Research Institute of Agricultural Engineering, p.r.i.

YEARBOOK

2013

Editor: **Antonín Machálek**
Romana Matoušová

Graphic layout: **Daniel Vejchar**
Translation: **Tomáš Šturc**

ISBN 978-80-86884-81-3

Drnovská 507, 161 01 Praha 6 – Ruzyně
e-mail: vuzt@vuzt.cz *http:// www.vuzt.cz*
tel: 233 022 274 *fax: 233 312 507*

Content

Introductory Word

Ladies and Gentlemen,

we are pleased to present you the Annual Report of the Research Institute of Agricultural Engineering, p.r.i. (RIAE,p.r.i.) mapping our activities in 2013. In the past year there have been major changes in the area of research and development on the national level. The change, which affects most our institution, is the introduction a new evaluation method for research results and research organisations in the period up to 2015.

The reaction to the above mentioned changes is the focus on quality and well-applicable research results and more significant extension of the original concentration of our institution on agricultural technologies in areas related to this field such as energy, ecology and engineering. In 2013 our research institute continued to complete, as in previous years, various research projects, finished the solution of long-term research projects and achieved good results in research. The RIAE, p.r.i. concluded last year 11 licence agreements for patents and utility models. We have also achieved good economic results and managed to exceed the planned targets. 2013 was year, in which we have managed to reverse the long-term trend of decline in main economic indicators. We can see the growing trend of total revenues, assets and liabilities including the increase of own resources. There was also recorded an increase in amount of working capital and as well as extension of duration time of its turnover. The profit for the year 2013 has increased five times in comparison with the previous year.

The future way of scientific research evaluation and thus its funding will be aimed at higher financial evaluation for an institution with excellent results at the expense of reducing the financial allocation for institutions with less quality results. If our institute wants to defend its reputation and position in the market, then must belong to the first group.

Our research team can achieve very good results, which is certainly a positive fact. The effort of management will be aimed at strengthening of existing team in the coming years with new researchers.

The necessary prerequisite for the successful functioning of our institute in the future is the emphasis on practical application of the results of research activities already during the formulation of a research project. The RIAE, p.r.i. will be successful on condition of joint effort of all staff.

Finally, I would like to thank all employees of the Research Institute of Agricultural Engineering, p.r.i. for their work and I believe, that the readers will find in this publication really interesting information.

Marek Světlík
Director

Identification Data

Research Institute of Agricultural Engineering, p.r.i. was established according to the Act No. 34112005 Coll. on public research institutions by the Ministry of Agriculture of the Czech Republic with effect from 1 January 2007. The Deed of Establishment RIAE, p.r.i., reference number 22972/2006 - 11000 from 23 June 2006 is on view in register of public research organizations conducted by the Ministry of Education, Youth and Sports (http://rvvi.msmt.cz).
At the same time the Founder constituted (according to § 15, letter i) mentioned law the pentamerous Supervisory Board of the Research Institute of Agricultural Engineering, p.r.i. and there were appointed its members. Three members of Supervisory Board are employees of the Ministry of Agriculture and two members are employees of the RIAE, p.r.i. In this way there is ensured the absolute majority for founder representatives. The activity of Supervisory Board is governed by rules of procedure, which is the internal provision of the RIAE, p.r.i. and is approved by the Founder.
RIAE, p.r.i. observes in its activity by properly approved internal provisions specifled in § 20 of Law No. 341/2005 Coll.

Identification data:	Research Institute of Agricultural Engineering, p.r.i. Drnovská 507 161 01 Praha 6 – Ruzyně / Prague 6 – Ruzyně Česká republika / Czech Republic
Identification No.:	00027031
Tax Identification No.:	CZ00027031
Legal From:	Public Research Institution
Founder:	Ministry of Agriculture of the Czech Republic

Deed of Establishment: Ref. No. 22972/2006-11000 from 23 June 2006 with effect from 1.1.2007

Contact data

Tel.:	+420 233 022 111; +420 233 022 274
Fax:	+420 233 312 507
e-mail:	vuzt@vuzt.cz
Internet	http://www.vuzt.cz
ID Data Box:	py5fcj

Management of Institute

Director

Ing. Marek Světlík, Ph.D..
Tel.: +420 233 022 274 or 307
e-mail: marek.svetlik@vuzt.cz

Deputy Director for Research and Developt

Ing. Pavlína Voláková, Ph.D. (to 31.7.2013)
Ing. Antonín Machálek, CSc. from 1.8.2013
Tel.: +420 233 022 268 or 372
e-mail: antonin.machalek@vuzt.cz

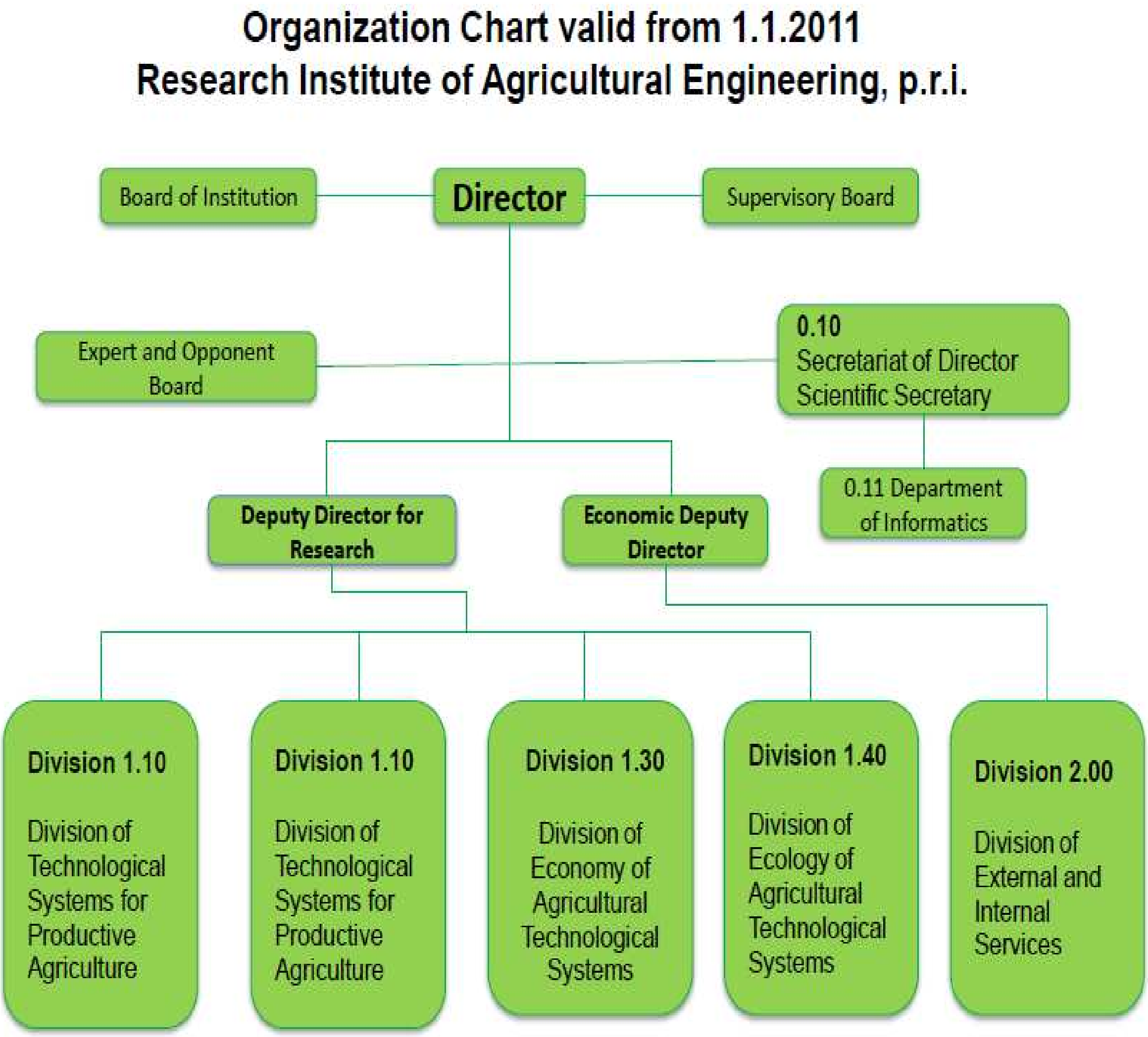
Deputy Director for Economics
Mgr. Vojtěch Smejkal (to 3.3.2013)
Ing. Vladimír Chalupa (from 4.3.2013)
Tel.: +420 233 022 233,
e-mail: vladimir.chalupa@vuzt.cz

Board of Institution
Ing. Petr Plíva, CSc. (VÚZT, v. v. i.) - Chairman
Ing. Antonín Machálek, CSc. (VÚZT, v. v. i.) – Vice - chairman
Ing. Michaela Budňáková (MZe) - Member
Bc. Milan Herout (VÚZT, v. v. i.) - Member
Ing. Radek Chmelík (Hájek, a.s.) - Member

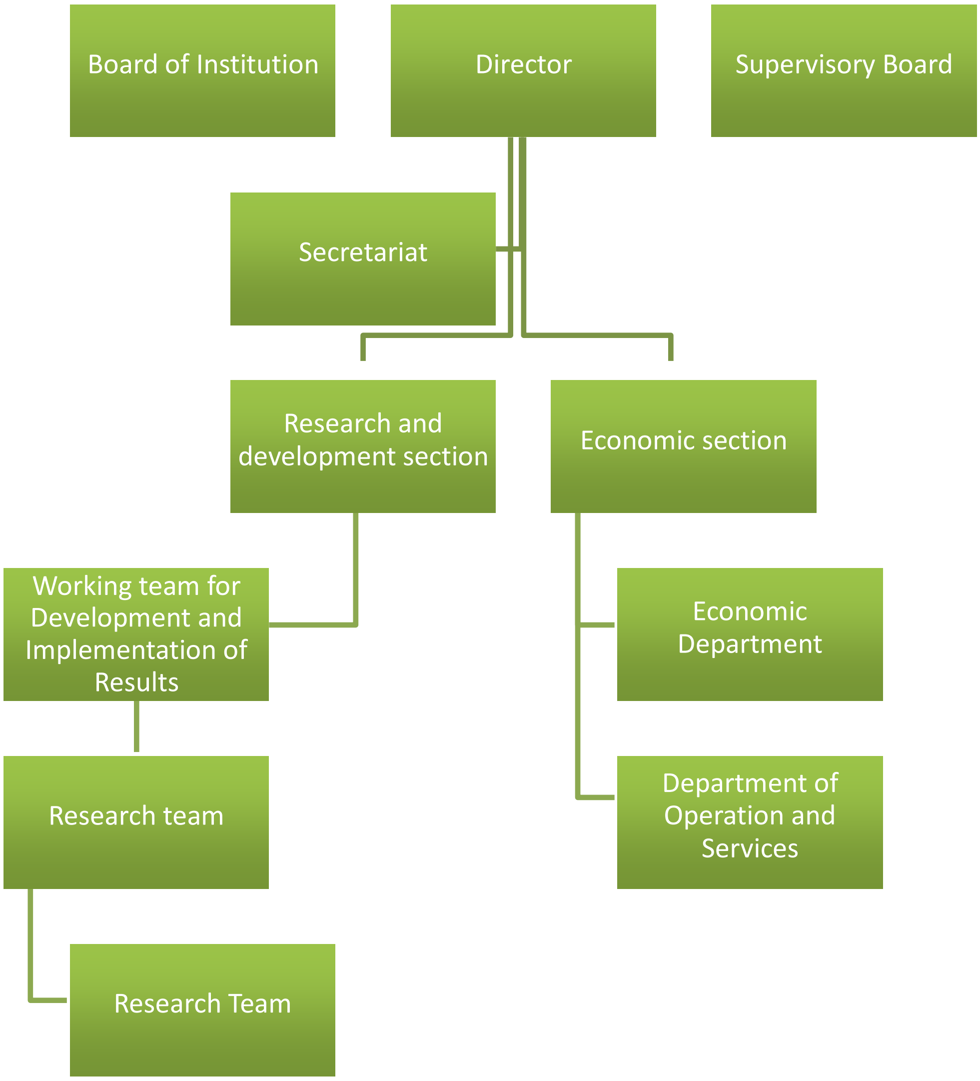
Supervisory Board

doc. Ing. Milan Podsedníček, CSc. (MZe) – Chairman
doc. Ing. Antonín Jelínek, CSc. (VÚZT, v. v. i.) - Vice-chairman
doc. Ing. Vlastimil Altman, Ph.D. (ČZU v Praze) - Member
Ing. Kamil Bílek (MZe) – Member
Ing. Jiří Souček, Ph.D. (VÚZT, v. v. i.) – Member

Organization Chart



Organization Chart valid from 28. 3. 2013



Scope of Institute

Research Institute of Agricultural Engineering, v.v.i. has more than 60-year history. It was established in 1951 by the Ministry of Agriculture of the Czech Republic. It changed the legal form to p.r.i. (public research institutions) in year 2007 as a result of the transformation of research institutes. In the course of its activities the Research Institute has created many inventions and patents.

Main Activity

The Research Institute of Agricultural Engineering, p.r.i. (RIAE, p.r.i.) has solved in 2012 the following kinds of research projects funded by the project sponsors :

- research projects of the Ministry of Agriculture (10 projects in total, the RIAE, p.r.i. is beneficiary-coordinator in case of 5 projects and beneficiary also in case of 5 projects);
- research project of the Ministry of Defence (1 project, in which the RIAE, p.r.i. is a coordinator;
- research project of the Technological Agency of the Czech Republic (6 projects in total, in case of 3 projects the RIAE, p.r.i. is a coordinator;
- research purpose of the Ministry of Agriculture (1 research purpose in total).

Additional Activity

The additional activity is carried out on the basis of requirements of competent state bodies or municipalities in public interest and supported from public funds. The subject of additional activity is connected with main activity in spheres of agricultural engineering, technology, energy industry, building and in boundary science disciplines of animated and lifeless nature which are related to these branches. They include the following activities :

participation in international and national centres of research and development;
scientific, professional and pedagogic cooperation;
verification and transfer of research and development results into practice, advisory activities and implementation of new technologies;
expert activities in the field of technical and technological legal protection.

The extent of additional activity is determined max. up to 40% of financial earnings from main activities. The Research Institute of Agricultural Engineering, p.r.i. has solved in 2013 totally 4 work contracts falling in additional activity, it means activities carried out on the basis of demands of state administration bodies.

Contract Work for Ministry of Agriculture

- A/9/13 Investigation in agricultural enterprises in 2013 and subsequent evaluation of storage sites for solid farmyard manures;
- A/10/13 Monitoring and evaluation of 3. Action Programme according to requirements of Council Directive No. 91/676/EEC in 2013, support for agricultural public in the framework of implementation of 3. Action Programme and elaboration of a report for European Commission;
- A/13/13 Ensuring of background data for 2013 necessary to evaluation of current state in implementation of ntrate directive in connection to financial demandness of realization of partial conditions from agricultural public and determination of financial means for the period after 2014.

Educational activity

Prof. Ing. J. Hůla, CSc. : Czech University of Life Sciences – TF Prague
Ing. J. Kára, CSc. : Czech University of Life Sciences - TF Prague
Doc.Ing. A.Jelínek, CSc. : University of South Bohemia – České Budějovice

Technical and Technological Consultancy

Consultancy is an important part of RIAE, p.r.i. activities given by the Deed of Establishment and necessary to communication of research workers very numerous group of users from agricultural and municipal practice, state administration, consultancy companies, processing plants, managers. The consultancy is carried out by several forms :

a) internet advisory and expert systems
The main RIAE, p.r.i. website is on the following address : http://www.vuzt.cz

b) consultancy within the environmental education and training

On the basis of comments from professional agricultural practice there were worked out the background data destined for amendment of Governmental Decree No. 615/2006 Coll., which determines emission limits and other conditions for operation of other stationary sources of air pollution to the Act No. 86/2002 Coll. on Air Protection.
The advisory activity of the RIAE, p.r.i. was aimed, as in the last year, at solution of advisory activity in area of implementation of controlled microbial composting technology on small piles having a basis in the Council Directive No. 99/31/EC on Storage of Waste. This directive orders to the EU Member States a decrease of quantity of biologically degradable municipal wastes transported to the landfills. The objective was to inform the producers of residual biomass about disponible composting equipment and technology, which minimize the adverse effects on environment.
The RIAE,p.r.i. research workers ensured the instructor´s activity in the training courses related to the systems of collection and processing of wastes and biological processing of biowastes.
All quotations of publications and lectures are in closing part of this edition.

Other Activity

For other activity there is considered such an economic activity, which is carried out for the purpose of a profit achievement under conditions determined by §21, par.3 of the Act No. 341/2005 Coll. and on the basis of trade licences or other entrepreneurial permissions.

There are the following activities :
- repairs of work machines;
- provision of services for agriculture and garden centres;
- editorial and publishing services;
- bookbinding and final elaboration of books and other printed matters;
- specialized retail trade with general merchandise;
- copying work;
- research and development in areas of natural and technical sciences;
- testing, measurements, analysis and controls;
- organization of special courses, trainings and other educational events, incl. tutor activity;
- consultancy in area of agricultural production;
- consultancy in area of energy industry;

- leasing of immovables, flats and non-residential premises (besides leasing there are not provided by a lessor other, than basic service sensuring proper operation of immovables flats and non-residential premises;
- authorized measurement of emissions (according to the Decision of the Ministry of Environment ref. number 20/740/05/HI of 23.2. 2005;
- activity of authorized experts in branches of building, engineering and agriculture – agrotechnical and zootechnical requirements for agricultural equipment (according to the List of institutes qualified for expert activity of the Ministry of Justice, ref.number 68/90-org. of 9.3.1990).

The extent of other activity is determined annually max. up to 40% of financial earnings from main activity.

Contracts falling into other activity

The Research Institute of Agricultural Engineering, p.r.i. has solved in 2013 totally 117 other activity contracts. It means, activity carried out for the purpose of profit achievement. There are chemical and microbiological analyses realized continuously for physical and legal entities, authorized measurements of ammonia emissions in agricultural objects, measurement of tractor engine performance, studies, standard external services of the RIAE, p.r.i. technical expertises of machines and other contracts.

The additional activity

- advisory service in area of agriculture production
- advisory service in area of energy industry
- testing, measurements, analysis and controls
- organization ofspecial courses, trainings and
- other educational events including tutor activities
- editorial and publishing activities
- bookbinding and finai elaboration ofbooks
- and other printed matters
- authorized emission testing
- measurement of odours
- survey sampling
- activily of authorized experts in branches
- of building, engineering and agriculture
- agrotechnical and zootechnicai requirements
- for agricultural equipment.

Address
Research Institute of Agricultural Engineering, p.r.i.
Drnovská 507, P.O.Box 54
161 01 Praha 6 - Ruzyne, Czech Republic
Phone: +420 233 022 111
e-mail: vuzt@vuzt.cz
http://www.vuzt.cz

Scientific and Research Activity

Main activity of institute was ensured by solution of research purpose, projects of the Ministry of Agriculture and projects from other government departments.
Research Project

Provider: MZE - Ministry of Agriculture (MZe)

Ident. kód Ident. Code	Název Title	řešitel Author	Od From	Do To
MZE0002703102	Research of effective utilization of technological systems for sustainable farming and natural resources utilization under specific conditions of the Czech agriculture.	Ing. Zdeněk Pastorek, CSc., prof. h. c. to 30.6.2012 Ing. Marek Světlík, Ph.D. from 1.7.2012	1.1. 2009	31.12. 2013

Research Projects of the National Agency for Agricultural Research of the Ministry of Agriculture of the CR

Provider: Ministry of Agriculture (MZe)

Ident. kód Ident. Code	Název Title	řešitel Author	Od From	Do To
QH81200	Optimization of water regime in landscape and increasing of its retention ability through application of compost from biologically degradable waste on arable land and permanent grassland. (Coordinator: VÚZT, v.v.i.)	Ing. Petr Plíva, CSc.	1.1. 2008	31.12. 2012
QH82191	Optimization of batching and placement of organic matter into soil with aim to limit the surface water runoff during intensive rainfall. (Coordinator: VÚZT, v.v.i.)	Ing. Pavel Kovaříček, CSc.	1.1. 2008	31.12. 2012
QH82283	Study on interaction between water, soil and environment from the point of view of manure management in sustainable agriculture. (Coordinator: VÚRV, v.v.i.)	doc. Ing. Jiří Vegricht, CSc.	1.1. 2008	31.12. 2012
QI101A184	Potato growing technology - new environmental friendly procedures (ways). (Coordinator: VÚB, s.r.o. Havl. Brod)	Ing. Václav Mayer, CSc.	1.1. 2010	31.12. 2014
QI101C246	Phytomass utilization from perennial grasses coners and landscape maintence. (Coordinator: VÚZT, v.v.i.)	Ing. David Andert, CSc.	1.1. 2010	31.12. 2014
QI111B107	Research on grape seed biologically active compounds extraction and utilization in order to improve a farm animal metabolism as a base for a proposal for the best available technique (BAT). (Coordinator: VÚRV, v.v.i.)	Ing. Martin Dědina, Ph.D.	1.1. 2011	31.12. 2014
QI91C199	Optimization of farm vermicomposting technology. (Coordinator: ČZU Praha)	Ing. Petr Plíva, CSc.	1.6. 2009	31.12. 2013

QI92A143	Research of suitable varieties and new method of oilseed flax processing for non-food and energy utilization. (Coordinator: Agritec Plant Research s.r.o.)	Ing. Jiří Souček, Ph.D.	1.6. 2009	31.12. 2013
QJ1210263	Agronomic measures to a reduction of water erosion on arable land with utilization of organic matter ploughdown. (Coordinator: VÚZT, v.v.i.)	Ing. Pavel Kovaříček, CSc.	1.4. 2012	31.12. 2016
QJ1210375	Research of dairy farming systems in terms of optimizing microclimate and energy-economic demands. (Coordinator: VÚZT, v.v.i.)	doc. Ing. Antonín Jelínek, CSc.	1.4. 2012	31.1. 2016
QJ 330214	Reducing the Risks of Soil Degradation, Erosive Effect and Risks to the Environment by Increasing the Share of Manure in Soil (Coordinator : VURV,v.v.i.)	Doc. Ing. Jiří Vegricht, CSc.	1.1. 2013	12.12. 2016

Projects from Other Government Departments
Provider: Technology Agency of the Czech Republic

Ident. Kód Ident. Code	Název projektu Title	řešitel Author	Od From	Do To
TA01020275	Developement of new technology and machine equipment for large-scale heating briquette from agricultural phytomass production (Coordinator: VÚZT, v.v.i.)	Ing. David Andert, CSc.	1.1. 2011	31.12 . 2014
TA01021213	Process of very fast heat dissotiation of biomass. (Coordinator: VÚZT, v.v.i.)	Ing. Petr Hutla, CSc.	1.1. 2011	31.12 2013
TA02020123	Soil conservation technologies, energy-saving storage, potato tuber and foliage use in relation to reduction of dependence on fossil fuels and environmental protection. (Coordinator: VÚB Havlíčkův Brod, s.r.o.)	Ing. Václav Mayer, CSc.	1.1. 2012	31.12 . 2015
TA02020601	Elimination of some gas pollutants by their combustion on a heated wire. (Coordinator: ILD cz. s.r.o.)	Ing. Petr Hutla, CSc.	1.1. 2012	31.12 . 2015
TD010056	Expert system for support of decision-making about using pesticides for improvement of economics of production and quality of environment. (Coordinator: VÚRV, v.v.i.)	Ing. Zdeněk Abrham, CSc.	1.1. 2012	31.12 . 2013
TD010153	Expert system for evaluation of technology and economics of production and use of biofuels. (Coordinator: VÚZT, v.v.i.)	Ing. David Andert, CSc.	1.1. 2012	31.12 . 2013

TA 03021245	Research and Development Environmentally Friendly Technologies and Equipment for Breeding of Livestock Leading to a Quality Increase of their Environment and Nutrition (Coordinator : Agromont Vimperk s.r.o.)	Ing. Antonín Machálek, CSc.	1.1. 2013	31.12 . 2015
TA 03010138	Utilization of Electric Motors for Agricultural Machinery (Coordinator : BEDNAR FMT s.r.o.)	Ing. Karel Kubín, Ph.D.	1.1. 2013	31.12 . 2015

Provider: Ministry of Interior (MV)

Ident. kód Ident. Code	Název Title	řešitel Author	Od From	Do To
VG201020140 20	Determination of the minimum energy demands to maintain basic funcions of agriculture in situation of crisis and analysis of the possibilities ensuring is own energy sector. (Coordinator: VÚZT, v.v.i.)	Ing. Zdeněk Pastorek, CSc., prof. h. c. to 30.6.2012 Ing. Otakar Syrový, CSc. from 1.7.2012	1.10. 2010	31.12 . 2014

Specialized Divisions

1.10 Division of Technological Systems for Productive Agriculture

Head of Division
doc. Ing. Jiří Vegricht, CSc., tel.:+ 420 233 022 281
e-mail: jiri.vegricht@vuzt.cz

Scope of activity
• Material and energy intensity of variantly solved systems of soil management and farm animal breeding and their optimalization by application of targeted research results and new technological systems
• Increase of farm products quality and to safety by utilization of sensor systems, actuating devices and automatic data collection. Utilization these systems for the control of production process in real time, control of production process qua on critical points and processing of documentation related to the course of production process
• Relationship among technological systems farm animal breeding and their effect on product environment, welfare, health state and performance
• Influence of modern technological systems and production technologies destined for productive and also ecological husbandry on the environment
• Reaction of farm animals on variantly solved systems of their breeding and their parameters. Adaptation of technological systems to requirements and needs of bred animals with utilization of results of performed research work

• Landscape management under conditions of sustainable development

• Land care in conditions of multifunctional agriculture (development of productive, non-productive, ecological, social, cultural and recreational functions), adaptation of technological systems
• Ecologically and economically accept management on soils threatened by erosion
• Care of soil and crop covers with the aim to reduce a risk of pesticide residues occurrence foodstuffs and feeding stuffs
• Soil management with favourable impact on landscape in rural areas
• Care of aesthetic aspects of landscape in conditions of intensive agricultural production
• Formation of quiet zones in intensively utilized agricultural landscape

Selected results of division research activity in 2013

Research of Controled Traffic Farming System Aimed at Reduction of Technogenic Compaction of Soil and Increase of Water Accumulation in Soil

Improvement of Soil Permeability for Water and Increase of Water Accumulation in Soil in Conditions of Application of Efficient Agricultural Machinery

Author: Ing. Pavel Kovaříček,CSc.

