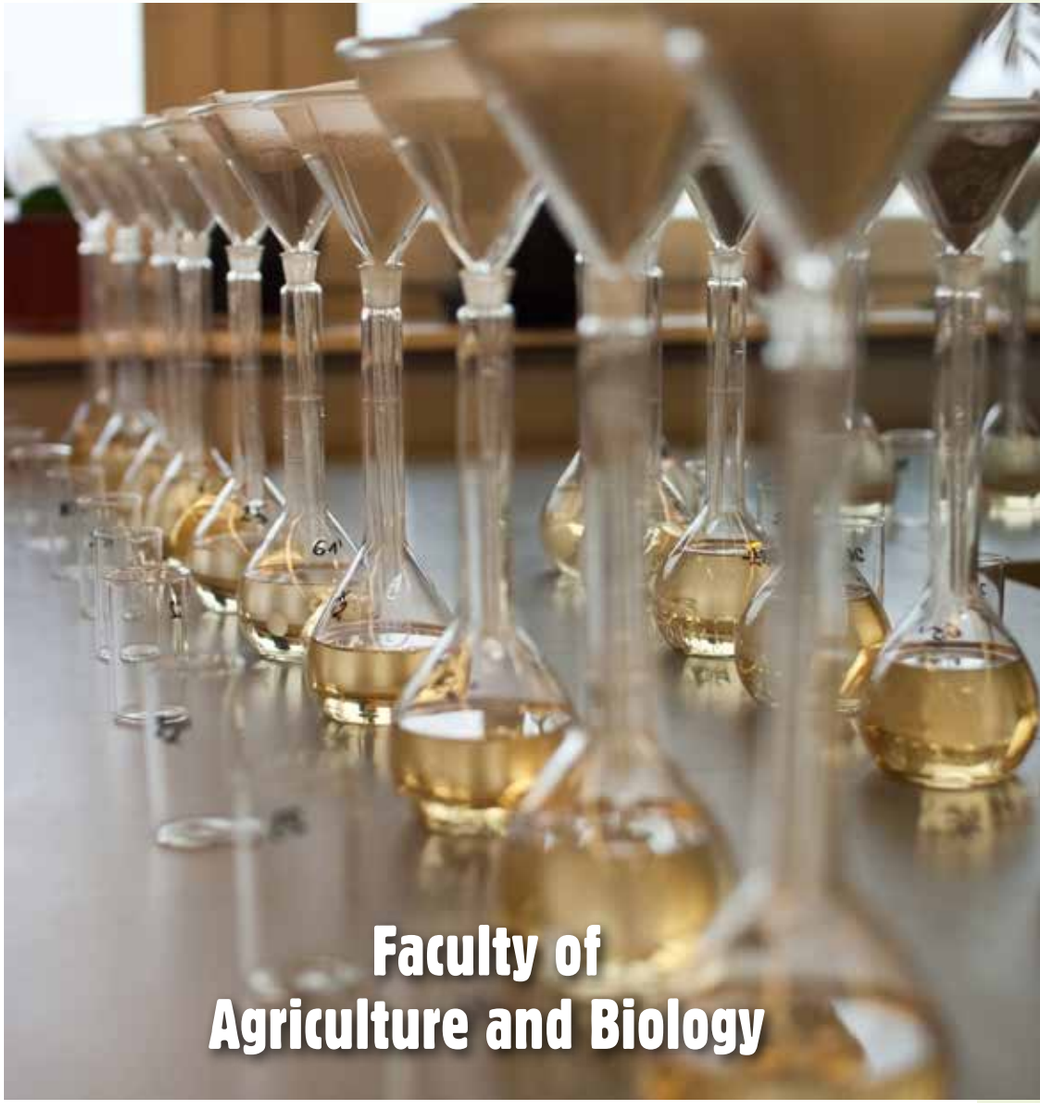
The project involves the creation of an innovative product composed of two key components. The first component is a database containing information about urban trees allowing for their review, diagnostics, identification of risks and determining the tending schedule. The second is software independent or database related component meant to be used by communes or companies. The software should allow evaluation of the trees and calculation or simulation of their depreciation following implemented or planned investments or wrong tending. As a result, estimation of the **value of trees** will be simple and fast, an important tool for e.g. developers.

IMPROVING CONDITIONS FOR TREE GROWTH AND WATER BALANCE IN CITIES

MARZENA SUCHOCKA, PHD, ENG.