Load of soil by agricultural machinery passages can raise a different reaction in soil profile. The degree of soil compaction is influenced by actual moisture of soil and the stage of previous loosening or compaction of soil. To the problematic operations belong above all the entries of spreaders and sprayers on fields before crop sowing and treatment of stands during the vegetation season. The comparison of infiltrated water quantity into the soil on various sites with differential stages of compaction we obtained on trial with concentrated permanent traffic lanes of machinery at the simulation of intensive rainfall. On experimental plot with basic working width of machines for soil cultivation and sowing 6 m and with tracks for fertilization and crop protection we monitored surface water runoff after simulated rainfall with total amount of 87,8 mm. In track inter-row the surface runoff started 10 min. after rainfall simulation, in sown tracks after soil cultivation and sowing in 14th minute, but in stand without tracks and thus also without compaction, as late as after 30 min. of irrigation. Cumulative surface runoff on all sites was increasing linearly (fig. 1). It was confirmed, that surface runoff in track inter-row (green colour) was double in comparison with sites over machine tracks covered by crop stand (red colour) and even fivefold higher than in cereals stand on sites without machinery passages (blue colour). During the Controlled Traffic Farming in permanent lanes and at the working width 6m more than 60 % of area was without any undesirable soil compaction. Using of this technology demands precise navigation system during the operations of soil cultivation and sowing and also fulfilment of condition, which is unification of working width of used machinery.

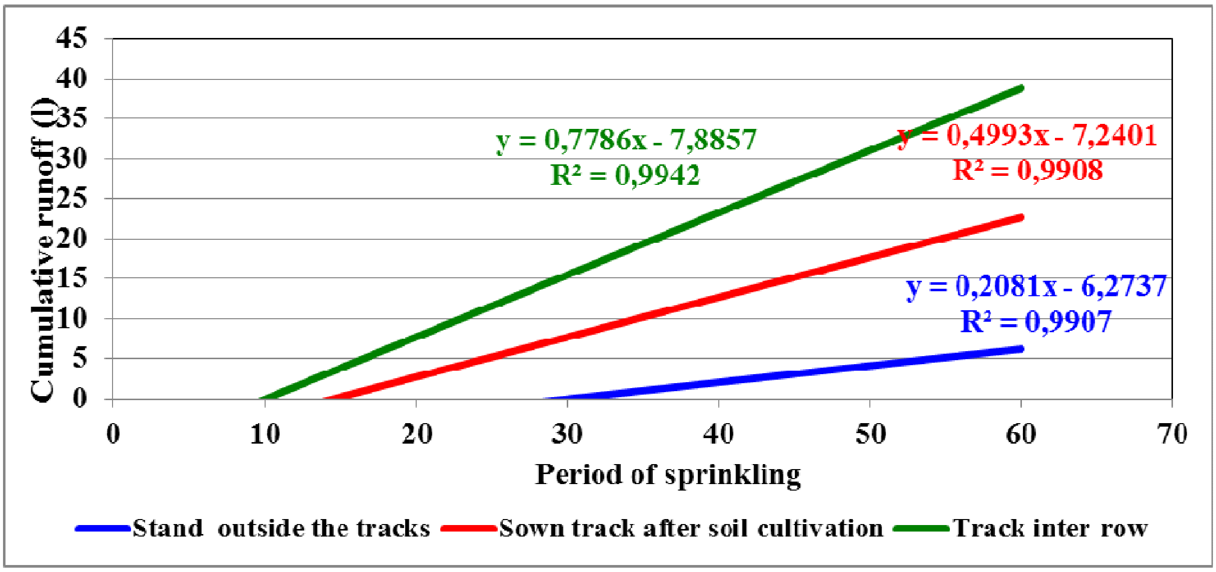


Fig. 1 Surface water runoff on trial variant without machinery passages, on sown tracks after soil cultivation and in track inter-rows
Third year of trial, average from 3 repetitions, period of rain simulation 60 min., constant intensity of sprinklingí 87,8 mm

Contact: Ing. Pavel Kovaříček, CSc. – pavel.kovaricek@vuzt.cz

Agronomic Measures Towards Reduction of Water Erosion on Arable Land with Utilization of Organic Matter Incorporation

On the experimental plots with compost application carried out in the agricultural enterprise BEMAGRO Malonty in New Castle Mountains, there were obtained the interesting results. On the plots with graded compost rates there were established the collectors destined for catchment of surface runoff during the intensive rainfalls (fig. 2). The collectors are installed after emergency of stand on the slopes with descent 3 - 5°, on each experimental variant there were 4 - 6 spots. The surface runoff from confined land area is concentrated in a vessel. The conducting sheet metal is covered in order not to come to a distortion of measurement results by the runoff from its surface. The rainfalls are monitored in the weather station situated in the distance of ca 1-2 km from experimental areas. The total amount of rainfalls for the monitored period is determinated by means of ombrometers placed on experimental area.
In spring 2013, the period of constant rains lasted from the beginning of May up to June,10. The interval of 10 days without rains was followed by a short period with storms and intensive rainfalls.

Fig 2: Collector of rainfalls placed in emerged cereals

For the experiments there were selected the plots in cadastral area of Malonty village, average altitude above sea level is 670 m and average slope of terrain 5,4°. On the plots there is light sandy loam soil. On the monitored plots there is used the technology of soil cultivation with ploughing. All working operations with mechanization means are carried out in direction of contour lines.

The plot called „U Váhy“ (stagnic cambisol) – according to the textural composition it is a medium sandy loam soil. The active soil reaction is subacid and exchange reaction of soil is neutral. Soil is not salinised and without carbonates. Total content of carbon is medium, it means 2 - 3 %. The ratio C : N is 11 and nitrogen reserve is medium or lower. Determined content of phosphor, potassium, calcium and magnesium according to Mehlich III is good or satisfactory.

The plot called „Za Farou“ (haplic cambisol) **–** according to the textural composition it is a medium sandy loam soil. The active soil reaction is subacid and exchange reaction of soil is neutral. Soil is not salinised and without carbonates. Total content of carbon is medium (2-3 %). The ratio C : N is 11,4 and nitrogen reserve is medium or lower. Determined content of phosphor, calcium and potassium is good or satisfactory and magnesium content is low.

On the plots with compost application there was recorded an increase of the content of fulvic acids and young humic acids in soil. The stage of humification was medium, up to 30 %. The content of carbon dissolved in water and microbial biomass have increased considerably.

On the plot called „U Váhy“ sown by winter cereal and fertilized with compost rate 53 t/ha (fig. 3) there were carried out in period between May 2, 2013 and May 28, 2013 4 readings of surface runoff. If the surface runoff from control variant without compost we consider for

100 %, then on variant with compost there was always measured lower runoff by 8 up to 12 %. The incorporated compost had a positive effect on the water infiltration into the soil.

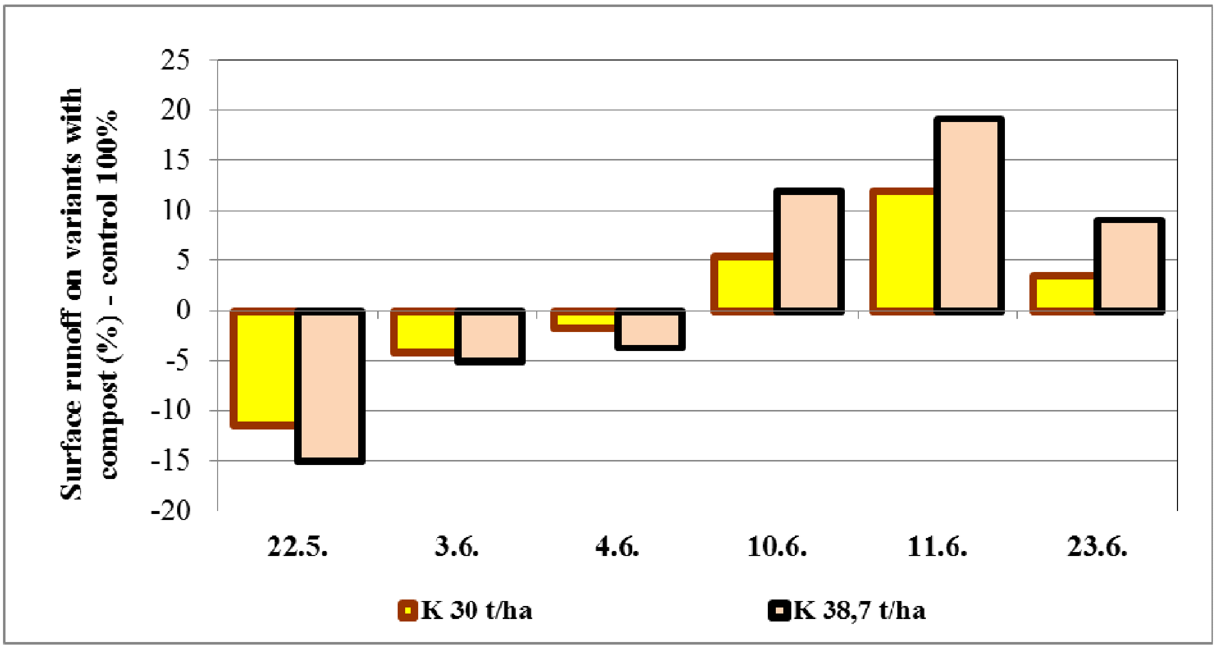


Fig. 3 On variant with compost rate in amount of 53 t/ha the surface runoff was lower, than on control variant; Malonty, plot called „U Váhy“

On the plot „Za Farou“ the oats was sown in April. The collectors were built in only at the beginning of May after its emergence. In May and June there were carried out 6 readings. In the 3 first dates of readings there was confirmed a hypothesis that the incorporation of compost has led to an improvement of water infiltration into the soil. On June 10, when the topsoil was already saturated with water, the ratio of surface runoff between fertilized variants and control variant turned round. The higher rate of compost was incorporated, the higher surface runoff of water was. The period between June 11, 2013 up to June 20, 2013 was without rainfalls, soil moisture was consolidated, but after heavy rain and storms, the adverse effect of compost incorporated into the soil on surface runoff was confirmed.

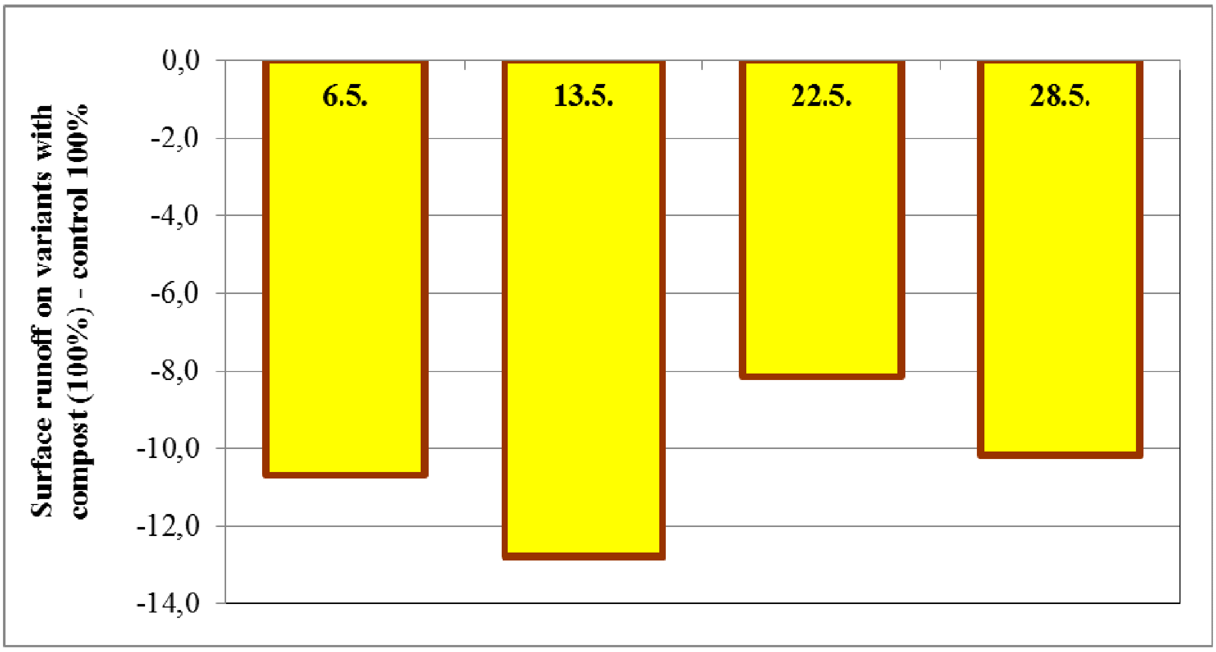


Fig. 4: On variants with rates of compost and oats stand there was measured at the beginning of rainfalls period by 12-15% lower surface runoff than on the control variant without compost. After soil saturation the ratio between the surface runoff on fertilized variants and control variant turned round;
Malonty, plot called „Za Farou“

Conclusions
The measurements of surface runoff of water during the unusually rainy period in late spring 2013 is a reason for deliberation. Is it true, that high rates of incorporated compost bind water in the topsoil and slow down its infiltration into the subsoil ? Answer to this quastion will be an important task, whereon it is necessary to focus our attention during the continuation of project solution.

The results presented in this article have been obtained during the solution of NAZV project No. QJ 1210263

Contact: Ing. Pavel Kovaříček, CSc. – pavel.kovaricek@vuzt.cz

Research of Controlled Traffic Farming System (CTF) Aimed at Reduction of Technogenic Compaction of Soil and Increase of Water Accumulation in Soil

Evaluation of CTF Effect on Physical Properties of Soil

Author: prof. Ing. Josef Hůla ,CSc.

The evaluation of the CTF effect has continued in 2013 on the selected plot with acreage of 10 ha. It is application of system with rigorous separation of driving tracks from the part of plot without tracks.

In diagram on the fig. 5 there are shown the values of soil porosity in lower part of topsoil at the beginning of July 2013. In driving tracks, which represent 32% from the plot acreage (except headlands), the values of soil porosity have shown the symptoms of undesirable soil compaction. The unfavourable state of soil was ascertained as well as on control part of plot with random passages, which correspond to usual method of passages along the fields, 68% of plot acreage was entirely without travelling mechanisms action (variant 3).

On the fig. 6 we can see a scheme of machinery passages on the field in system of concentrated permanent traffic lanes in agricultural enterprise, where this system is tested.

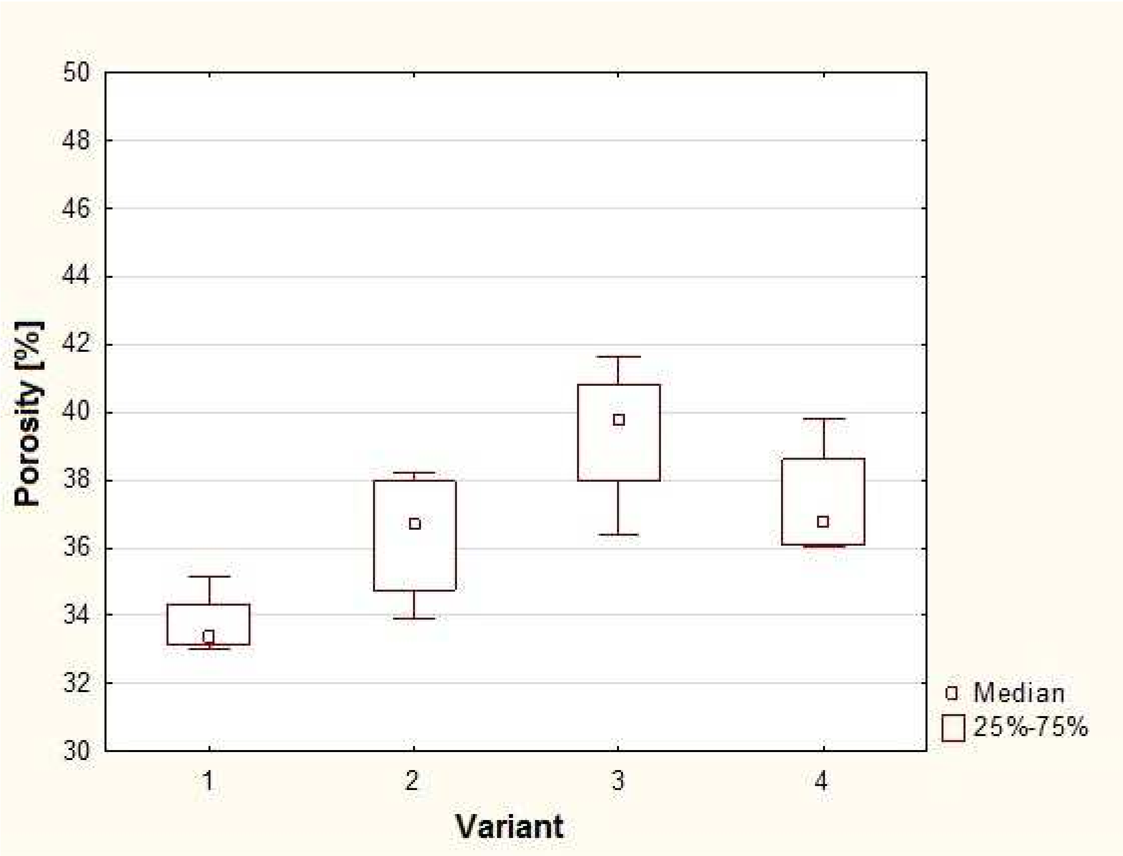


Fig. 5 Soil porosity in depth of 0,25-0,30 m (2.7.2013)

Variants: ***1 –traffic lanes***
2 – tracks outside thetraffic lanes (sown)
3 –outside the tracks
4 – random passages (control variant)

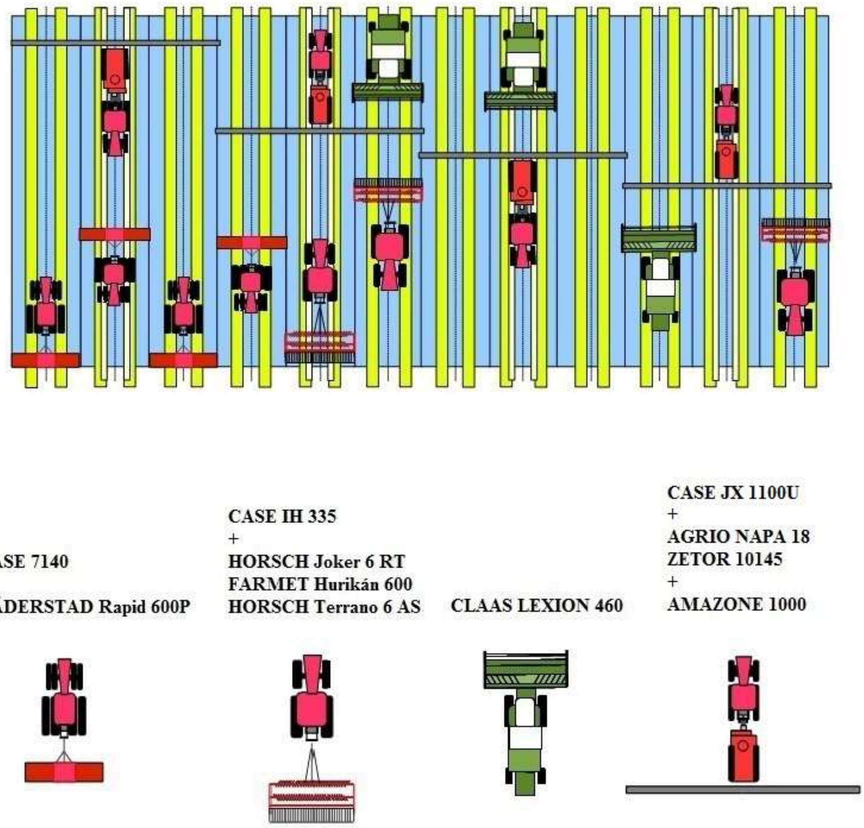


Fig. 6 Scheme of sets used in tested system of control passages

From the results of multiyear pilot plant experiment resulted the feasibility of controlled passages system in conditions of agricultural enterprise equipped very well by agricultural machinery. The systematic evaluation of soil physical properties and quality parameters of soil tillage has shown advantageousness of concentration of machinery passages into permanent traffic lanes.

The condition for using of this system is technological discipline and care of quality of working operations. It is necessary to scatter the chaff and broken straw in whole working width of harvesters, because during the soil tillage there are eliminated passages at an angle towards the direction of harvester movements, it isn´t any possibility to improve additionally space distribution of post-harvest crop residuals. For the selection and adjustment of cultivators used during the soil tillage it is necessary to apply the requirement for levelling of soil surface in the course of passages in direction of movements of other machines.

Contact: prof. Ing. Josef Hůla, CSc. – josef.hula@vuzt.cz

1.20 Division of Energy and Logistics of Technological Systems and Biomass Utilization for Non-food Purposes

Head of Division
Ing. Jaroslav Kára, CSc.,tel.: +420 233 022 334
e-mail: jaroslav.kara@vuzt.cz

Scope of activity
Production and utilization of biogas, processing of biologically degradable waste
Reduction of gas production originating from agriculture taking a share in greenhouse effect
• Utilization of biomass and waste materials as renewable source of energy - biogas plants in agriculture
• Utilization of biogas for electric energy production and integration of biogas plants into rural energy systems
• Co-fermentation of energy plants in mixture with biologically degradable waste
• Technology for sustainable waste management in agricultural enterprises
• Production and utilization of organic and organo-mineral manures on the basis of farmyard manure and biologically degradable waste
Decentralized alternative sources of fuels and energy
• Integration of energy sources for biomass in rural energy systems
• CZT systems
• Systems of individual heating
Utilization of biomass for material and energy purposes, technology and economy
• Non-Food utilization of agricultural production
• Effective production and utilization of renewable sources of energy originating from agriculture
• Utilization of biomass for electric energy production and its integration into rural energy systems
Environmental technology in agriculture (heating, ventilation, air condition, illumination)
• Control and optimalization of energy and technological processes
• Illuminative systems in structures of agricultural production
Transport, handling, storage and technologies used in agriculture
• Mobile energy means and machinery, transport and handling machines and facilities
• Optimalization oF logistic chains, transport tasks on various levels oř agri-(
• Determination of normative fuel on for individual operations, crops an
• Optimalization of energy needs of agricultural enterprises, working operations and final products (wood chips, briquettes, pellets)
Production and utilization of biofuels
• Production and utilization of fuels manufactured of biomass, fuels or the first and second generation
• Production and utilization of solid fuels of biomass (wood chips, briquettes, pellets)
• Production and utilization of thermically gasified fuels produced of biomass

Selected results of division research activity in 2013

Transport in Logistic Systems of Energy Biomass

The transport of biological raw materials has several particularities. It can be also said about the transport of energy biomass, which has different demands on transport machinery in comparison with materials of abiological nature.

The setting of transport parameters was carried out systematically throughout the period of solution. The background data were obtained by means of field measurements in real conditions.

The obtained results of transport parameters in case of the most often used forms of energy biomass transported by means of different kinds of transport vehicles are shown in diagrams on the figures 7 and 8. The results are recalculated on 1 tonne of transported material in dry matter. A tractor with construction speed up to 40 km.h^{-1} is ,,tractor A". The specification ,,tractor B" represents the tractor with construction speed over 40 km.h^{-1}.

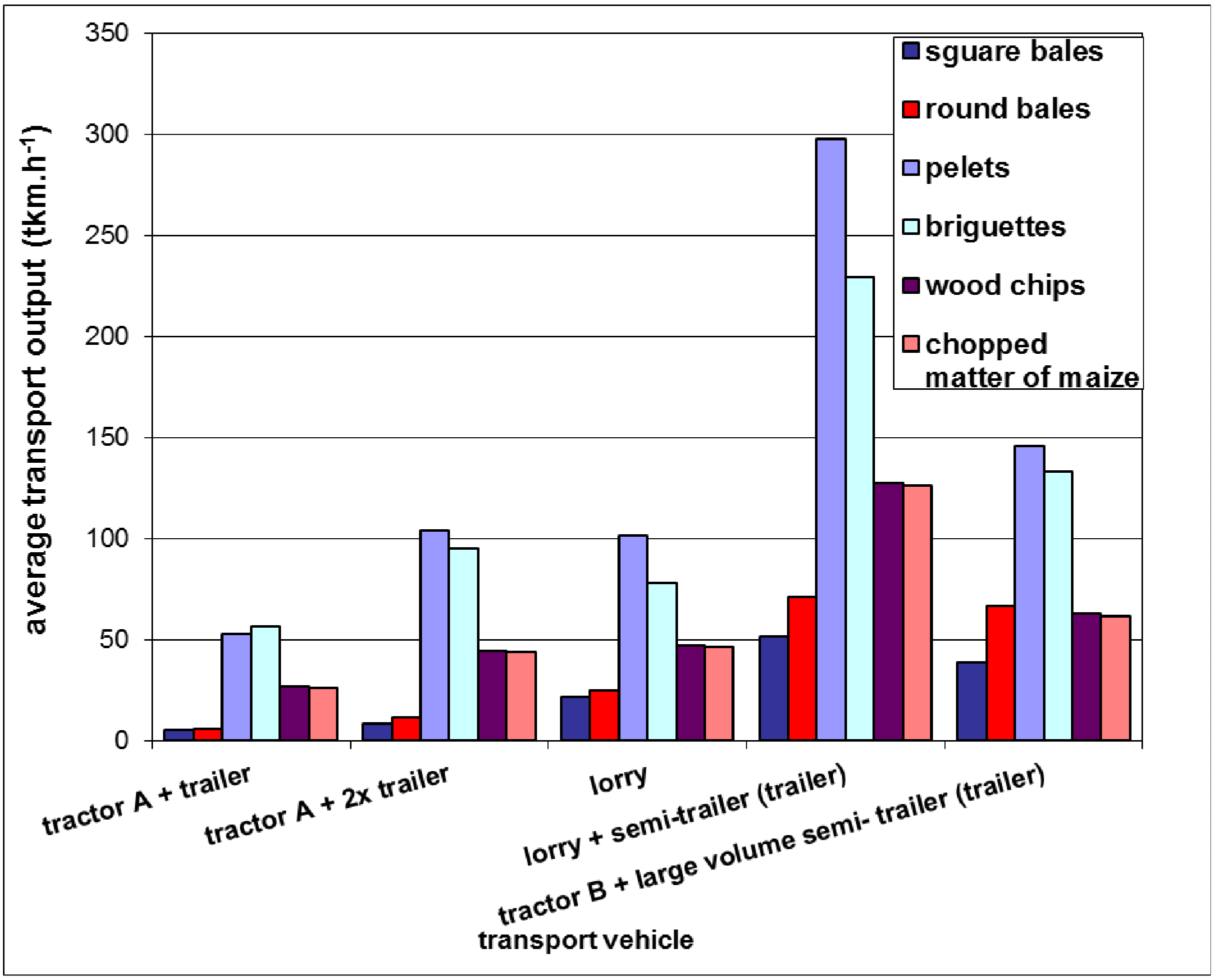


Fig. 7: Transport output during the transportation of bioenergy feedstock

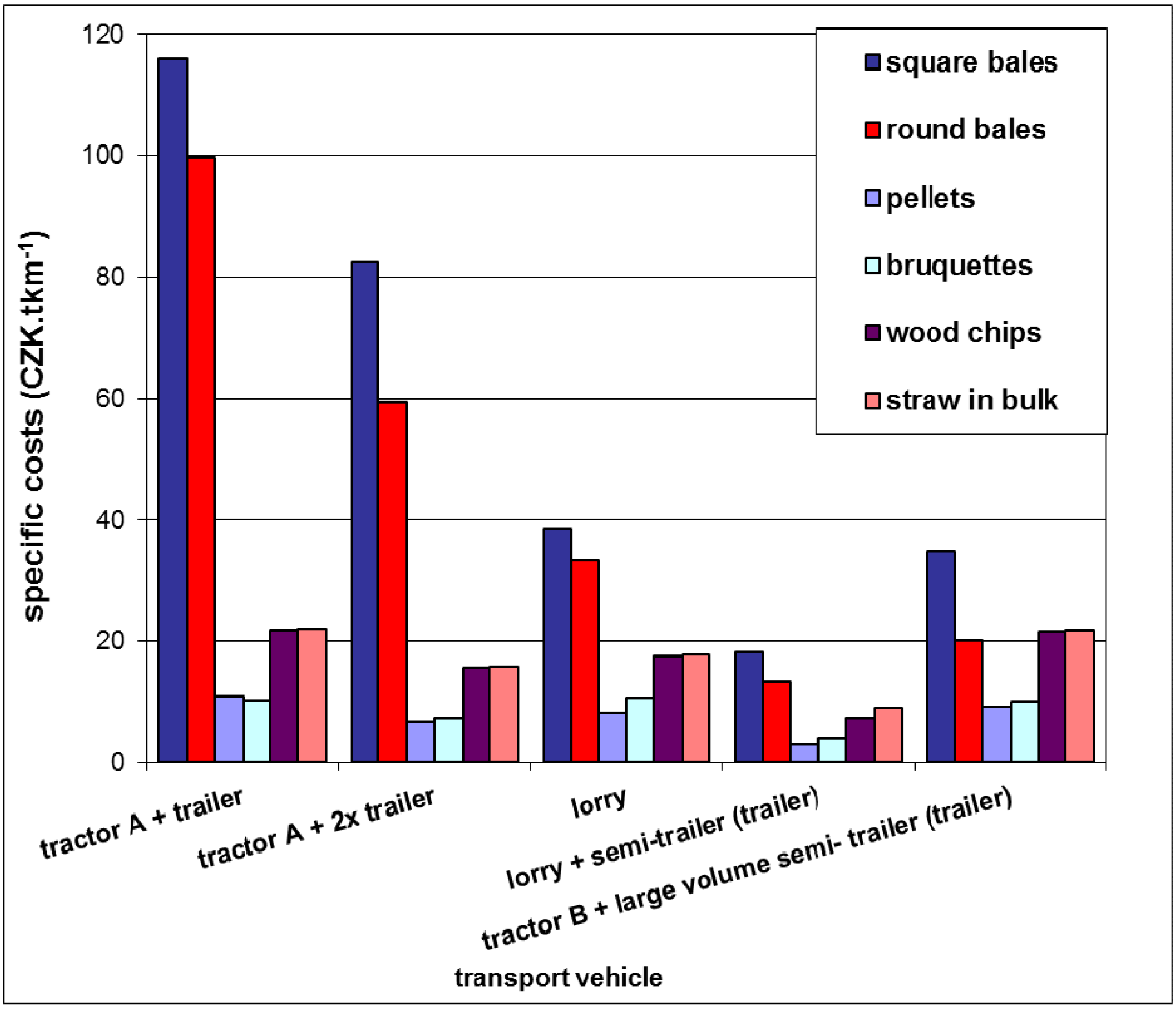


Fig. 8: Specific costs during the transportation of bioenergy feedstock

At the present time the development trend in agricultural transport is aimed at utilization of higher construction speed of tractors integrated with large-scale tilting tractor semi-trailers. In consideration of prevailing share of driving along the paved roads and with regards to the changing transport distance according to the place of work it is suitable to have the authorized speed 40 $km.hod^{-1}$ at least for connected vehicles. This trend is also confirmed by found values. The results of transport sets of this type are comparable to the results obtained during the use of lorry transport. But it is necessary to take into account, that a tractor is within the agricultural enterprise much more utilizable during the year, than a lorry.

In light of transport output, the most effective kind of transport utilizes large-scale semi-trailer or a lorry with trailer. The disadvantage of this type of transport vehicle is worse manoeuvrability, longer time of loading and unloading and above all substantial limitations during the off-road movement. Therefore it is suitable to realize this kind of transport only in case of longer distances and on paved roads.

Transport parameters with utilization of a lorry are comparable for the majority of feedstock to the transport carried out by means of ,,tractor B“ with large-scale semi-trailer, eventually trailer. However, tractor has considerably better ability of manoeuvring, especially during the off-road driving.

The worst parameters were found out, as expected, in case of transport utilizing the tractor sets with trailer and low construction speed. This technique can be partially streamlined by connection of two trailers, however this set shows in operation worse manoeuvring characteristics and it can create the problems in regard to the fulfilment of road safety conditions.

From the transported forms of energy biomass, the transport of pellets and briquettes is the most effective. On the contrary, the transport of bales is the least effective. The main reason is their low volume weight, which doesn´t allow full utilization of transport capacity of transport means. The transport of wood chips and chopped maize straw is more effective, than transport of bales, also after recalculation of results on dry matter quantity. In case of utilization of large-scale semi-trailers, in particular if they are equipped by pressing faces enabling an increase of specific weight of cargo, their transport is comparable to the transport parameters of pellets and briquettes.

Considering the dependence of transport price on distance moved, the essential problem of energy biomass is its availability in „collection area“, its required quantity, quality and accessability relating to harvest or extraction.

Contact:
Ing. Jiří Souček, Ph.D.

Efficiency and Technological Indicators of Linseed

Within the project solution No. *QI92A143 – Research of suitable varieties and new method of linseed processing (Linum usitatissimum L.) for non-food and energy utilization* there were determined the energy and exploitative parameters of technological operations utilized at cultivation, harvest and processing of linseed. The data was used for the assessment of energy efficiency of production. The parameters have been determined by means of measurements in operational and semi-industrial conditions in the localities Lukavec, Morkovice, Šumperk, Loštice, Bludov and Bohutín. For the purpose of assessment and comparison the crop stands were harvested by harvester and flax puller. At the harvest by means of flax puller there was harvested a greater quantity of mass. The losses moved around 5 %. At the harvest by means of harvester were not harvested root part of plants and part of stem forming the stubble (ca 15 cm). The quantity and structure of harvested mass are illustrated graphically on the figures 9 and 10.

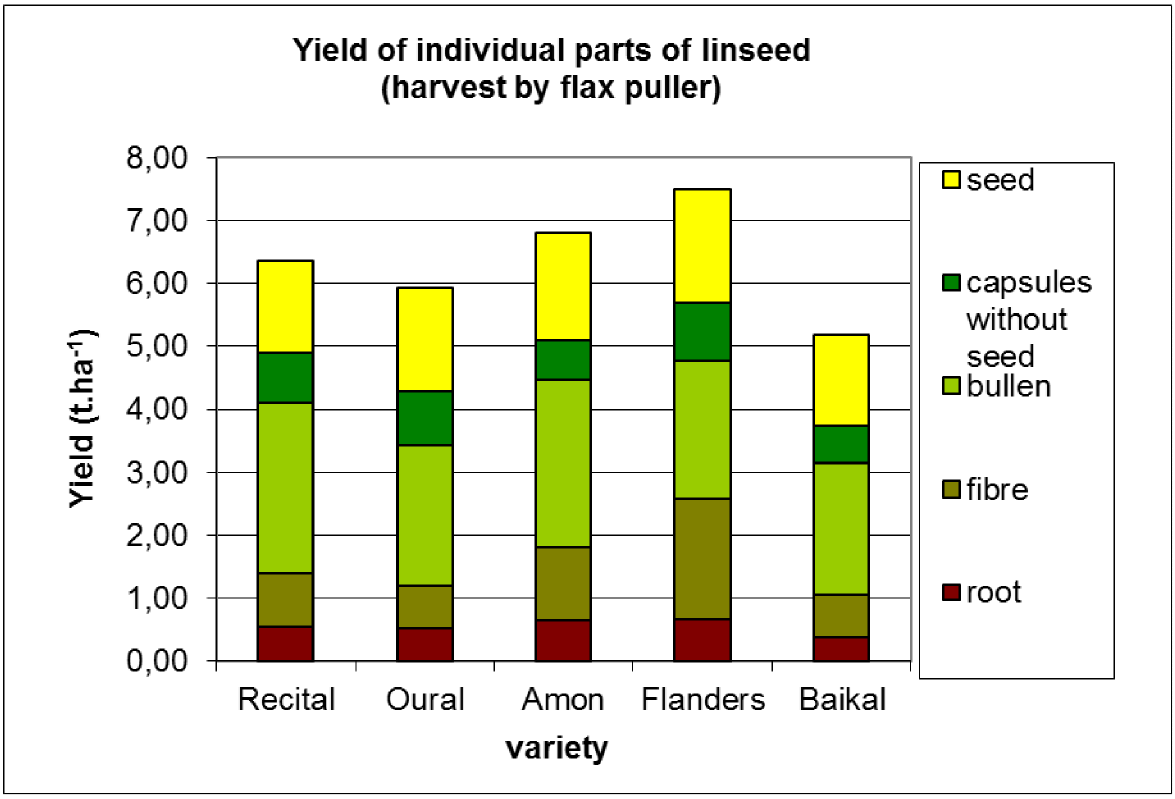


Fig. 9: Yield of individual parts of linseed selected varieties at the harvest carried out by flax puller (Lukavec, average 2009 – 2013, recalculated on dry matter)

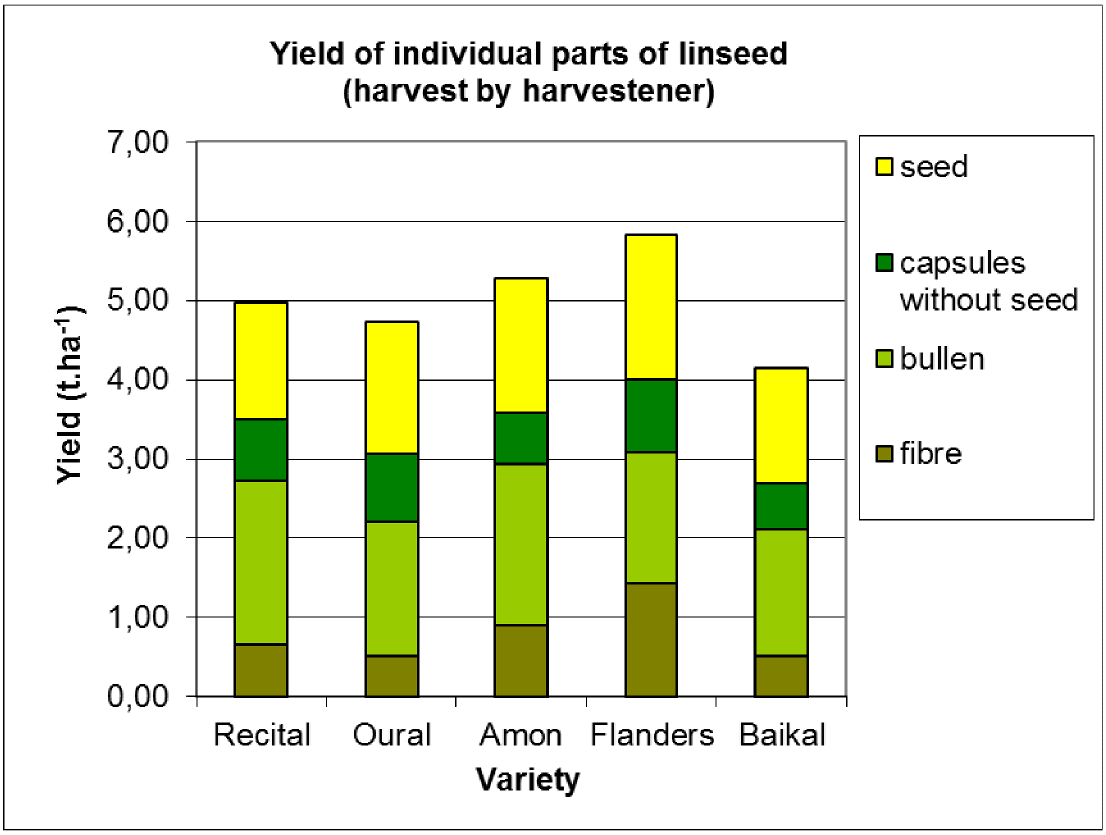


Fig.10: Yield of individual parts of linseed selected varieties at the harvest by harvester (Lukavec, average 2009 – 2013, recalculated to dry matter)

For the harvest of flax stem there were selected alternatives with pressing into round bales, big rectangular bales and small rectangular bales. In this way a group of 6 alternatives of harvest for comparison has arisen.

On the figure 11 there are illustrated graphically the values of specific consumption of diesel and work requirement expressed for 1 ha of crop stand. The values imply all operations realized in connection with establishment, protection and harvest of crop stand and with transport of products to a storage place. The weighed transport distance is 2,5 km. The exploitative parameters of operations were determined by means of time recording with using of GPS. The consumption of diesel fuel was calculated by means of flow indicator embedded into the energy means.

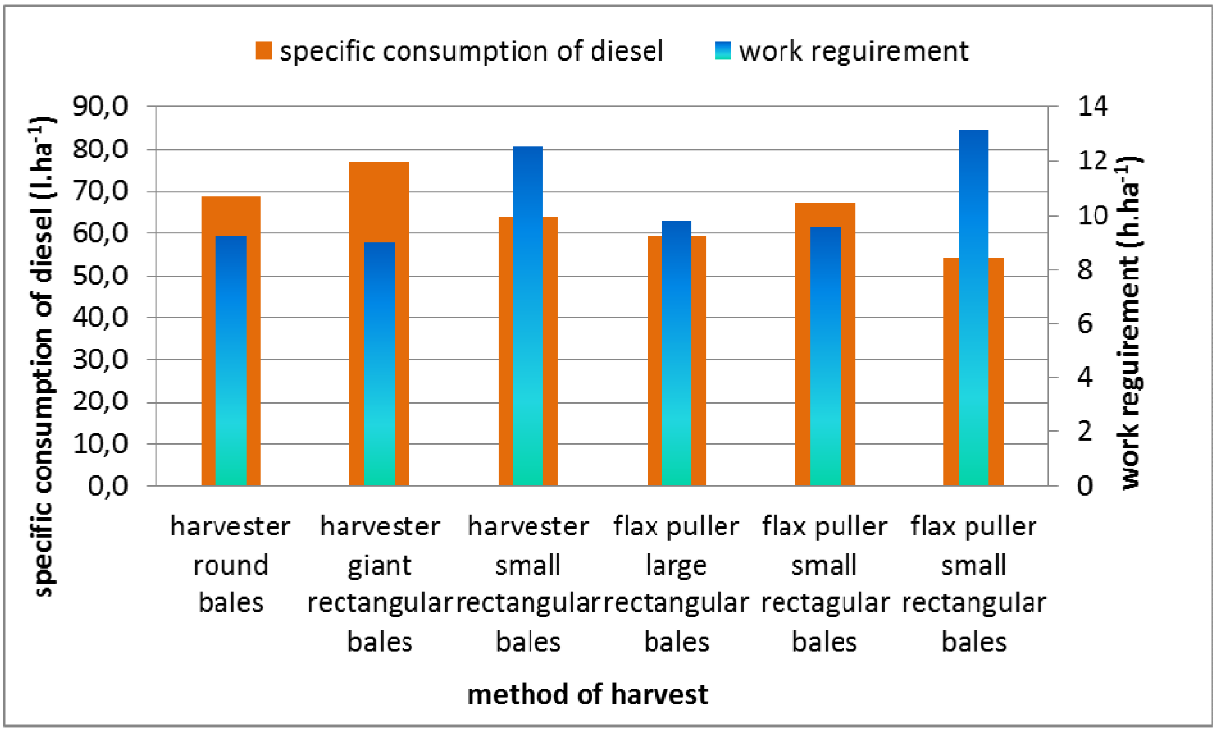


Fig. 11: Specific consumption of diesel and work requirement for establishment, cultivation and harvest of stand for selected alternatives of harvest, expressed on area of 1 ha.

At the evaluation of particular alternatives the authors have assessed complete technological process from soil preparation up to the harvest.

By recalculation of consumed energy in the form of diesel to the yields of selected varieties it is possible to determine the specific energy consumed on 1 tonne of mass. For the better possibility of comparison the values were related to 1 tonne of harvested biomass, without distinction of individual parts. The values recalculated on dry matter of material are illustrated grafically on the figure 12.

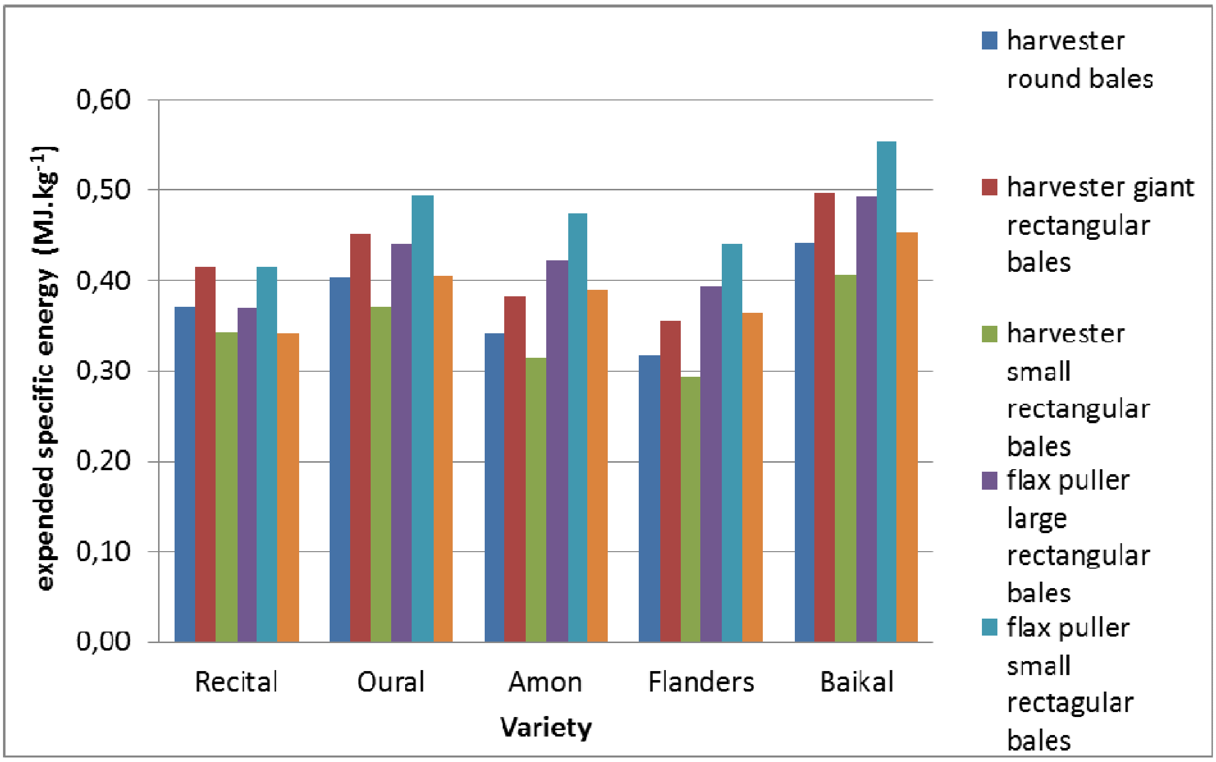


Fig. 12: Specific energy expended for production of selected varieties of linseed with use of different alternatives of harvest.

In order to quantify the energy contained in obtained mass of linseed there were utilized the data gained by evaluation of analyses and field trials carried out during the project solution. Average yields of individual parts of plants are shown in graphs on the figures 9 and 10. The results of analyses of individual parts are mentioned in the table T01.

T01: Average results of analysis of linseed individual parts

	Heat of combustion	Calorific value	Ash	Carbon	Nitrogen
	(MJ.kg^{-1})	(MJ.kg^{-1})	(%)	(%)	(%)
Seed	26,76	18,07	3,99	48,01	2,86
Capsules	18,92	12,28	3,95	48,03	0,82
Bullen	18,24	11,77	1,96	49,02	0,77
Fibre	16,73	10,65	4,60	47,70	0,79
Roots	17,97	11,57	6,32	46,84	0,50

For the assessment of technologies it is important to know economic aspects. As a main indicator for individual alternatives of technological processes at selected varieties there were calculated the specific costs related to 1 tonne of produced dry matter of a material. The specific costs were calculated from real costs for machinery operations, depreciations of machinery, labour costs and costs for necessary materials and operations (seed for sowing, fertilizers, plant protection and desication).