In spite of developments of civilization, people still feel better if they are at least to a small degree surrounded by nature, particularly **trees**. Moreover, it is profitable for companies or communes to operate in a well-designed landscape. Still, it happens more and more often that the centres of big cities are destinations for investments that do not include green areas at key locations. Partly, it is simply caused by the restrictions imposed by a resulting harsh habitat in which trees would not be able to grow.

The author of the project plans to develop methods for planting trees in the cities possessing highly urbanized environment where planting trees would otherwise be impossible. **A system of structural soils** will include drafting a catalogue of surfaces and soils that could simultaneously become a foundation for pedestrian and vehicle traffic and improve various soil capabilities, such as water retention, and at the same time prevent impairing root growth and the threat of soil compaction. This would also help to solve potential conflicts between some plants and the urbane infrastructure.



Faculty of Agriculture and Biology

CANNABIS SATIVA SUBSP. SATIVA – A PLANT WITH A FUTURE

SŁAWOMIR JANAKOWSKI, PHD

It's hard to find a plant that would be as versatile in its uses as the hemp. The plant is very undemanding about soil and can be grown in quite difficult conditions. At the same time it is able generate a lot of green mass that can be used e.g. by power plants and or clothing industry. Its greatest wealth, however, is hidden in the chemical substances it contains that can be utilized in the production of anxiolytics, analgesics, and antiphlogistics. There have been over 400 such chemical compounds identified. With its wide range of applications the plant does not generate any waste, and thus it is extremely environmentally friendly.

Faculty of Wood Technology

WOOD-BASED PANELS FROM RAPIDLY RENEWABLE RAW MATERIAL

PIOTR BORUSZEWSKI, PHD, ENG.

In Poland, we note a serious shortage of raw material for **wood-based panels** industry. Therefore the attempts undertaken with the aim of replacing the wood-based materials with alternative solutions. The **innovative composite materials** from a short-cycle renewable lignocellulosic biomass would improve the **competitiveness** of the wood industry. New raw materials, though still similar to those currently used, might be launched onto the market.

NEW METHODS OF VENEERING FOR FURNITURE INDUSTRY

SYLWIA OLEŃSKA, MSC, ENG.

There has been very little significant change in the veneering technology for many years. **Modern trends** in asymmetrical veneering can be referred to as a welcome response to this state of affairs. It is a modern and ecological method resulting in maintaining high quality of production with lower costs. The method will also reduce the consumption of raw materials (which is especially important when using rare woods).

LAMINATED FLOORS WITH IMPROVED TECHNICAL CHARACTERISTICS

AGNIESZKA JANKOWSKA, PHD, ENG.

The idea is to increase the thermal conductivity of the flooring laminated materials made of wood or wood-based materials, adapted for underfloor heating systems.

DEVELOPMENT OF AN OPTIMAL HARDWOOD FLOORING FOR UNDERFLOOR HEATING SYSTEMS.

VALERJAN ROMANOVSKI, MSC. ENG.

Wooden floors installed over an underfloor heating system provide **high comfort** in use. Incompetently selected floor may undermine all efforts of an underfloor heating system installation. The author of the concept decided to develop an optimal method of selection and installation of **wood flooring**. The proposed solution consists in using the mineral subfloor (containing the heating system) as a layer to stabilize solid slats. This should bring many benefits: higher efficiency of heating, easy production of slats and savings on the wooden material.

Faculty of Applied Informatics and Mathematics

E-LEARNING PLATFORM SGGWX

PROF. MARIAN RUSEK

The best universities in the world (e.g. Harvard, Stanford, MIT) have for some years been introducing a new trend in distance learning. They make their **courses** available on-line in the form of short film "**knowledge pills**" and interactive instant feedback self-checking exercises. Each of those courses can gather even dozens of thousands of participants from around the world - therefore they are referred to as Massive Open Online Courses (MOOC). The courses are offered at no charge, paid are only official certificates of course completion confirming the participant's identity.

The project's aim is for WULS (SGGW) to join this type of initiative. Installing and implementing this type of a platform is neither difficult nor expensive and can significantly increase the prestige and visual identification of the University. A prototype service based on Open edX courseware is already available (http://edx.sggw.pl). The platform can power courses developed under the e-agriculture project. They are prepared in the form of presentations, transcripts and lists of test tasks. The project would include recording of videos of lectures and uploading them to the platform.

The project would give an opportunity of obtaining paid credits in a **selected e-agriculture course** for participants from outside the university **without** enrolling into a full program of **extramural studies**. After their translation into English, the best courses could be made available on the platform at: http://edx.org. Among agricultural universities, only one university has made its courses available (and then only two courses). None of the Polish universities has tried that yet.

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