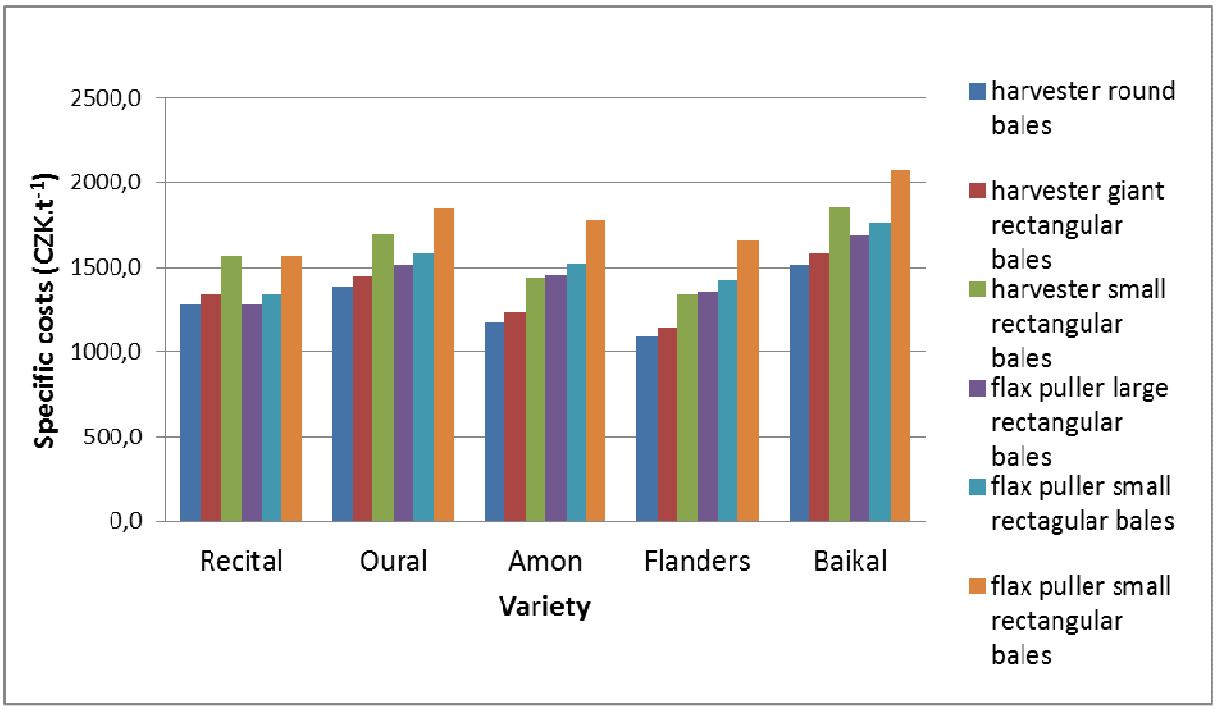


Fig.13: Specific costs for production of selected varieties of linseed (related to the weigh of dry matter of harvested mass)

On the figure 13 there are grafically eleborated the values of specific costs on production of one tonne dry matter of linseed selected varieties. In these values are included all costs originated in connection with preparation, establishment and cultivation of crop stand, protection, harvest and transport to a storage place (average distance 2,5 km).

From the results it is evident, that at all varieties there is the costliest alternative the pressing of straw into small rectangular bales. The reason is a low capacity of pressing device and higher share of manual manipulation. By comparison of technologies of pressing into round bales and large rectangular bales mildly lower specific costs were ascertained in case of round bales. However, in practice there is a rule, that the choice of technology is conformed to the availability of machinery and requirements of relevant consumer.

In spite of lower yield of mass the alternatives of harvest by means of harvester show lower specific costs in comparison with alternatives using flax puller. This fact is in conformity with the present trend to grow the linseed for production of seed.

Selection and Innovation of Preparatory Processes, Technical Support of Production and Standardization of Biofuels and their Blends with Fossil Fuels

In relation to the processing and certification of methodology for practice based on foreign and own results of research aimed at thermolysis technological processes for energy and material use of residual biomass and separated plastic and cellulose particles of solid municipal and industrial waste there was the focus of work in 2013 the monitoring and assessment of properties and parameters of synthesis gases, raw pyrolysis biooil and solid residue - biocoke, which can be used in various ways in energetics or as intermediate products destined for aftertreatment.

The realized line destined for processing of mixture, which contains mainly plastic materials and cellulosis, furthermore biomass and combustible safe wastes, consists of input bunker, dosing apparatus, carbonizing cylindrical input bunker, carbonizing cylindrical reactor with external heating up to 700 °C, interbunker of solid product for carbonization, cylindrical reactor with external heating up to temperature of 1000 °C for its gasification. To the output of gasification reactor is connected two-stage separator. In this separator there are carried out the washing of syngas in light hydrocarbons and also, together with water steams, their cooling and condensation. The purified synthesis and energy gas, adapted for drive of combustion engines and turbines, production of heat and electric energy, is the main output product. Separated sludges and sediments are dosed into the carbonization reactor and carbonization water into gasification reactor. The warming of reactor is ensured by the part of produced energy gas. The testing line enables to combine the processis of pyrolysis, carbonization and gasification depending on ways of feedstock processing. The scheme of line is shown on the fig.14. Container solution realized together with PolyComp, a.s. Poděbrady is shown on the fig. 15. On the fig. 16 there are illustrated the reservoirs of operation liquids and condensed liquid wastes and column for washing of raw syngas.

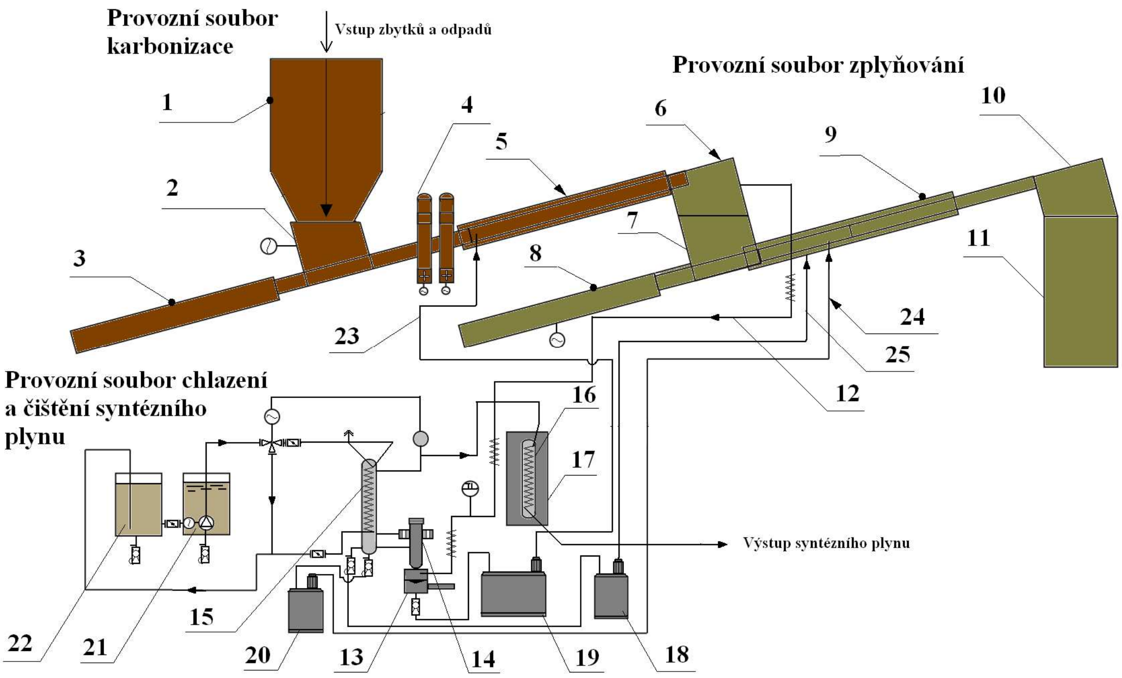


Fig. 14: Scheme of technological process of the VÚZT, v.v.i. (RIAE,p.r.i.) related to thermolysis processing of biomass residues and biogenic waste with operational sets of carbonization, gasification, cooling and purification of syngas with possibility of pyrolysis and carbonization tests

1 – container for modified residual biomass and biogenic waste, 2 – airtight seal, 3 - hydraulic drive of feeder of carbonization reactor, 4 – hydraulic liquid reservoirs 5 – carbonization reactor with heating sections 6 – hopper seal of gasification reactor, 7 – hopper of gasification reactor,

8 – hydraulic drive of gasification reactor, 9 – gasification reactor, 10 – hopper seal,

11 – container of ash eventually semi-coke, 12 – heated pipeline of raw syngas, 13 – boiling vessel, 14 – washing column, 15 – first stage of raw syngas washing, 16 - condensation of light hydrocarbons and water steam, 17 - cooling, 18 – container of mud and boiling liquid, 19 – container of carbonized water, 20 – container of boiling liquid, 21 – reservoir of cooling water, 22 – reservoir of heated water,

23 – dosing of carbonized water, 24 - dosing of heated water, 25 – dosing of light hydrocarbons

Fig. 15: Container placing of development and testing technological line VÚZT, v.v.i. Prague - PolyComp, a.s. Poděbrady for carbonization and gasification of residues and waste with performance of 20 kg/h input feedstock

Fig. 16: View of the part of operational set of cooling and cleaning of syngas line VÚZT, v.v.i. Prague - PolyComp, a.s. Poděbrady with containers for operational liquids and condensation waste and washing column of raw syngas

The best results of energy parameters obtained syngases are shown in the table 2. Under optimal temperature parameters there was reached net calorific value of syngas from tested TAP (solid alternative fuel) - MEVO in range of 19,8 - 28,5 $MJ.m^{-3}_N$. It represents after recalculation of analyses results and after substraction of diluting air, it means on zero concentration of oxygen, net calorific value between 36,5 - 42 $MJ.m^{-3}_N$. These parameters are fully comparable with the net calorific value of natural gas. The results confirm the correctness of proposed, and in test operation verified, two-stage process. The obtained results are destined for design processing of demonstration operational unit with performance of 250 $kg.h^{-1}$ input material. By introduction of two, eventually more reactors it is possible to increase the performance. By this way it can be ensured the annual operational capacity around 5000 t TAP (solid alternative fuel) and standardized residual biomass to the syngas and its energy use within the decentralized plants.

Table 2: The best results of energy parameters of syngases obtained by two-stage technological processing of solid alternative fuels (TAP) in testing facility of VÚZT, v.v.i. Prague - PolyComp, a.s. Poděbrady

Parameter	Units	Temperature of carbonization **550 °C** Temperature of gasification **600 °C**		Temperature of carbonization **600 °C** Temperature of gasification **750 °C**		Temperature of carbonization **550 °C** Temperature of gasification **850 °C**	
		Results of analysis *)	Recalculated results to zero oxygen concentration	Results of analysis*)	Recalculated results to zero oxygen concentration	Results of analysis*)	Recalculated results to zero oxygen concentration
Hydrogen H_2	% V/V	3,8	5,71	4,09	6,93	6,03	8,32
Oxygen + (Argon) O_2 + (Ar)	% V/V	10,08	-	8,97	-	6,02	-

Nitrogen N_2		43,03	13,11	36,90	8,28	35,36	19,15
Methan CH_4		9,59	17,76	10,72	18,17	11,83	16,32
Carbon monooxide CO		4,66	8,64	4,82	8,17	4,54	6,26
Carbon dioxide CO_2		5,00	9,26	4,72	8,00	7,61	10,50
Ethylen C_2H_4		5,14	9,52	6,09	10,31	5,67	7,82
Ethan C_2H_6		5,89	10,91	7,61	12,89	3,91	5,40
Sum C_3		6,22	11,53	7,98	13,52	6,72	9,27
Sum C_4		2,41	4,46	3,27	5,54	5,67	7,82
Sum C_5		0,57	1,06	0,80	1,35	3,91	5,40
Density of syngas under normal conditions	$kg.m^{-3}{}_N$	1,280	1,273	1,287	1,286	1,355	1,380
Combustion heat of syngas	$MJ.m^{-3}{}_N$	21,33	39,52	26,62	45,11	30,63	42,24
Net calorific value of syngas		**19,78**	**36,65**	**24,49**	**41,84**	**28,48**	**39,28**

*) Analytic laboratory TESO® estimated uncertainty of individual determination O_2, N_2, CH_4, CO, CO_2 to 6 %; H_2, C_2H_4, C_2H_6 to 10 %; Σ C_3, Σ C_5 to 15 %. It isn´t entirely eliminate, that hydrogen concetrations were somewhat higher in time of sampling and concentrations of other components lower.

In relation to the realized verification of technology
decentralized pressing of rapeseed with treatment of rapeseed oil to the quality of standard ČSN 65 6516 „Automotive fuels – Fuel from rapeseed oil for vegetable oil compatible combustion engines – Technical requirements and test methods“ and
continual production of standardized blended diesel with high oxidation stability
there were determined the final requirements for quality shown in the tables 3 and 4.

Table 3: Requirements, test methods and limit values for automotive fuel -rapeseed oil

Property	Unit	Limit values		Test method
		min.	max.	
Visual opinion	–	Without evident contamination and sediments and also free water		–
Density at 15 °C	kg/m^3	910,0	925,0	ČSN EN ISO 3675 ČSN EN ISO 12185
Kinematic viscosity at 40 °C	mm^2/s	–	36,0	ČSN EN ISO 3104
Net calorific value	MJ/kg	36,0	–	ČSN 65 6169
Iodine number	g iodine/100 g	–	125	ČSN EN 14111
Acid number	mg KOH/g	–	2,0	ČSN EN 14104
Flash point in closed crucible	°C	101	–	ČSN EN ISO 2719
Ignition ability	–	40	–	
Oxidation stability at 110 °C	h	6,0	–	ČSN EN 14112
Total content of impurities	mg/kg	–	24	ČSN EN 12662

Sulphur content	mg/kg	–	10	ČSN EN ISO 20884 ČSN EN ISO 20846
Phosphorus content	mg/kg	–	3,0	ČSN EN 14107
Calcium content	mg/kg	–	1,0	ČSN EN 14538
Magnesium content	mg/kg	–	1,0	ČSN EN 14538
Water content	mg/kg	–	750	ČSN EN ISO 12937

Table 4: Requirements,test methods and limit values for blended diesel(SMN B30) with 30 % V/V FAME

Property	Unit	Limit values		Test method
		min.	max.	
FAME content	% (V/V)	30,0		ČSN EN 14078
Cetane number		51,0	–	ČSN EN ISO 5165 ČSN EN 15195
Density at 15 °C	kg/m^3	820,0	860,0	ČSN EN ISO 3675 ČSN EN ISO 12185
Distilling test at 250 °C predistilles at 350 °C predistilles 95 % (V/V) predistilles at	 % (V/V) % (V/V) °C	 85	 <65 360	ČSN EN ISO 3405
Polycyclic aromatic hydrocarbons	% (m/m)	–	5,6	ČSN EN 12916
Cetane index		46,0	–	ČSN EN ISO 4264
Sulphur content	mg/kg		10,0	ČSN EN ISO 20846 ČSN EN ISO 20884
Flash point	°C	over 55	–	ČSN EN ISO 2719
Carbonization residue (related to 10% distilling residue)	% (m/m)	–	0,30	ČSN EN ISO 10370 ČSN ISO 6615
Ash content	% (m/m)	–	0,01	ČSN EN ISO 6245
Total content of impurities	mg/kg	–	24	ČSN EN 12662
Corrosive effect on copper (3 h at 50 °C)	degree of corrosion	class 1		ČSN EN ISO 2160
Oxidation stability	h	20	–	ČSN EN 15751
Greasing ability, adjusted diameter of abrasion surface at 60 °C	µm	–	460	ČSN EN ISO 12156-1
Viscosity at 40 °C	mm^2/s	2,00	4,50	ČSN EN ISO 3104
Water content	mg/kg		250	ČSN EN ISO 12937
Acid number	mg KOH/g		0,20	ČSN EN 14104
Filtering ability (CFPP) Class B Class D Class F	°C		 0 –10 –20	ČSN EN 116
Cloud point Class F (inf.)	°C		 –8	ČSN EN 23015

Requirements for the contents of phosphorus, calcium and magnesium in rapeseed oil fuel were tightened with regard to the final treatment of exhaust gases of internal combustion engines. In order to simplify the analyses, the flash point in closed crucible was determined at min.101 ^{o}C. Requirement for density at 15 ^{o}C was narrowed in order to be proved possible admixtures of other fuels. The limit values for minimal iodine number, ash content and carbonization residue were eliminated. Requirements for quality of SMN B30 were updated in line with relevant demands for quality of diesel mentioned in the standard ČSN EN 590 and with demands for quality of FAME mentioned in the standard ČSN EN 14214. There was left out oxidation test according to the standard ČSN EN ISO 12205. Content of phosphorus, alkali metals and metals of alkali soils was limited according to the requirements for FAME pursuant to the standard ČSN EN 14214. There was tightened the requirement for water content (max. 250 mg/kg) and for oxidation stability according to the standard ČSN EN 15751 to min. 20 hours. Requirements for low temperature properties come from the standard EN 14214:2012.

Further There were finished the work activities related to the elaboration of final proposal of the standard ČSN EN 16214-4 „Sustainable criteria for production of biofuels and bioliquids for energy use - Principles, criteria, indicators and verifiers - Part 4: Methods of balance calculation of greenhouse gas emissions with use of analyses of life cycle“. This technical standard mentions the detailed methodology, which enables to an economic subject in chain of biofuels or bioliquids calculate by the standardized and transparent way the real greenhouse gas emissions connected with its activity and take into account all relevant mass standpoints. It includes all stages of chain from the production of biomass up to the transport to final consumer and distrubution activities. The methodology follows exactly principles and rules determined in the Renewable Energy Directive(RED) and especially its Annex V, Decision of European Community from June10, 2010 „On guidance for calculation of carbon resources in soil“ for purposes of Annex V Directive 2009/28/ES (2010/335/EU), as well as whatever another interpretation of legislative text published by the European Commission. Where it is necessary, the rules are precised, explained and further worked out. In relation to the calculation of heat, electricity and surplusses consumption it is possible to refer also to the Directive 2004/8/EC „ On promotion of combined production of heat and electricity based on demand for useful heat on internal market with energy“ and with it relating Decision of European Commission from December 21, 2006, which determines harmonized reference values of efficiency for separated production of electricity and heat. Technical standard ČSN 65 6508 was published by ÚNMZ in February 2013, ČSN 65 6516 in April 2013 and ČSN EN 16214-4 in August 2013.

Contact:
Petr Jevič , petr.jevic@vuzt.cz
Zdeňka Šedivá

Motor Fuels for Diesel Engines

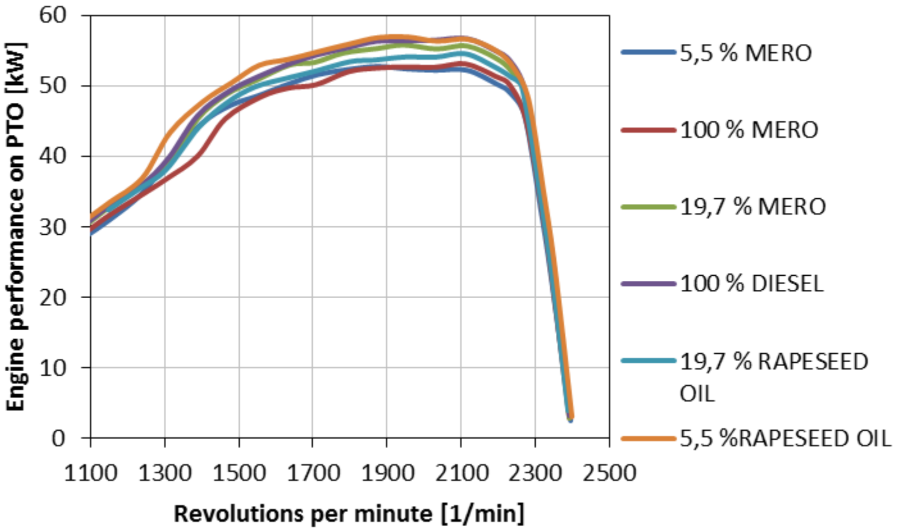
The majority of mobile energy means in agriculture is currently driven by diesel engine. For this reason the diesel, traditional fuel for diesel engines, has a significant share in energy consumption in the Czech agriculture. For many reasons there is an effort of society gradually replace the diesel oil by other fuels, for whose use it is not necessary to make significant modifications of engine. One of the main reasons is the fact, that traditional diesel fuel is the fuel of petroleum origin, whose reserves on Earth are limited. Equally important is the fact that results from the commitments of the European Union on reducing greenhouse gas emissions. Replacement of diesel fuel consumed in agriculture by fuel of plant origin will enable to support agricultural production and ideally also increase the energy independence of farms.

In addition to the possibility of using FAME (FAME – Fatty Acid Methyl Ester, ČSN EN 14214) there are plant oils other usable fuel in diesel engines, in our conditions there is mostly rapeseed oil (ČSN 65 6516). The direct utilization of vegetable oil in the combustion chamber reduces fuel costs, because it is not necessary to carry out the esterification of oil to the FAME, which is energy consuming and costly. Therefore, the vegetable oils are a promising fuel for agricultural mobile machinery, which would allow farms to increase energy self-sufficiency. Greater expansion of the fuel is limited by the fact, that vegetable oil cannot be burned in existing combustion enginesdestined for diesel or FAME without structural modifications of the engine.The vegetable oils have in comparison with diesel slightly higher density, slightly lower calorific value, considerably higher viscosity, higher flash point and they have also significantly lower oxidation stability. However, there is a possibility to use the blended fuels, which consist of diesel and vegetable oil, in a similar way as there is added today FAME in diesel.

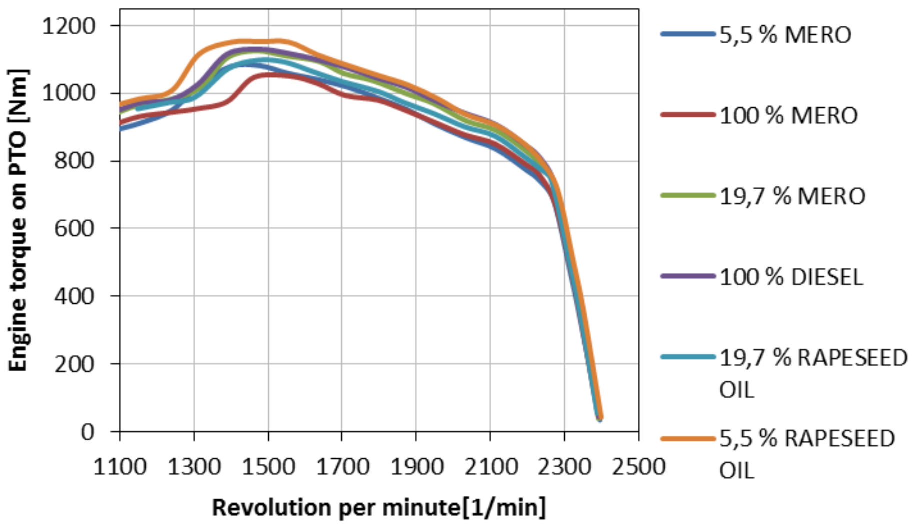
In order to verify the effect of blended fuels on performance, consumption and tractor engine smoke there were carried out the measurements, in which the tractor engine was loaded by dynamometer, while there were measured engine performance, its consumption of fuel and smoke. In total, the measurements were carried out at six different fuels : 100 % pure diesel, 100 % methyl ester rapeseed oil (MERO), blend 5,5 % MERO in diesel, blend 19,7 % MERO in diesel, blend 5,5 % rapeseed oil in diesel and blend 19,7 % rapeseed oil in diesel. At first, the particular fuels were compared on the basis of nominal rated speed characteristics. Furthermore, these fuels were compared on the basis of weighted average fuel consumption in eight different engine operating modes, that were selected in accordance with standardized test measuring NRSC points.

Results

According to the prepared methodology there was performed at first the measurement of nominal speed characteristics at PTO for all tested fuels. The measured performance and torque are shown on the figures 17 a 18.



Obr. 17: Motor performance of tractor Zetor Forterra 8641 for particular tested fuels



Obr. 18: Engine torque of tractor Zetor Forterra 8641 for particular tested fuels

From the measured characteristics result, that smaller shares of biocomponents in diesel fuel haven´t any significant impact on reducing of performance parameters of tractor engine. Even in case of addition of 5,5 % rapeseed oil into diesel fuel there has been a slight increase in torque and engine performance.

By means of the obtained torque curves for the individual tested fuels there were determined the measuring points of NRSC test. From the measured values of performances, fuel consumptions and smoke for individual measuring points of NRSC test there were calculated specific consumptions and specific production of particles for the whole NRSC test.

Summary of the results for various fuels is given in the table. 5. The table confirms the fact, that the specific fuel consumption increases with growing share of biocomponent in fuel due to the lower energy content in MERO respectively in rapeseed oil compared to diesel. In terms of diesel engine smoke and production of harmful particles the results of measurements show a positive effect of blending of biocomponents into diesel, especially in case of MERO.

Tab. 5: Results of NRSC test for tested fuels

Fuel	**Weighted specific consumption of fuel [g·kWh^{-1}]**	**Weighted specific production of particles [g·kWh^{-1}]**
5,5 % MERO	324,8	0,365
19,7 % MERO	325,6	0,136
100 % MERO	367,0	0,048
5,5 % rapeseed oil	312,7	0,118
19,7 % rapeseed oil	318,8	0,117

The presented results have been obtained during the solution of research purpose MZE 0002703102 „Research of Effective Use of Technological Systems for Sustainable Farming and Utilization of Natural Resources in Specific Conditions of Czech Agriculture“

Contact: Ing. Karel Kubín, Ph.D.

Measurement of Mulcher Power Input and its Energy Intensity

In line with working schedule of the project No. TA03010138 – „Utilization of Electric Motors in Agricultural Machinery " there were carried out in 2013 the experimental measurements of mulcher with conventional drive by means of the PTO - Power Take Off. To the main objectives of realized measurements belonged:

1. determine power input taken by mulcher from the tractor PTO during the mulching of grassland,
2. determine the fuel consumption of tractor during the work with mulcher,
3. evaluate of effect cutting edge of knives on energy intensity of mulcher,
4. determine the yield of grassland and dependence of power input taken by mulcher on performance of mulching,
5. evaluate the changes of monitored variables during the mulching of selected field.

Power output and energy intensity of mulcher during the work in field conditions

The main objective of measurement , which bas been taking place in July 2013, was to determine the power output taken from the tractor PTO during the mulching of clover-gramineous stand. The ascertained values formed the basic data for proposal of solution of mulcher with electric drive. The measurement was carried out on the selected field southward from the town Žamberk. For the measurement there was used working set consisting of the tractor John Deere 7930 (rated power output 189 kW) and MULCHER MZ6000.

Methodology of measurement

On the tested working set of tractor with mulcher there were installed at first the sensing units and another devices necessary to measurements of monitored variables during the working activity of set. On tractor PTO was installed sensing unit of torque MANNER Mfi 2500Nm_2000U/min. Into the fuel system of tractor there was placed a flow indicator AIC VERITAS 4004. For determination of set position and determination of its speed there was placed on the roof of tractor GPS receiver . By means of other sensors there were also monitored air temperature and pressure (evaluation of changes in altitude above sea level). All sensors were connected by means of appropriate converters to a measuring computer, which was placed in cabin of tractor.
In the first part of experimental plot there were traced three measuring sections with length ca 100 m (01, 02 and 03, see fig. 19). On these sections there were carried out three measuring drives at various working speeds of set (3 km/h, 6 km/h a 9 km/h). During this measuring drives the mulcher worked with knives, which have already shown considerable degree of wear. Analogously, in the second part of plot there were traced four measuring sections (04 up to 07) with length ca 180 m. The first of these sections was cultivated at the speed of 6 km/h and the mulcher was still equipped by weared knives. Subsequently all mulcher knives were exchanged for completly new ones. In th measuring sections 05, 06 and 07 there were evaluated energy intensity of mulcher equipped by new knives at working speeds 6 km/h, 9 km/h and 3 km/h.
The last part of this measurement was focused on evaluation of variability energy demands of mulcher during the common work. The part of experimental plot with an area of ca 2,3 ha was therefore mulched coherently and at the same time there were recorded continuously the values of PTO revolutions, torque transmitted over PTO, fuel consumption, position of set, working speed, temperature and pressure of air.

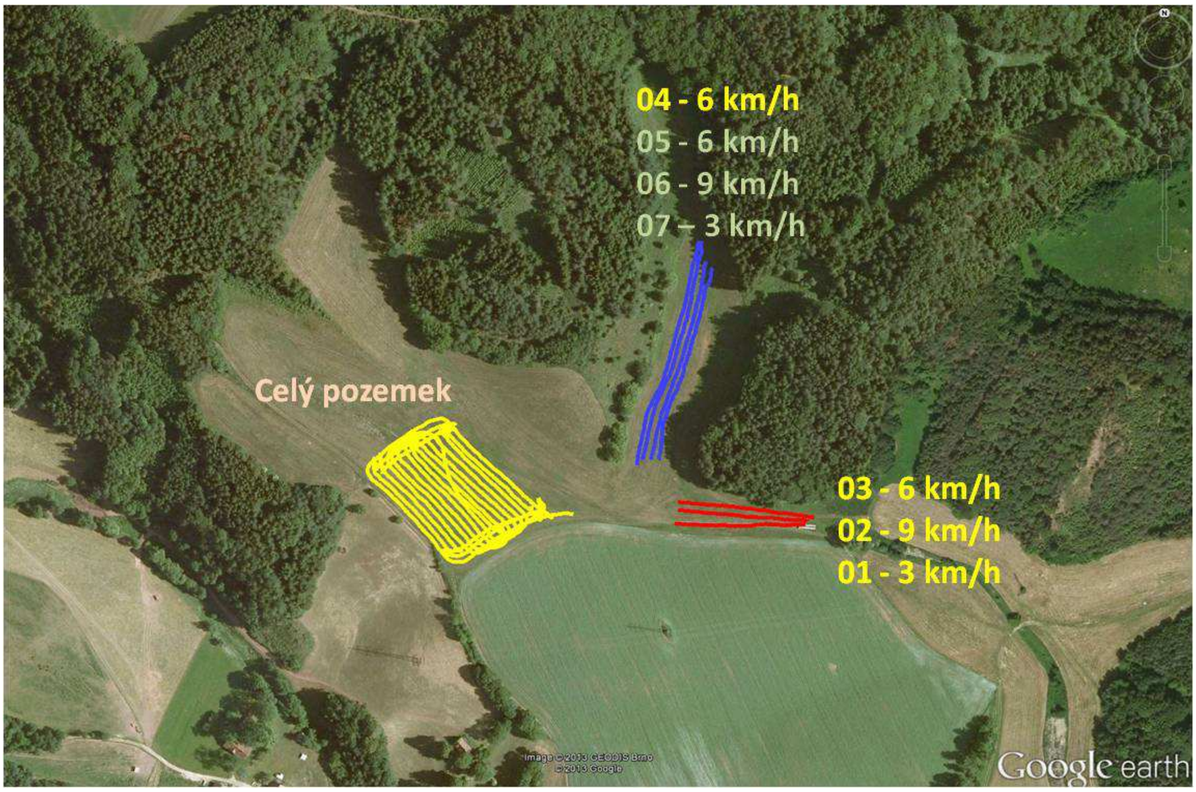


Fig. 19: Measuring sections

Results of measurements

Evaluated results of measurements on individual sections are shown in table T6. Selected courses of measured variables at measurement on the section 03 are illustrated on fig. 20. From measured values there was subsequently determined dependence of mulcher power input on mass performance of machine (fig. 21). Trajectory of tractor set with mulcher MZ6000 (new knives) at continuous mulching of plot with area of ca 2,3 ha is shown on fig. 22. Average values of monitored variables ascertained during this measurement are shown in the table T7. All measured values with their geografical localization were elaborated in the QGIS programme, in which there were created from these values so-called maps (see fig. 23), which illustrated clearly the changes in monitored variables on the whole mulched plot.

Table 6: Summary of measurement results of mulcher energy intensity on measuring sections 01 till 07

	Measuring section						
	01	**02**	**03**	**04**	**05**	**06**	**07**
Knives	old	old	old	old	new	new	new
Working width (m)	5,85	5,85	5,85	5,85	5,85	5,85	5,85
Distance covered (m)	111,0	107,6	113,7	193,3	188,9	170,2	176,7
Cultivated area (ha)	0,065	0,063	0,067	0,113	0,110	0,100	0,103
Total consumption (l)	1,05	0,49	0,68	1,12	1,13	0,83	1,50
Unit consumption (l/ha)	16,1	7,9	10,3	9,9	10,2	8,4	14,5
Average torque (Nm)	890,3	1272,1	1194,8	870,3	841,7	948,8	576,7
Average performance of PTO (kW)	92,6	131,0	125,9	89,9	89,3	98,9	60,8
Worktime (s)	117,5	41,5	61,5	107,5	104,5	66,0	182,5
Average speed (km/h)	3,40	9,34	6,66	6,47	6,42	9,28	3,49
Average rotation speed PTO(1/min)	993,0	984,2	1006,4	986,4	1013,5	996,5	1006,8
Performance (ha/h)	1,99	5,46	3,89	3,79	3,81	5,43	2,04
Yield of grassland (t/ha)	11,2	6,2	9,2	6,7	7,0	5,5	4,7

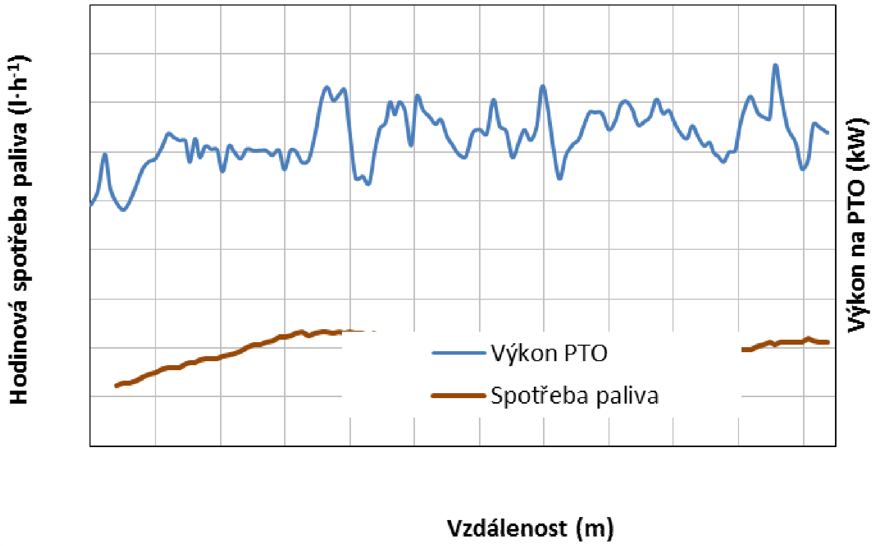


Fig. 20: Course of fuel consumption per hour and performance on PTO at measurement on the section 03

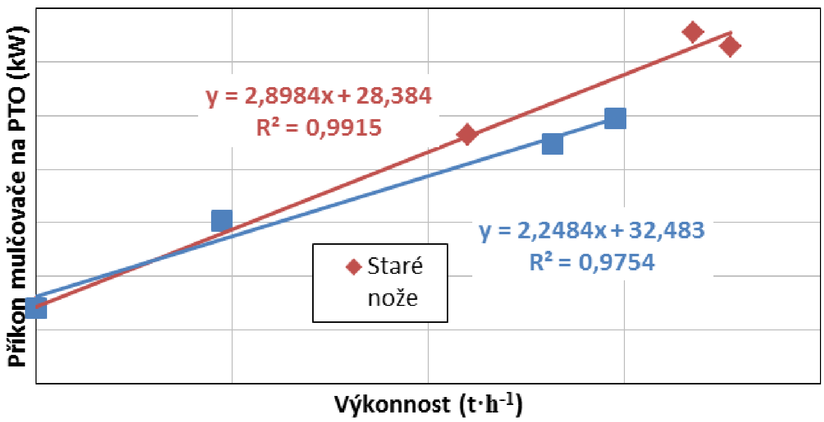


Fig. 21: Dependence of mulcher power input on performance of machine

Fig. 22: Trajectory of tractor set with mulcher during the continuous mulching of plot

Fig. 7: Average values of monitored variables measured during the continuous mulching of plot

Measurement on whole plot, new knives	
Working width (m)	5,79
Distance covered (m)	2765,6
Cultivated area (ha)	2,326
Total consumption (l)	14,38
Unit consumption (l/ha)	6,2
Average torque (Nm)	741,7
Average performance PTO (kW)	76,6
Worktime (s)	1634,0
Average speed (km/h)	6,09
Average rotation speed of PTO (1/min)	987,3
Performance (ha/h)	5,12

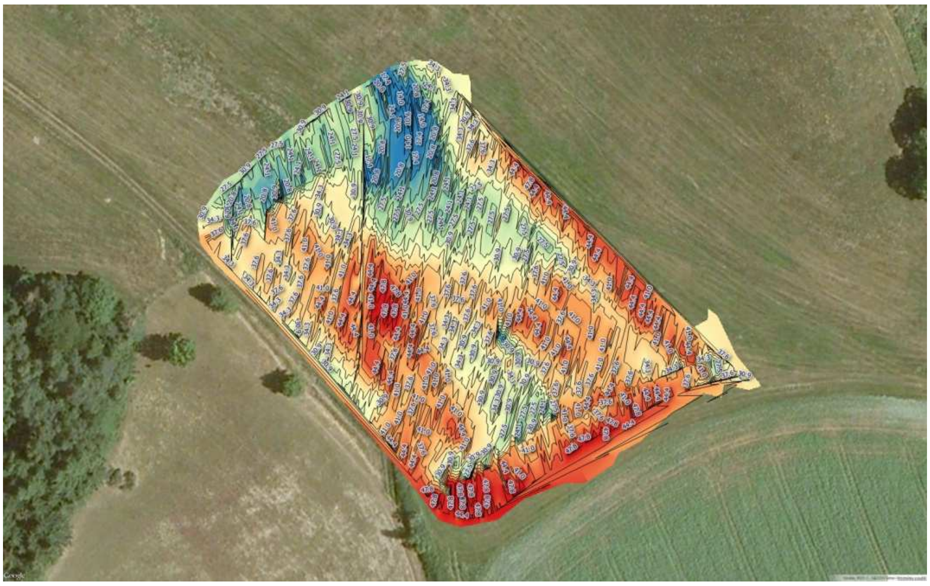


Fig. 23: Map of fuel consumption per hour on mulched plot

Conclusion – Measurement of mulcher in field conditions

The measurement of energy indicators of mulcher MZ6000 has proved the high energy intensity of mulching, when it is necessary to ensure the drive of mulcher with the performance up to 25 kW/ per 1m2 of working width. There was also confirmed the prerequisite, that, mulcher power input depends on working speed and yield of mulched stand. Exchange of weared knives of mulcher for completely new ones has brought awaited decrease of energy intensity and enhancement of machine work quality.

The realized measurement has proved unequivocally, that the performance offtake during the machine work is considerably uneven. Owing to this fact at conventional concept of machine drive by the PTO shaft comes to a considerable change of loading of combustion engine used energy means (tractor). Therefore, the combustion engine cannot work continuously in area with low specific consumption of fuel owing to the necessity of maintenance of constant revolutions. In comparison with it, in case of proposed concept

related to solution of working mechanism drive of mulcher by electric motors it is not taking place the rigid linkage between combustion engine revolutions and mulcher rotors. It must be utilized at suggestion of electric drive solution and nad it is also necessary to ensure the function of energy means engine in optimal area with regard to actual performance requirements of driven mulcher.
Presented results have been obtained during the solution of project No. TA03010138 – „Utilization of Electric Motors in Agricultural Machinery“

Contact: Ing. Karel Kubín, Ph.D. karel.kubin@vuzt.cz

Minimal Consumption of Energy for Maintenance of Basic Functions in Agriculture During the Critical Situations

The project solution in 2013 was aimed at determining the need of energy in crop and livestock production in critical situations. For the critical situations there are considered those, in which there is a restriction of energy supplies, especially fuel and natural gas. In this case it is necessary to ensure the energy supplies, which would guarantee the basic functions of agriculture, it means urgent need of food for population and products for energy production. Furthermore, maintenance of unused farmland and preservation of unused farm animals.

The basic indicator of energy intensity of labour, transport and handling operations is the unit energy consumption. This unit energy consumption is the consumption, which is linked to the unit work done.

The indicators used per unit of energy consumption in crop production are given in the Table 8.

Tab. 8: Indicators used at unit energy consumption

Field of activity	**Kind of energy**		
	Motor fuels (LTO)	**Electric energy**	**Natural gas**
Crop production	$l.ha^{-1}$ $l.t^{-1}$	$kWh.ha^{-1}$ $kWh.t^{-1}$	$m^3.ha^{-1}$ $m^3.t^{-1}$
Handling with material (transport,loading operations) storage, treatment of material	$l.t^{-1}$ $l.tkm^{-1}$ $l.ha^{-1}$	$kWh.ha^{-1}$ $kWh.t^{-1}$	$m^3.t^{-1}$ $m^3.ha^{-1}$

The unit energy consumption is affected mainly by:
- type of operation,
- conditions for realization of the operation (natural and production conditions, size of plots, slope of the land or driving direction, status of processed material, transport distance etc.),
- technical ensuring of operation (technical, exploitation and energy parameters of used machinery and its state).

This fact was taken into account at determination of consumption for each operation.

Operations were divided according to their position in the labour (cultivation) process into groups:
- basic tillage,
- tillage before sowing and planting,

- fertilization,
- establishment of crop stands,
- treatment of crops during the growing season,
- harvest of products,
- treatment of products after harvest and their storage.

There were included 225 operations into the solution. For these operations there was determined the unit energy consumption with regard to the production area, in which the operation is carried out (maize, sugar beet, potato and mountain areas) and on its technical equipment (kind and type of machine).

From the created set of operations there were selected those with less energy intensity as a suitable working processes for ensuring of crop production in critical situation.

Due to the short duration of crises (year, no more than several years) there is not expected, that the farms would change significantly the composition of their machinery. In the period of lack of energy, especially diesel and natural gas, the farms will utilize those, with lower energy intensity.

In comparison with standard situation there were eliminated from the critical working processes the operations, which aren´t necessary for production of plant products (several tillage operations, fertilization, crop treatment during the vegetation period etc.). However, the consequence will be a decrease in yields.

Minimal consumption of energy in critical situation was determined on the basis of results obtained at the solution of operations with low energy intensity, critical working procedures and technological systems created for critical situations.

Therefore, in the crop production there was determined minimal energy consumption for :

- food production,
- obtaining of products used to energy production,
- maintenance of unused agricultural land.

Consumptions of particular kinds of energy in critical situations have been determined both for individual regions and for manufactured products. Utilization of agricultural land in critical situation is given in the Table 9.

Table 9: Use of Agricultural Land in Critical Situation

Use of Agricultural Land	**Acreage [ha]**
Food production	1 433 409
Production of products used to energy production	1 168 262
Maintenance of unused agricultural land	752 697
Total	3 354 368 [1)]

Note: 1) Czech Statistical Office, Acreage of Agricultural Land in 2012

It is assumed, that in a critical situation the crops used to the food production will be grown on the 43% agricultural land and the crops used as the renewable energy sources on the 39% agricultural land. The remaining part of agricultural land will be maintained in a condition, that will allow its reutilization for production purposes.

The energy consumption in critical situation destined for food production, production of renewable sources and maintenance of unused areas is given in the Table 10.

Table 10: Energy Consumption in Crop Production in Critical Situation in the Czech Republic

Use of products	Kind of energy		
	Diesel	**Electric energy**	**Natural gas**
	[l]	[kWh]	[m^3]
Food production	112 084 943	31 990 313	6 663 551
Energy production	81 907 145	12 871 082	2 718 561
Land maintenance	20 518 621	0	0
Total	214 510 709	44 861 395	9 382 112

The energy consumption in critical situation destined for production of plant products was determined for individual regions and grown crops.

The presented results have been obtained within the project solution of the Ministry of Defence of the Czech Republic „Determination of Minimal Energy Consumption for Ensuring of Basic Functions of Agriculture in Critical Situations and Analysis of the Possibilities of its Ensuring from Own Resources of this Branch“ with identification code VG 2010 2014020.

Contact:
Ing. Otakar Syrový, CSc.
e-mail: otakar.syrovy@vuzt.cz

Size Effect of Tyre Contact Area and Number of Passages on Soil Compaction

The objective of measurements was to determine the size effect of tyre contact area and number of passages on soil compaction at working operation called transport of grain crops during the harvest. On the basis of measured parameters, it means penetrometric resistance of soil, porosity and compaction of topsoil by profilograph in specific soil conditions, there was compared the effect of using of road and flotation tyres. There was also necessary to determine the effect of multiple number of the passages in the same track on soil compaction.

For the measurement there was selected a tractor with semi-trailer. It was the tractor John Deere 7720 with semi-trailer Mega 20 (ZDT Nové Veselí). On the semi-trailer there was placed a tandem axle. The semi-trailer was filled by rapeseed during the whole period of measurement. Before this measurement the working set, it means tractor John Deere 7720 with semi-trailer Mega 20 wasm weighed by axle weighing machines HAENNI. The total weight of set made 32,6 tons (the weight of load was 15,6 tons). The tractor was equipped during the whole period of measurement by the same tyres (on the front axle - MITAS RD-02 Radial Drive, 480/70 R 30, with inflation pressure 190 kPa, on the rear axle - FIRESTONE MAXI TRACTION 620/70 R42 with inflation pressure 150 kPa). Then there were taken the tyre prints for both variants (fig. 24). From the measured weights falling on a wheel and from detected tyre prints there was calculated according to the standard ČSN 30 0523 the mean static specific pressure on a soft surface.

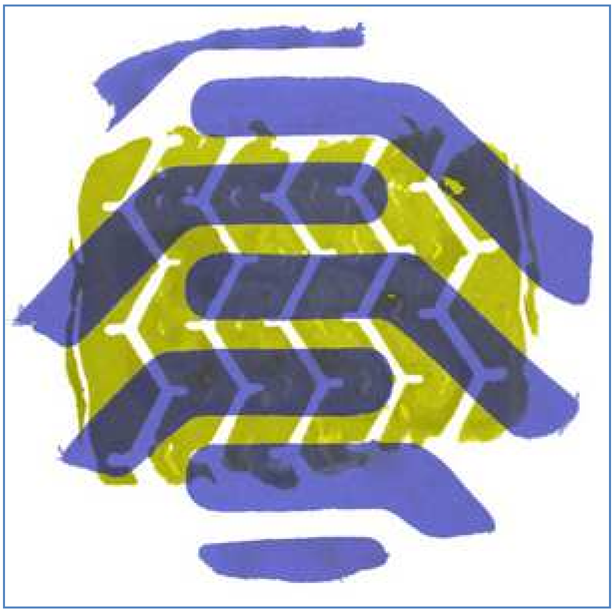


Fig. 24 Comparison of flotation tyre prints MITAS TRACTION TR-08, 550/60 - 22,5 (blue colour) and road tyre prints BARUM BT 41 ROAD TRAILER, 445/65 R 22-5 (yellow colour) during the same loading on hard surface under inflation pressure 120 kPa in case of working set of tractor John Deere 7720 with semi-trailer Mega 20

The proper measurement of soil compaction has taken place on stubble after harvest of winter rape and the semi-trailer was filled during the period of measurement by rapeseed.The measurement of soil compaction was the following: on the semi-trailer MEGA 20 there were mounted the flotation tyres(MITAS TRACTION TR-08, 550/60 - 22,5) with the inflation pressure for given loading (350 kPa) recommended by manufacturer. Before the proper measurement there was carried out the soil sampling in order to determine the porosity on marked section of measured plot (for every variant of measurement 3 samples in 3 depths) and soil samples for determination of soil moisture. There was measured the penetrometric resistance of soil and by means of wired profilograph there was determined transversal profile of soil before passage in three spots. Subsequently the set (tractor+semi-trailer) drove through the measured section. On marked spots there was carried out again the sampling, there was determined penetrometric resistance of soil and there were measured the soil profiles after first passage of section by the set. The working set drove through the section three times in total. After every passage there have been determined above mentioned parameters. Afterwards there were mounted on semi-trailer instead of flotation tyres the road tyres (BARUM BT 41 ROAD TRAILER, 445/65 R 22-5 with inflation pressure 750 kPa). The measurement was carried out in the same order as in case of flotation tyres. On the tractor there were mounted during the whole measurement the same tyres with the same inflation pressure. Road and flotation tyres on the semi-trailer have been inflated to the pressure given for loading recommended by manufacturer.

The mean static specific pressure of tyre on soft surface at tractor tyres was low - 1,27 kg/cm^2 at front wheel and 1,38 kg/cm^2 at rear wheel. In case of filled semi-trailer MEGA 20 with road tyres the mean static specific pressure 7,2 kg/cm^2. When the flotation tyres were used, this pressure decreased in average by 41 %. This fact was also confirmed after evaluation of measured data. It means data related to penetrometric resistance of soil, withdrawed soil samples for determination of porosity taken in the three depths and change of topsoil profile. More favourable effect of flotation tyres on soil was recorded also during the repeated passage, how it is evident from the fig. 25. The soil porosity before first passage was similar at both of variants and makes in the first depth 45 %. After first passage of working set with flotation tyres the porosity decreased to 43 %, at the second passage the porosity decreased to 36 % and after anather passage decreased to 34 %. In case of variant with road tyre the decrease of porosity was more evident already after first passage of set, when the porosity decreased to 33 %.

More favourable effect of flotation tyres on soil compaction was evident also from penetrometric resistance of soil fig. 26). The average penetrometric resistance of soil was higher at road tyres in comparison with flotation tyres. The resistance of soil, which doesn´t influence by passage, was in the depth of 40 mm 0,4 MPa and after another passages this resistance enhanced. In case of road tyres the soil resistance after three passages of set increased to 2,4 MPa, at flotation tyres was this value lower roughly by 25 %.

After evaluation of data from wired profilograph was ascertained, that the highest compaction of topsoil occurred after first passage both at flotation tyres and road tyres (fig. 27). In case of road tyres this compaction was in average 4,1 cm, after second passage of set this compaction enhanced to 5,2 cm and after another passage increased to 5,9 cm. This compaction was lower at flotation tyres in comparison with road tyres.

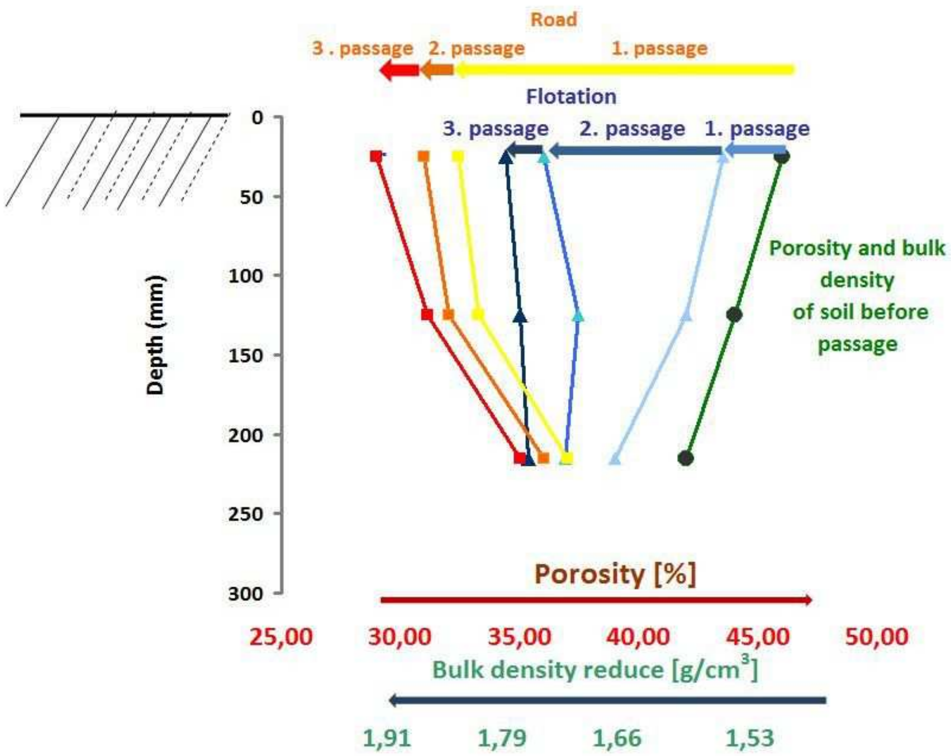


Fig. 25 Effect of number of passages on change in porosity and volume weight of soil in particular depths in case of working set of tractor John Deere 7720 with semi-trailer Mega 20 road and flotation tyres

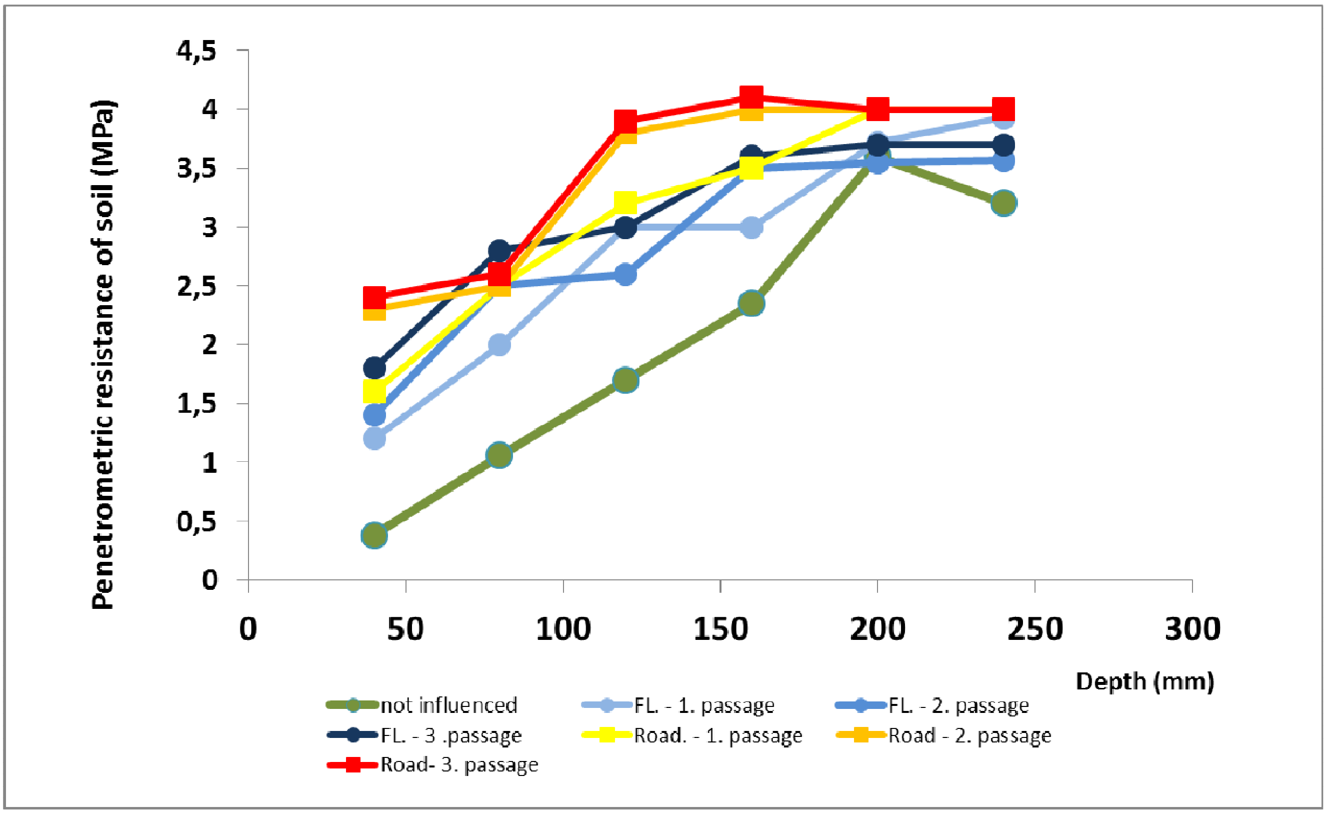


Fig. 26 Effect of number of passages on increase of penetrometric resistance of soil in particular depths at working set of tractor John Deere 7720 with semi-trailer Mega 20 road and flotation tyres

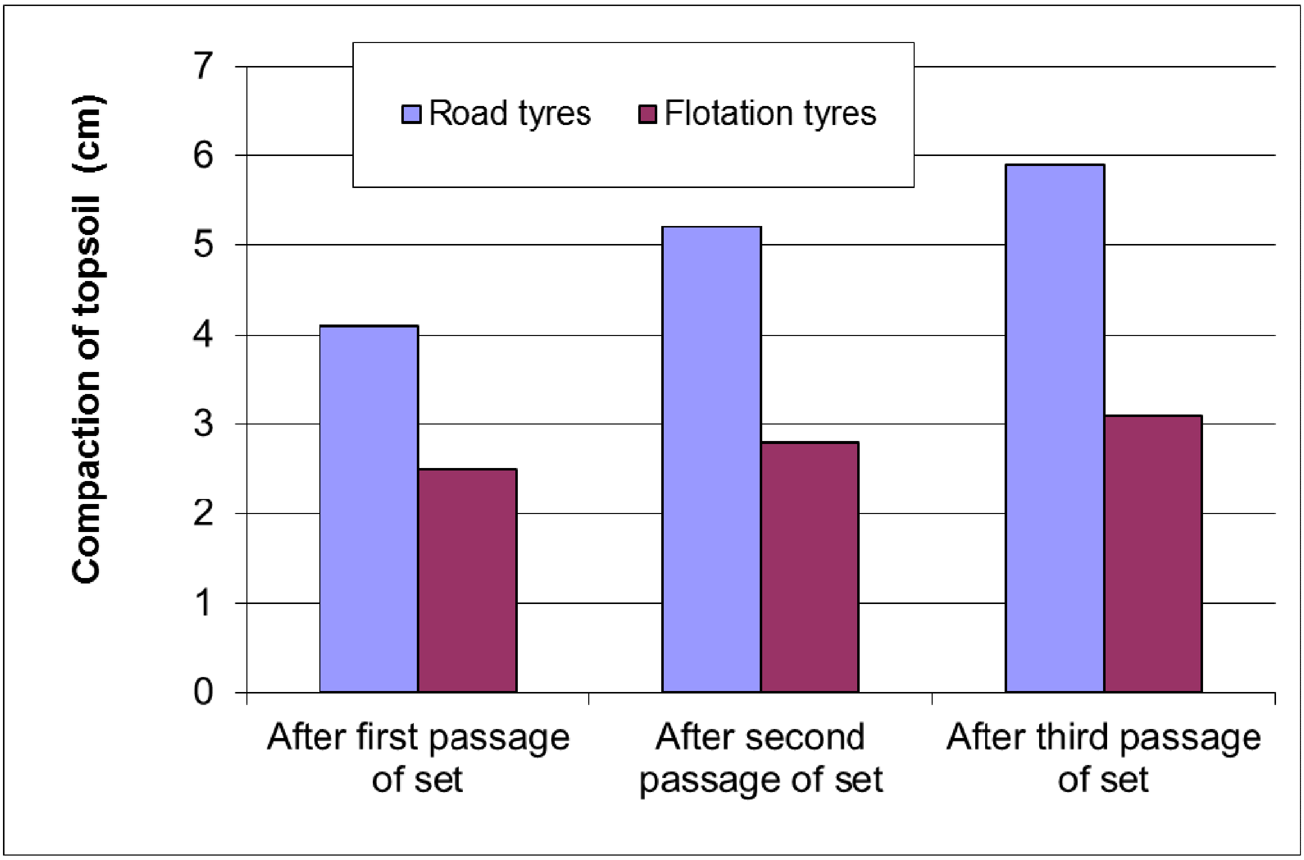


Fig. 27 Effect of number of passages on average compaction of topsoil during the use of road and floatation tyres in case of working set consisting of tractor John Deere 7720 with semi-trailer Mega 20 measured by wired profilograph

The presented results have been obtained during the solution of research purpose No. MZE 0002703102 "Research of Effective Use of Technological Systems for Sustainable Farming and Using of Natural Resources in Specific Conditions of the Czech Agriculture".

Contact: Ing. Radek Pražan, Ph.D.
E.mail: radek.prazan@vuzt.cz

1.30 Division of Economy of Agricultural Technological Systems

Head of Division
Ing. Zdeněk Abrham, CSc.,tel.: +420 233 022 399
e-mail: zdenek.abrham@vuzt.cz

Scope of activity
Research of technical and economic conditions of machinery utilization in agriculture

- utilization normative of operational and investment costs of agricultural machinery
- normative of technical and economic parameters of recommended sets for technical provision of agricultural production
- evaluation of state and innovation of technical equipment in agriculture
- evaluation of machinery necessity in agricultural enterprise

Research of technological, economic and energetic conditions of production systems in agricultural enterprise

- recommended technological processes in crop growing, input evaluation, production and general economic profitability of a crop
- rational systems of reserve and productive fertilization , selection of suitable material inputs under minimalization of costs
- evaluation of production purpose of agricultural enterprise, effect of fix and variable costs, influence of subsidies

Research of technological and economic conditions of material and energetic utilization of agricultural biomass

- recommended technological processes in growing of non-food crops
- recommended systems of material and energetic utilization of production
- economic and energetic effectiveness of biofuels

Transfer of new research results into practice and consultancy

- creation of internet advisory systems (sets of normative on the RIAE, p.r.i. website)
- creation of expert systems as the support of decision making process in agricultural practice –freely available on the RIAE, p.r.i. website – modeling and calculation of operational costs of machines and sets, technology and economy of crop cultivation, technology and economy of production and utilization of biofuels etc.

Expert System for Assessment of Production Economy and Biomass Utilization

Introduction

At the present time there is a great interest in production of solid biofuels. In relation to limiting resources of wood mass, it is necessary to aim in rural areas above all at biomass from agriculture. This biomass represents very important alternative source of energy. For the Czech Republic there has been already approved „National Renewable Energy Action Plan of the Czech Republic up to 2020 and the energy utilization of biomass is very important for fulfillment of these purposes.

In order to support of decision-making in this area there was created an expert system, which enables for growers of energy phytomass to assess comprehensively economy of energy crop growing and production of biofuels, provide the investors in agriculture with sufficient number of objective background data for choice of suitable technologies and improvement of projects for obtaining of subsidies. There are evaluated the production of energy crops, production of shaped biofuels and biomass utilization for biogas production. The results are offered to the users from agricultural practice by the form of internet expert system.

Expert system is realized by the form of database model programme. A user has a possibility to create his own enterpreneurial purpose, choose from database suitable recommended technological systems for its realization, evaluate operational and investment costs and further economic benefits of purpose, returnability of investment and energy effectiveness of a product.

Internet application of expert system (hereinafter ES) is solved by the manner enabling free transition between individual stages of output data entry and processing of results. Results or entered data is possible to store at any time and a user can return later to stored project and continue its processing.

The ES is divided into 3 main activities according to the type of production purpose in area of biofuels production :

- growing of energy crops
- production of solid shaped biofuels
- biogas production

The similar process diagram of expert system is shown on the figure 28.

A) Growing of energy crops

The final product in this part of expert system is a grown and harvested phytomass for further processing or for marketing in system of energy utilization. It contents intentionally grown energy crops and also phytomass from other agricultural crops (by-products of market crops – straw etc.).

The user´s work with expert system is carried out in the following steps :

Selection of production region *(M + SB, P,P +M)*

- *selection of crop and entry of acreage*
- *adjustment of technological and economic parameters of a crop*
- *calculation of quantity and economy of production*

According to entered acreage of crops and normatives adjusted by a user there are calculated the quantity and final production economy of energy crops to output summary.

The indicators are mentioned in the table according to individual crops and it means, that it is possible to evaluate the benefit for the whole business plan. Therefore, a user can gradually return to the previous steps, change the crops or production details of individual crops and by means of this modelling to search **for optimal variant of production plan.**

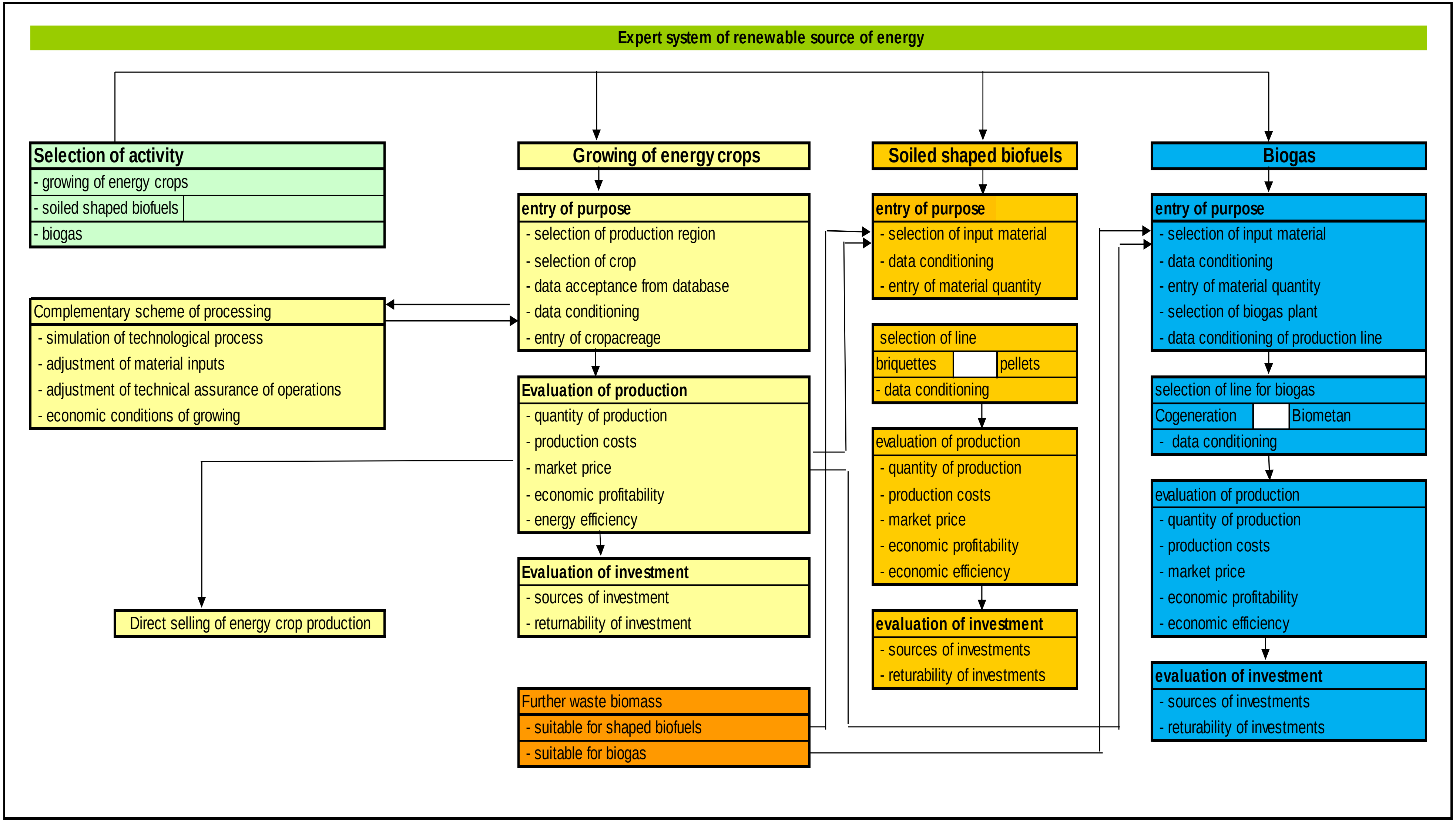


Fig. 28 Process diagram of expert system

B) Production of shaped biofuels

The input material (feedstock) can be a phytomass obtained from above mentioned production purpose or phytomass purchased as agricultural phytomass (straw, hay, grain etc.) and also non-agricultural phytomass (sawdust, wood chips, waste originating from processing industry etc.). The final products in this part of expert system are briquettes and pelletes.

User´s work with expert system is carried out in the following steps :

- *selection and entry of input materials*

The materials can be selected from database of input materials. The choice of concrete kind of phytomass is carried out by a user´s entry of phytomass quantity. In database the every material has preset basic parameters, which are important for the production of shaped biofuels and their fuel properties. These properties can be modified according to local conditions. By this manner it is possible to entry also a new material, which isn´t contained in database.

- *selection and entry of shaping line – there is carried out in 3 steps*:
  - specification of production - on the basis of input materials there is carried out specification of production type, quantity of production and market price;
  - specification of production line – briquettes/pelletes, necessity of building of production hall, drying of input material and packaging of production
  - selection of concrete variant of line from database and specification of its technical and economic normatives (according to background data relating to machine equipment or construction), further it is possible to entry other operational costs (for example.: renting of buildings, rent or operation of machines, production and administrative expenses, overhead expenses etc.)
  - way of financing – there is entered the utilization of subsidies and credit for financing of purpose
- *economy of purpose –example of output relation is mentioned on the figure* 29 and this one is divided into 5 parts:
  - header - title, elaboration date, file of entries for calculation;
  - operational costs of line – material inputs, energy, repairs and depreciations, personal costs, foreign capital costs, other costs;
  - economy of production plan– receipts, costs, profit/loss, profitability, returnability of an investments;
  - economy of production – market price, costs, profit/loss for production unit;
  - energy efficiency of production – energy for input material, energy for biofuel production, energy value of production, energy efficiency (energy obtained/supplied)

C) Biogas production

The final product is biogas and its combined utilization for the production of power energy and heat, eventually treatment of biogas to biomethane.

User´s work with expert system is carried out in the following steps:

- *selection and assignment of biomass* – selection of biomass kind and biomass quantity is made by a user similarly as in case of shaped biofuels from the offer of material database, dry matter content and ratio of C and N substances are assessed continuously (C:N).

Technologie a ekonomika produkce biopaliv

Úvod a volba výrobního záměru	Otevřít model nebo ho uložit	Vstupní materiály	Zadání linky	Produkce a náklady linky	Způsob financování	Ekonomika záměru

Zobrazit/skrýt mapu programu Subsystém: **Výroba tuhých tvarovaných biopaliv - Ekonomika záměru**

Tisknout

Ekonomika linky na výrobu tvarovaných biopaliv - Název: model-1 Dne:17.01.2014

Vstupní materiál		Množství (t/r)		Sušina (%)	Cena (Kč/t)
Pšenice ozimá - sláma		1000		85	600
Výrobní linka	Produkce celkem	Volně ložená		Balená	Ostatní
Roční produkce :	944 t	944 t	5000 (Kč/t)		
Investiční náklady (tis. Kč) :		Celkem: 8000		Stavba: 2200	Technologie: 5800
Financování (tis. Kč) :		Dotace: 0		Úvěr: 0	Suma splátek: 0
Podrobnější specifikace linky :		Drcení: ano		Sušení: ano	Balení: ne
		Instalovaný výkon (kW) 600		Počet pracovníků: 1.8	ON obsluhy (Kč/h): 120

Roční provozní náklady linky (Kč/r)

Vstupní materiály	600 000
Sušení vstupních materiálů	30 000
Elektrická energie	480 000
Odpisy stavby	73 333
Odpisy technologie	580 000
Náklady úvěru	0
Opravy a udržování	392 000
Osobní náklady	475 200
Ostatní provozní náklady	0
Celkem	2 630 533

Ekonomika výroby

Výnosy výrobního záměru	(Kč/r)	4 720 000
Náklady fixní	(Kč/r)	653 333
Náklady variabilní	(Kč/r)	1 977 200
Náklady celkem	(Kč/r)	2 630 533
Zisk+/ztráta-	(Kč/r)	2 089 467
Míra rentability	(%)	79
Návratnost	(r)	4

Ekonomika produkce

Tržní cena na jednotku produkce	(Kč/t)	5 000
Náklady celkem na jednotku produkce	(Kč/t)	2 787
Zisk+/ztráta- na jednotku produkce	(Kč/t)	2 213

Energetická efektivnost produkce

Energie na vstupní materiál	(GJ/t)	0.70
Energie na výrobu biopaliva	(GJ/t)	0.11
Energie spotřebovaná celkem	(GJ/t)	0.81
Energie produktu (biopaliva)	(GJ/t)	15.1
Energetická efektivnost biopaliva	(GJ/GJ)	18.64

Odeslat

Fig. 29: Line destined for production of shaped biofuels – output relation

- *assignment of line – there is given detention time in fermenter*, utilization of biogas production, efficiency of cogeneration unit and necessity of other technological supplements;
- *specification of production and costs of line* – data from database of technological lines can be
  modified according to the background data of line supplier;

- *financing of production plan - there is entered utilization of subsidies and credits for* financing of plan
- *business plan –final output relation is divided into* 3 main parts:
  - header - title, elaboration date, basic data related to input material, production data and assignment of line, investment costs of line, financing of line;
  - operational costs of line – material inputs, energy, depreciations of building and technology, repairs and maintenance, credit expenses, personal costs, liquidation of digestate, other costs;
  - economy of production – receipts, costs, profit/loss, profitability, returnability

Conclusion

Decision about diversification of agricultural entrepreneurial subject in the area of energy biomass utilization is very important. There are usually the investments in amount of several dozens of millions with relatively long period of returnability. In the current conditions of agricultural enterprises the management has for this decision-making absolute lack of objective background data , decision-making is often subjective and wrong decision can considerably worsen economic situation and stability of an agricultural enterprise for a long time.

The results of long-lasting work are offered to user´s practice in the form of freely accessible internet expert system. The similar comprehensive on-line expert system for growing and processing of biomass hasn¨t been elaborated so far. The presented expert system should increased significantly the quality of decision-making and reduce the risk of wrong investments purposes. At the same time this system creates the conditions for improvement of economic stability of an enterprise and contributes to the rural development.

This programme is freely utilizable from the end 2013 on website of project solver WWW.VUZT.CZ .

These results have been obtained within the solution of research project TA ČR TD010153 „Expert system for evaluation of technology and economy of production and biomass utilization“.

Contact:
Ing. Zdeněk Abrham, CSc.,tel.: +420 233 022 399
e-mail: zdenek.abrham@vuzt.cz

1.40 Division of Ecology of Agricultural Technological Systems

Head of Division
doc. Ing. Antonín Jelínek, CSc.,tel.: +420 233 022 398
e-mail: antonin.jelinek@vuzt.cz

Scope of activity

- Research of problems relating to the effect of agricultural activity on the environment - atmospheric burden by emissions of ammonia, greenhouse gases, odours and dust
- Proposals and verification of new technologies applying in agriculture the element of nanotechnologies as well as technologies suitable for sustainable husbandry In landscape
- Verification of methods serving to an utilization of suitable agricultural machinery for renewal of historic countryside and processing of biologically degradable waste originating from agricultural activity, or maintenance of countryside
- Direct application of outputs resulting from solution of particular problems originated in process of formation laws, decrees of government or departmental ordinances
- Advisory activity for the spheres of air polution, Best Available Technique (BAT), Biologically Degradable Waste processing and improvement of agricultural activity In cultural landscape
- Authorized measurement of gas and odour emissions (certificate)
- Employees of division are „Competent pw sod' (CP) within the Act on integrated prevention (IPPC)

Selected results of division research activity in 2013

Vermicomposting of Agricultural Residual Biomass

The vermicomposting (composting with using of earthworms) is a processing technology known in the CR mainly from domesting processing of cooking scraps. It is mainly for the reason, that this way of biowaste processing is quite simple and uses the principles known from the nature. For this purpose there are used various types of **small-scale vermicomposters**–from simple crates up to multilevel plastic vermicomposters. An user can influence the processing and qualityof vermicompost, which is then utilized by this user in crop cultivation.

When we handle with large volumes of residual biomass from livestock and crop production including wineries, it prevails in our country the classic composting in piles on open area, where, owing to the aeration, there are used the expensive and for operation demanding compost turners. However, **large-scale productive vermicomposting on the open area,** which is similar to the conventional composting technology in band or surface piles gains more and more importance.

Outdoor arrangement of vermicomposted raw materials **into the band or surface piles on the open area** is the simplest type of vermicomposting.
This form of vermicomposting **is easy to invest and technically simple**. The piles with raw materials is not necessary to dig up or turn, it is only necessary to monitor the temperature and humidity inside the and, if necessary, to ensure their correct value for vermicomposting, for example by watering.

The most widely used variant of vermicomposting on the open area in established piles is so-called **„additional feeding of earthworms“.** In this process the raw materials means – the feed for earthworms – added to the surface of pile in the layer 30-50 cm every 3 weeks. Then the earthworms move to higher layers searching food and it leads to the processing of raw materials. Disadvantage of this process is higher number of realized working operations (continual delivery of raw material).

At the volume of processed residual biomass greater than 1 m^3 (height of pile is min. 0,5 m) and correct establishment the earthworms are not influenced by weather conditions. In winter only thin surface layer is frozen and the earthworms inside the pile live nrmally in the majority of cases, process the residual biomass and in conditions of higher temperature they reproduce as well.

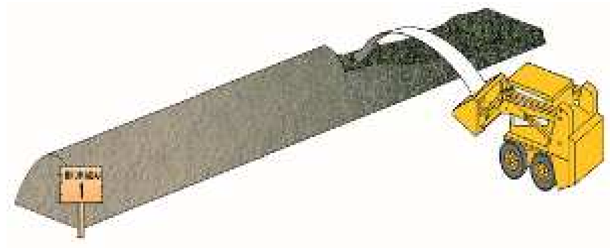
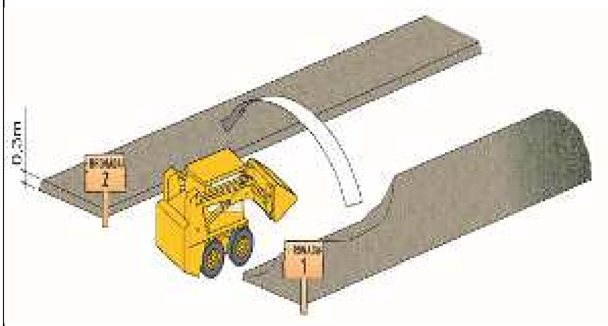
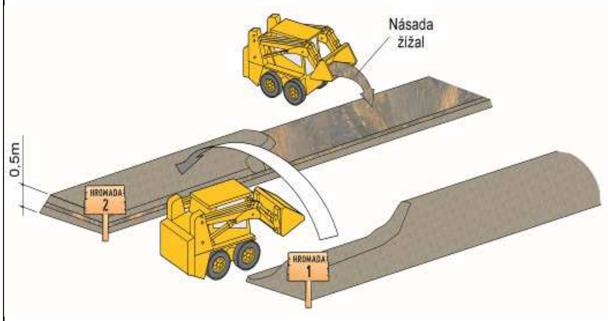
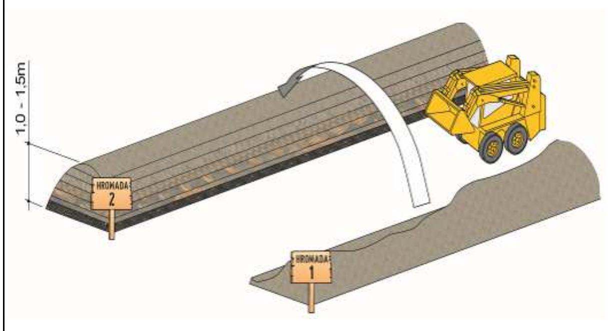
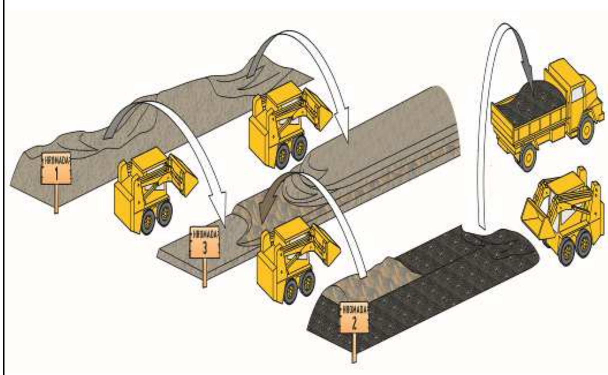
Individual operations carried out in process of vermicomposting in band piles on the open areas is shown in the table 11.

In case of vermicomposting is one of the most demanding working operations the **separation of earthworm individuals from the finished vermicompost** at the end of process.

One of the ways how to do it is the method, whereby after a certain period of additional feeding by fresh ingredients **the top part of a pile is removed** čby means of frontal loader and this removed material - „earthworm substrate" is used for establishment of a new pile.

The second possibility how to remove the earthworms from the finished vermicompost, is **establishment of a new pile in the immediate proximity of processed pile**. Then the earthworms can find their way and move themselves into a new pile, where they can find something to eat. In both cases there will be some loss of earthworm individuals.

Table 11: Vermicomposting in band piles on open area

1		Homogenized processed material is store with using of front wheel loader iinto the **band pile No. 1**, without Californian earthworms. In the **pile No. 1** there takes place the first phase of the composting process – heating across the entire pile up to temperatures unacceptables for earthworms.
2		After warming up, the processed materials are taken from one end of the **pile No.1**. by means of front loader and used for establishment of the **pile No.2 –** its underlyin**g** layer. **The pile No. 1 i**s complemented according to the needs by the new residual bomass
3		Into the **pile No. 2** there are given the earthworms – on created substrate layer with a thickness of ca 0,3 m and then the Californian earthworms are evenly spread in the layer of ca 0,1 m. On this layer there is laid the layer of material with thickness of ca 0,1 m from **pile No. 1.** After establishment the total height belt **pile No. 2** max. 0,5 m.
4		After 21 days required for acclimatization of earthworms there are laid, at certain time intervals, additional layers of residual biomass with a thickness of ca 0,5 m from **pile No. 1** up to the total heigth of the **pile No. 2** ca 1,0-1,5 m. A necessary prerequisite for any further layering is to monitor the temperature inside the beltt **pile No. 2** and compliance with maximum permissible temperature of 35 °C.
5		In the final stage of vermicomposting process there is separated from the **pile No. 2** zthe processed material with Californian earthworms from the finished vermicompost and those are given into newly prepared band **piley No 3,** where it was created the underlaying layer from the material from **pile No. 1.** After removal of all materials with Californian earthworms from **pile No. 2** the finished vermicompost can be dispatched. This procedure ensured **ncontinuous operation** of processing of residual biomass without additional costs for further delivery of Californian earthworms.

Practical examples of vermicomposting in agriculture

The Research Institute of Agricultural Engineering, p.r.i. (RIAE,p.r.i.) in collaboration with the FILIP company - Lužice u Hodonína, which belongs to the important companies in the Czech Republic engaged in breeding of Calirnian eatrhworms, participated in introduction of vermicomposting of biologically degradable residuesi at many farmers. There are especially the following enterprises :

I. VINSELEKT MICHLOVSKÝ (fig*. 30a)*

Vermicomposting **– in band piles on open area**
Kind of raw materials – **mouldings after processing of grapevine** (marc)
Quantity of processed raw materials – **600 t/year^{-1}**
Quantity of one-off purchased earthworms - **7 t**

II. Organic farmer KRÁL, Břeclav *(fig. 30b)*

Vermicomposting **- in band piles in bunker silo**
Kind of processed materials – **agricultural residual biomass**
Quantity of processed materials **- 100 t/year^{-1}**
Quantity of one-off purchased earthworms - **10 t**

III. ZOO Prague *(fig. 30c)*

Vermicomposting – **in surface piles on open non-secured area**
Kind of processed materials – **waste biomass from the zoo**
Quantity of processed materials – **60 t/year^{-1}**
Quantity of one-off purchased earthworms - **6 t**

IV. MANNER, o.s.

Vermicomposting – **in surface piles on open non-secured area**
Kind of processed materials – **horse and sheep manure**
Quantity of processed materials **- 150 t/year^{-1}**
Quantity of one-off purchased earthworms – **15 t**

V. Winery KOVACS, s.r.o

Vermicomposting – **in band piles on open secured area**
Kind of processed materials – **mouldings after processing of grapevine** (marc)
Quantity of processed materials – **80 t/year^{-1}**
Quantity of one-off purchased earthworms - **8 t**

VI. Wine MARCINČÁK *(fig. 30d)*

Vermicomposting – **in band piles on open secured area**
Kind of processed materials – **mouldings after processing of grapevine** (marc)
Quantity of processed materials – **600 t/year^{-1}**
Quantity of one-off purchased earthworms - **10 t**

Fig. 30: Agricultural vermicomposting installations

Economy of vermicomposting

Process of composting has to be carried out in installations with capacity over 150 t.r^{-n} on hydrologically safeguarded area. It is valid both for conventional composting and for vermicomposting. In view of the fact, that the costs for building a new secured area are in the most cases the most important item of investment into these installations, **the costs for acquisition of compared technologies won´t be significantly different.** However, in spite of it, it is possible to find certain differences in economic costs for building and subsequently operation of particular installations.

The total costs **for turning of materials established i**n belt piles – quantity of 1 000 t in one composting cycle (90 days) make **72 946,- CZK.**

The total costs **for acquisition of earthworms** for processing of 1 000 t residual biomass **in one composting cycle** (300 days) including costs for their **additional feeding** make **59 000, - CZK.**

The costs for processing 1 000 t residual biomass are in case of vermicomposting lower, however the length of composting cycle – keeping the processed materials on the composting area – is in case of vermicomposting 3,3x longer. It leads to an increase of costs during the process of vermicomposting. In view of the fact, that earthworms are acquired for the period of several years without necessity of their renewal (it is **one-off investment)**, the final costs are for certain period covered and in comparison with conventional composting, where it is necessary to carry out continuously the turning,, are ever reducing.

Conclusion

Finally,it is possible to say that the vermicomposting penetrates slowly also into our country. To this situation contribute the following aspects:

I/ **reduction of costs**, which are expended for turning of piles – The access of air into the processed materials is secured by earthworms, which form tiny corridors inside the piles;

II/ **investment in earthworms is single** – earthworms reproduce in optimal conditions and they can be used to the processing further quantity of biowaste;

III/ vermicomposting is the process **taken from nature** – during the vermicomposting aren´t added into processed materials any additive substances - vermicomposting and subsequent utilization of vermicompost is suitable especially **for organic farmers;**

IV/ by vermicomposting can be solved at growers **problem of handling with residual biomass and delivery of quality ecological fertilizer into the soil** (for example processing of marc at wine-growers);

V/ **qualitative features of** produced vermicompost are in many cases higher, than at common compost thanks to beneficial substances, which come to the compost from digestive system of earthworms – they have high content of nutrients, humus substances, useful microorganisms, enzymes and phytohormons;

VI/ final product **vermicompost – organic fertilizer of high quality**, its application has a positive effect on agrochemical and biological properties of soil and subsequently on increase of yields and production quality, furthermore on increase plant resistence against diseases and pests and for this reason it is possible to reduce (or remove) dosing of protective spraying;

VI/ by means of earthworms and their enzymes it is possible to process successfully **strongly evil-smelling biowaste, w**ithout molesting of composting plant surroundings;

VII/ one of few **unfavourabl**e **parameters** of vermicomposting is the period of keeping the processed materials on secured composting area (ca 3,3x longer)

vermicomposting is therefore advantageous especially for processing **quantity of residual biomass up to 150 t/year^{-1}**, when it is not necessary to have a hydrologically secured area. From the long-term view the vermicomposting is then cheaper than conventional composting.

The solvers of research project NAZV QI91C199 ***„Optimization of technology of farm vermicomposting“***, funded by the Ministry of Agriculture of the Czech Republic believe, that in view of growing popularity of environmentally-friendly technologies and products and above mentioned aspects the vermicomposting, which is a suitable technology serving to change of agricultural residual biomass into valuable raw material, will find very soon application at more farmers.

Contact:
Ing. Petr Plíva, CSc.
E-mail: petr.pliva@vuzt.cz

Monitoring and Analysis of Selected Technical and Technological Systems Used in Dairy Cow Breeding in the Czech Republic

Monitoring of selected technical and technological systems used in dairy cow breeding in the Czech Republic takes place within the project solution of the Ministry of Agriculture of the Czech Republic No. NAZV QJ1210375 „Research of Dairy Cow System from the View of Optimization of Microclimate and Energy-Economic Intensity“. All activities connected with project solution are realized on four selected experimental farms for cattle breeding in the Czech Republic (farm A – farm D). The stables included in monitoring differentiate in urbanistic and building solution as well as used technical and technological systems. Charakterization of particular stable objects is mentioned in modified Annual Report 2012 related to the project QJ1210375. Furthermore there are presented the selected partial results of realized measurements and analyses.
For all monitored stable objects there were prepared on the basis of obtained background data and carried out analyses building and constructional elements 3D models of stables. An example is shown on the Fig. 31.

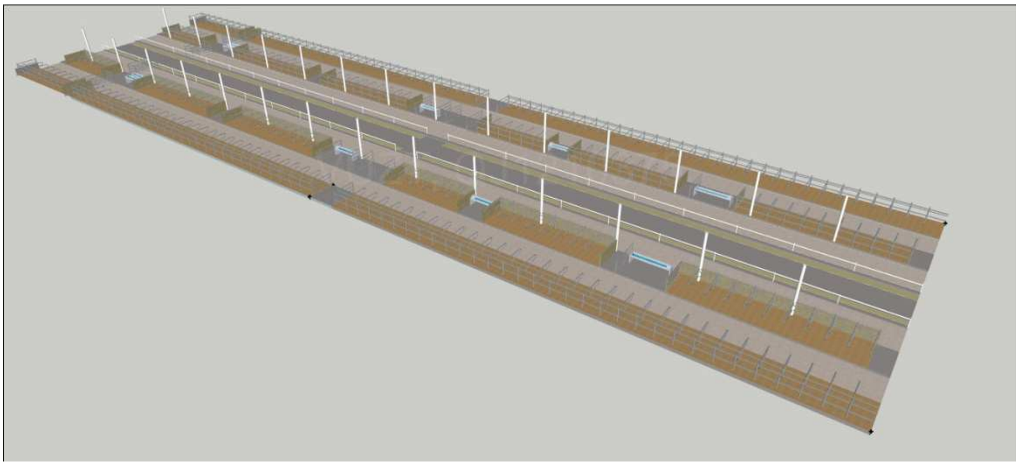


fig. 31 *Internal arrangement of experimental stable (farm C)*

On all experimental farms are monitored in long-term period the data about microclimatic conditions in stable objects by means of suitably placed recording device equipped by sensors
for measurements of air temperature**, relative air humidity** and dew point, which in regular time interval, record the data concerning microclimate. In order to evaluate the effect of climatic conditions on microclimatic ambient inside the stables, the recorders of temperature, relative humidity and dew point are placed also in outdoor space (outside the stable). To the monitoring of climatic conditions in site of measured objects serve meteostation, which completes information from recorders of temperature and relative humidity with information about intensity of solar radiation, direction and strenght of wind and another climatic data.
In order to compare the effect of the stables from the constructional and technological point of view on temperature welfare of animals there was used, among others, temperature and humidity **index** THI, which is the function of temperature and humidity and it is used for evaluation of dairy cows welfare.
The course of temperature and THI during the extremely warm summer day is illustrated on the fig.. 32 resp. on fig. 33. How we can see from mentioned diagrams, the temperature and THI index inside the all stable objects is lower than outside.

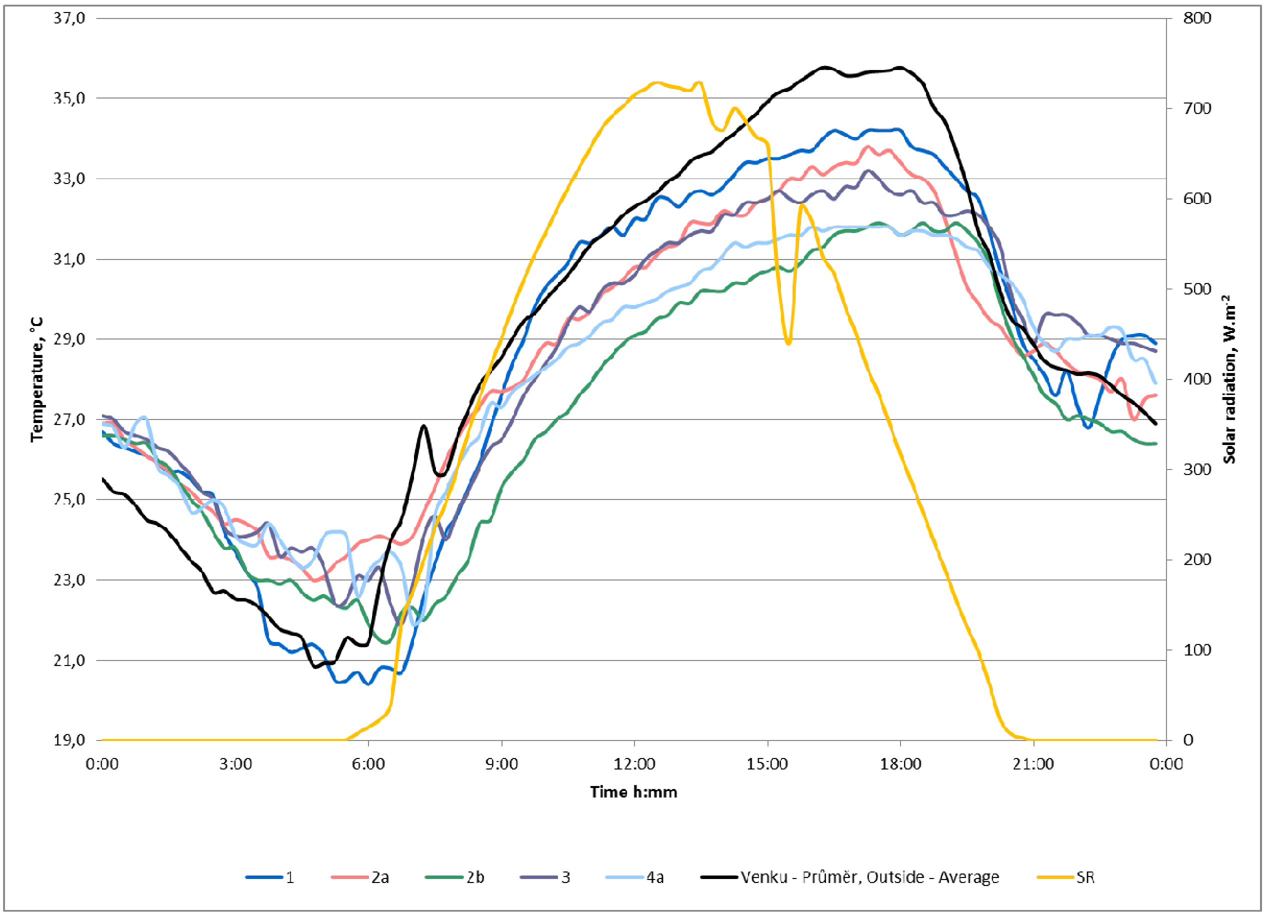


Fig. 32 Course of temperature inside the dairy cows stable and in outside space *(extremely warm summer day)*

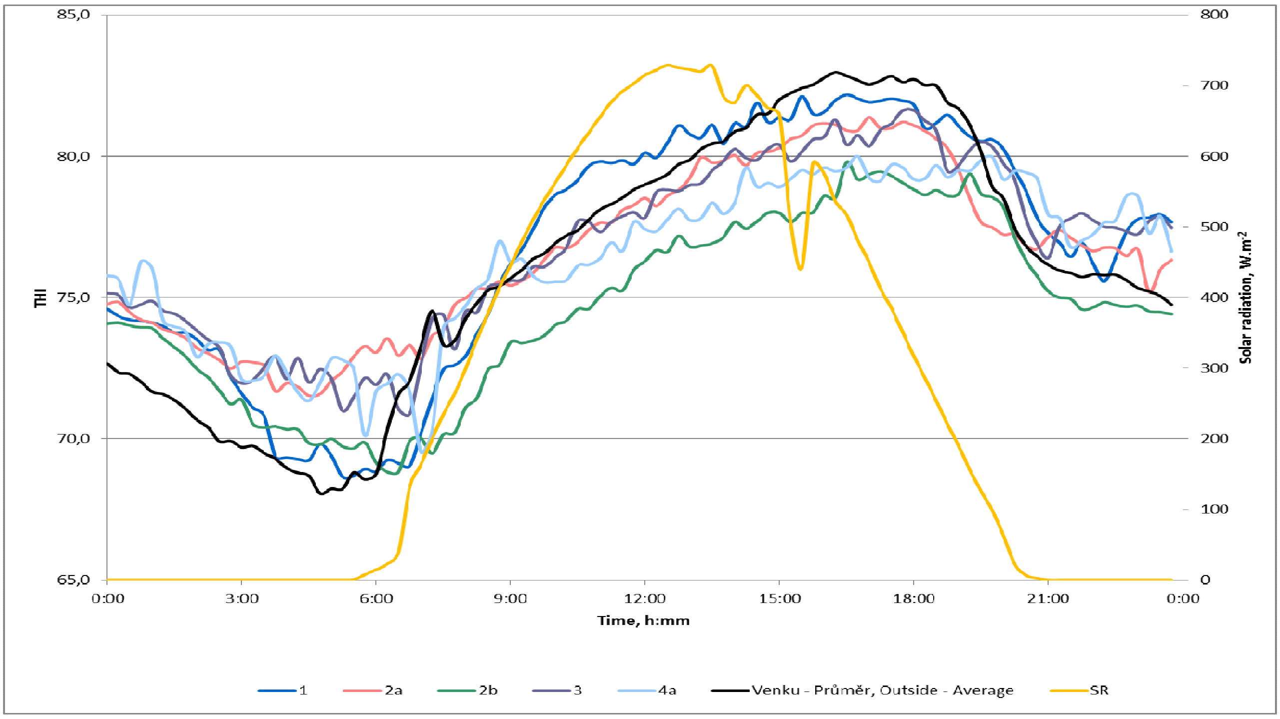


Fig. 33 Course of the THI inside the dairy cows stable and in outside space (extremely warm summer day)

In diagram on Fig. 33 there is mentioned number of days, when there was surpassed during the summer time the limit of mild temperature stress (THI > 72) and limit of mean temperature stress (THI > 78) for the period of 1 hour per day at least.

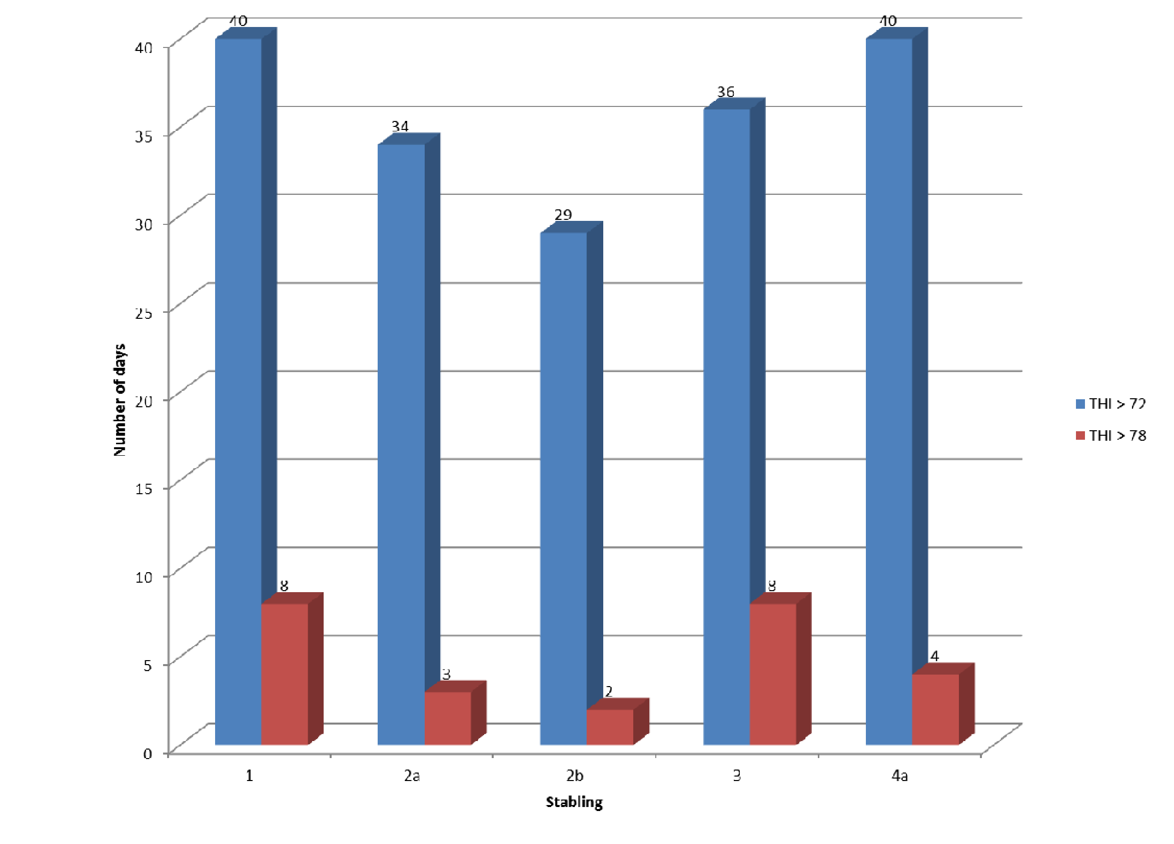


***Fig. 34** Number of days, when there was surpassed in summer season (from 1.6.up to 22.8.) the limit of temperature stress for the period of 1 hour at least*

The monitoring of electric energy consumption at fans in experimental stables has gone on in 2013.
For example, in the monitored stables on the A and B farms the fans are controlled automatically according to the temperature. In the stable S1 the fans are installed in 2 rows, in every row there are 6 fans. In the stables S2a and S2b the fans are installed in 2 rows, each row with 5 fans. In these stables there is used the gradual regulation of revolutions according to temperature, fans are switched on at the temperature ca 20°C on 1/3 performance, at the temperature ca 25°C on 2/3 performance and at temperature ca 30°C on full performance. In the stable S3 The fans are controlled by hand in regime ON/OFF without using the possibilities of performance regulation and without possibility of automatic control according to climatic parameters in stable. The maximal power input of one fan on A, B and C farms is 1300 W. The example of processing of measured data is obvious on Fig 35.

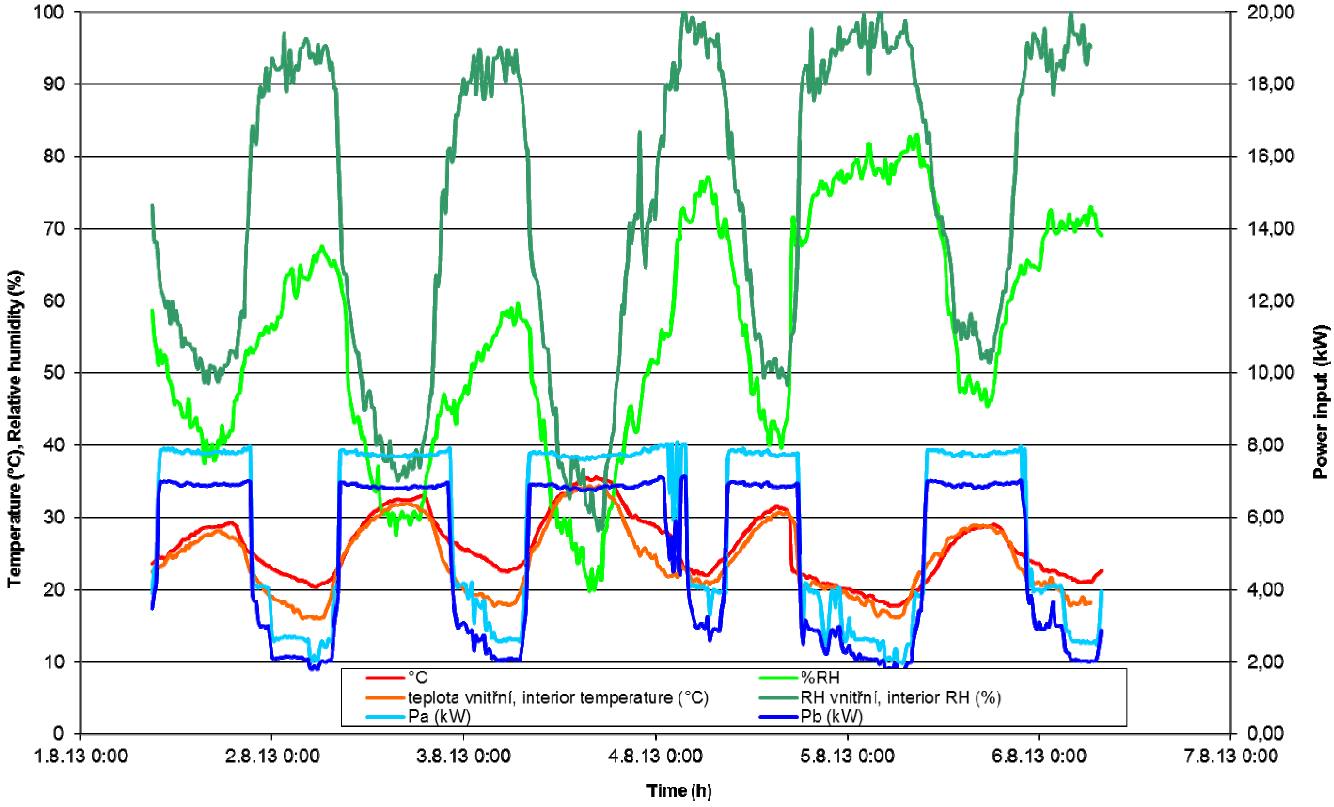


Fig. 35 Measured courses of *temperature and relative humidity of air in outside ambient and in stable S1 together with power inputs of left and right group of fans (farm A)*

On basis of input **analysis of illumination systems** in monitored stables there was determined for adaption of illumination one of monitored objects. There was begun collection and more detailed analysis of related data. Apart from it there was ascertained, that by influence of operational staff, it comes to the repeated late switching off illumination in early hours of a day. Time periods, when the illumination was switched on, were evident from Fig. 36.

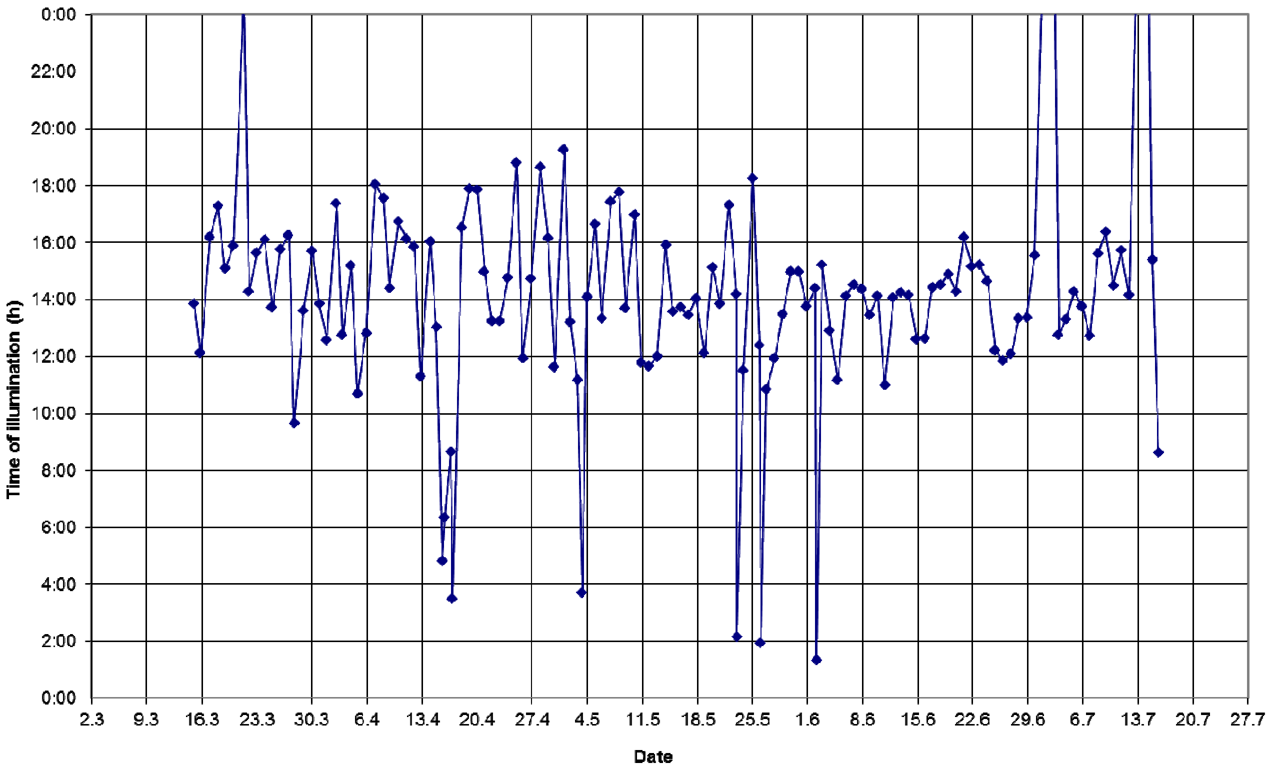


Fig. 36 Shining time of fluorescent devices *in one of monitored stable objects*

We can see, that the periods of illumination don´t correspond to the changing length of day (monitored period from 14.3. up to 16.7. 2013) and obviously rather correspond to the times, when in stable take place individual technological operations. At the same time there was ascertained, that, fluorescent devices are connected into groups regardless to the level of well-proportioned illumination in night hours (reduced power input) and during the whole period of illumination there is switched on the overall illumination, which should be switched on only in well-founded cases. It is unsuitable with regard to the energy consumption, therefore it will be prepared a design of automatical control of illumination.

Contact:
doc. Ing. Antonín Jelínek, CSc.
e-mail: antonin.jelinek@vuzt.cz
Ing. Petra Zabloudilová
e-mail: petra.zabloudilova@vuzt.cz
Ing. Miroslav Češpiva
e-mail: miroslav.cespiva@vuzt.cz
Ing. Josef Šimon
e-mail: josef.simon@vuzt.cz

International Cooperation, Conferences, Agreements on Cooperation

Membership in International Organizations

The representatives of the Research Institute of Agricultural Engineering, p.r.i. (RIAE,p.r.i.) are members of the following organizations :
European Association of Potato Research (EAPR),
ESSC (European Society for Soil Conservation),
ISTRO (International Soil and Tillage Research Organization),
The RIAE, p.r.i. is an active member of ENGAGE (Association of European Institutes of Agricultural Engineering). This association is included in EurAgEng as a regional association of agricultural graduates for Europe within the CIGR. Our institute is also a member of Association of Agricultural Engineering Institutes of Central and Eastern Europe (CEEAgEng).
The representative of institute (Ing. M.Dědina, Ph.D.) is a member of two working groups : Technical Working Group for Intensive Livestock Farming (IPPC sphere) – Czech representative for branch of agriculture under gestion of the Ministry of Environment of the Czech Republic; Technical Working group for Ammonia Abatment in the frame of UNC (ensuring of application and principle of the Göteborg Protocoll – CLTRP-IPPC sphere) – Czech representative for the Ministry of Agriculture of the Czech Republic under gestion of the Ministry of Environment of the Czech Republic.

International Cooperation, Conferences, Agreements on Cooperation

There were concluded agreements on cooperation with two Slovak partners:
- Faculty of Mechanization of Slovak University of Agriculture in Nitra

The content of cooperation is common measuring work in sheep breeding with the aim to consider the technical parameters of stables and breeder conditions in a selected agricultural cooperative, measurement of air conditioning parameters of pigsty and examination of technical possibilities of sheep breeding stables for measurement of emissions. There was installed a measuring device for long-term monitoring of microclimatic parameters in pigsties and there was launched data collection.
- Agrovaria Export-import, limited liability company, Štúrovo – direct cooperation in the sphere of applied research, mainly at processing of biologically degradable waste and reduction of ammonia and greenhouse gas emissions in agriculture.

The content of cooperation:
- experiments carried out during the separation of pig and beef cattle slurry,
- experiments relating to dosage of biotechnological preparations into the liquid fertilizers or feed water in process of biologically degradable waste composting,
- organization of joint scientific workshops dealing with problems of relation between agriculture and environment.

For common experiments the AGROVARIA, limited liability company lends its own technological equipment and the RIAE, p.r.i. (VÚZT, v.v.i) Prague gives measuring devices. The outcomes are presented jointly. As the result of mutual cooperation after operational experience with separator was realized constructional modification of separator.

Agreements on Scientific and Technical Cooperation

Agreement on Direct Scientific and Technical Cooperation between the VIESCH Moscow (The All – Russian Research Institute for Electrification of Agriculture) and the RIAE,p.r.i. (VÚZT, v.v.i.) Prague in the sphere of agricultural energy.

The contract between the RIAE,p.r.i. (VUZT,v.v.i.) Prague and Institute of Ecobiotechnologies and Bioenergy at the National University of Life and Environmental Sciences of Ukraine, Kiev).
Agreement on Scientific and Technical Cooperation was concluded with North-West Research Institute of Mechanization and Electrification of Agriculture (SZNIIMESH) in Sankt Petersburg.

Multilateral Cooperation

Cooperation in connection with solution of project ALTENER XVII/4.1030/Z/99-386: Biodiesel Courier International – A Union-Wide News Network:
Mr. Werner Körbitz, Chairman of the Austrian Biofuels Institute (ABI), Vienna, Austria – editor
Mr. Dieter Bockey, Assistant Director of Union zur Förderung von Öl- und Proteinpflanzen (UFOP), initially Bonn, later-on Berlin, Germany
Mr. Peter Clery, Chairman of the British Association for Biofuels and Oils (BABFO), Spalding, United Kingdom
Mr. Petr Jevic, task leader Biodiesel, Research Institute for Agricultural Engineering, p.r.i. (VÚZT, v.v.i.), Prague, Czech Republic

All agreements on cooperation have been approved by the Council of Institution.

Deliveries (Results) Solutions for 2013

I. Category – Published results

J_{imp} – Article in Professional periodical

HANČ, A., PLÍVA, P., 2013: Vermicomposting technology as a tool for nutrient recovery from kitchen bio-waste. Journal of Material Cycles and Waste Management, 15: 431-439.

J_{sc} – Articles in Reviewed Journals (SCOPUS or ERIH)

SOUČEK, J,: MOULDS Occurrence in Woodchips, RAE 2013,

HUTLA, P., PETRÁČKOVÁ, B., KÁRA, J.: Experimental model of ammonia elimination by ozone in the air. Res. Agr. Eng., 59 (2013), s. 39-45. ISSN 1212-9151

J_{rec} – Articles in Czech Professional Non-Reviewed Journals

ABRHAM, Z., ANDERT, D., MUŽÍK, O., HEROUT, M.,: Energetické využití zemědělské biomasy, Komunální technika. č.5, roč. VII, 2013, vědecká příloha, příspěvek č 2., ISSN 1802-2391

BRADNA, Jiří a Jan MALAŤÁK. Možnosti dlouhodobého skladování potravinářských zrnin ve věžových zásobnících. *AgritechScience* [online], 2014 – recenzovaný článek, předáno oponentovi 12/2013, ISSN 802-8942.

FABIANOVÁ, Mária, Petra ZABLOUDILOVÁ, Josef ŠIMON a Miroslav Češpiva. Stavebně-hygienické ukazatele rekonstruovaných stájí. *Náš chov*, 2013, č. 9, s. 62 - 64. ISSN 0027-8068.

GERNDTOVÁ, I.: Analýza dopravy sena a zavadlých pícnin při sklizni sběracími návěsy. [Analysis of the transport of hay and wilted grass during harvest by means of loader wagons] In: *Agritech Science,,* předáno oponentovi 12/2013, ISSN 802-8942

GUTU D., HŮLA J., KUMHÁLA F., KOVAŘÍČEK P.: The influence of traffic in permanent traffic lanes on soil compaction parameters. In.: *Trends in Agricultural Engineering 2013*, Prague, CULS Prague, Faculty of Engineering, 2013, p. 186-190. ISBN 978-80-213-2388-9

HAUSVATER, E., ČEPL, J., DOLEŽAL, P., KASAL, P., MAYER,V.,VOKÁL, B. (2013): Zásady pěstitelské technologie. In: Brambory: šlechtění – pěstování – užití – ekonomika. Praha: Profi Press, 2013, s. 60-100. ISBN 978-80-86726-54-0.

HUTLA, Petr, Lukáš VYHLÍDKA a Josef ŠIMON. Osvětlení stáje pro dojnice. *Světlo : časopis pro světlo a osvětlování,* 2013, č. 6, s. 40 – 43. ISSN 1212-0812.

HUTLA, P., VYHLÍDKO, L., MIČÍN, R.: Možnosti osvětlení zemědělské opravárenské haly. Agritech Science, 8 (2014), ISSN 1802-8992 [v tisku]

HUTLA, P., BÍMA, V., ŠIMON, J.: Osvětlení stájí pro dojnice. Světlo, 17. ISSN 1212-0812

HUTLA, P., VYHLÍDKO, L.., ŠIMON, J.: Osvětlení stájí pro dojnice. Světlo, 16 (2013), č. 6, s. 40-43. ISSN 1212-0812

CHAJMA, P., KÁRA J.: Provozní sledování kvality bioplynu v závislosti na použitých surovinách substrátu. [Operational quality monitoring biogas in relation raw to substrate]. *AgritechScience* [online], 2013, roč. 7, č. 1, s. 1-10. ISSN 1802-8942. Dostupné z: http://www.agritech.cz/clanky/2013-1-4.pdf

KOVAŘÍČEK P., HŮLA J., VLÁŠKOVÁ M.: Snížení propustnosti zhutnělé půdy v jízdních stopách strojů. *Mechanizace zemědělství*, 2013, roč. LXIII, č. 5 s. 34-36. ISSN 0373-6776

KOVAŘÍČEK P., ABRHAM Z., HŮLA J., VLÁŠKOVÁ M.: Hnojení tuhými minerálními hnojivy, vliv na půdu a vodní erozi. *Mechanizace zemědělství*, 2013, roč. LXIII, č. 9 s. 60-62. ISSN 0373-6776

KOVAŘÍČEK P., HŮLA J., VLÁŠKOVÁ M.: Snížení propustnosti zhutnělé půdy v jízdních stopách strojů. *Mechanizace zemědělství*, 2013, roč. LXIII, č. 5 s. 34-36. ISSN 0373-6776

KOVAŘÍČEK P., HŮLA J., VLÁŠKOVÁ M.: Vliv zapraveného kompostu na míru povrchového odtoku vody při simulovaném zadešťování. *Komunální technika*, 2013, roč. VII, č. 5, vědecká příloha, příspěvek 26, 4 s. ISSN 1802-2391.
KOVAŘÍČEK P., ABRHAM Z., HŮLA J., VLÁŠKOVÁ M.: Hnojení tuhými minerálními hnojivy, vliv na půdu a vodní erozi. *Mechanizace zemědělství*, 2013, roč. LXIII, č. 9 s. 60-62. ISSN 0373-6776

KOVAŘÍČEK P., HŮLA J., VLÁŠKOVÁ M.: Vliv zapravení kompostu na pórovitost a na vlhkost půdy. *Agritech Science* http://www.agritech.cz/, 2013, č. 2, článek 3, s. 1-5. ISSN1802-8942

MACHÁLEK, Antonín, Jiří VEGRICHT a Josef ŠIMON. Inovace v oblasti dojící techniky. *Náš chov*, 2013, roč. LXXIII, č. 2, s. 69-70. ISSN 0027-8068.

MAYER, Václav. Technika pro pěstování, sklizeň a tržní úpravu brambor. [Technique for growing, harvest and market adjustment potato.]. *Mechanizace zemědělství*, 2013, roč. LXIII, č. 9, s. 82-85. ISSN 0373-6776, MAYER, Václav. Technika pro pěstování, sklizeň a tržní úpravu brambor. Mechanizace zemědělství. 2013, roč. 63, č. 9, s. 82-85. ISSN 0373-6776.

MAYER, V., HŮLA, J., KASAL, P., VEJCHAR, D. (2013):Technika pro pěstování, sklizeň, posklizňové zpracování, skladování a tržní úpravu brambor. In: Brambory: šlechtění – pěstování – užití – ekonomika. Praha: Profi Press, 2013, s. 120-136. ISBN 978-80-86726-54-0.

MAYER, V., VEJCHAR, D., PASTORKOVÁ, L. (2013): Zdraví škodlivé látky při produkci brambor a metody jejich měření.(dáno a zařazeno do tisku) AgritechScience [online], 2013, roč. 7, č. XX. ISSN 1802-8942. Dostupné z: http://www.agritech.cz/clanky/2013 č. XX

PLÍVA P.: Kompostování Ekocentrum Vyšehrad – 16/2013. *Komunální technika*, 2013, roč. VII, č. 5, s. 44-46. ISSN 1802-2391.

PLÍVA P.: Kompostárna Jaroměř AGRO CS – 17/2013. *Komunální technika*, 2013, roč. VII, č. 6, s. 26-27. ISSN 1802-2391.

PLÍVA P.: Správná teplota, významný faktor úspěšného kompostování. *Odpadové fórum*, 2013, roč. 14, č. 2, s. 16-20.
ISSN 1212-7779

PLÍVA P.: Kompostárna Želivec – 22/2013. *Komunální technika*, 2013, roč. VII, č. 11, s. 20-22. ISSN 1802-2391.

PLÍVA P., KOVAŘÍČEK P., VLÁŠKOVÁ M.: Technologie kompostování zbytkové biomasy ze zemědělské činnosti . *Úroda*, 2013, roč. 61, č. 12, vědecká příloha CD Aktuální poznatky v pěstování, šlechtění, ochraně rostlin a zpracování produktů, s. 68-75. ISSN 0139-6013.

PLÍVA P.: Kompostárna Humpolec – 23/2013. *Komunální technika*, 2013, roč. VII, č. 12, s. 27-29. ISSN 1802-2391.

PLÍVA P., KOVAŘÍČEK P., VLÁŠKOVÁ M.: Technologie kompostování zbytkové biomasy ze zemědělské činnosti. *Úroda*, 2013, roč. 61, č. 12, vědecká příloha (CD) Aktuální poznatky v pěstování, šlechtění, ochraně rostlin a zpracování produktů, s. 68-75. ISSN 0139-6013

PLÍVA P.: Kompostárna Městec Králové – 12/2013. [*Composting Městec Králové – 12/2013*]. *Komunální technika*, 2013, roč. VII, č. 1, s. 12-13. ISSN 1802-2391.

PLÍVA P.: Kompostáreň Městec Králové. [*Composting Městec Králové*]. *Komunálna technika*, 2013, roč. V, č. 1, s. 32-33. ISSN 1337-9011

PLÍVA P.: Centrální kompostárna Brno, a.s. – 13/2013. *Komunální technika*, 2013, roč. VII, č. 2, s. 20-22. ISSN 1802-2391.

PLÍVA P.: Centrálna kompostáreň Brno, a.s.. [*Composting Městec Králové*]. *Komunálna technika*, 2013, roč. V, č. 2, s. 32-34. ISSN 1337-9011

PLÍVA P.: Kompostárna Jarošovice – 14/2013. *Komunální technika*, 2013, roč. VII, č. 3, s. 18-20. ISSN 1802-2391.

PLÍVA P.: Kompostárna Trhový Štěpánov – 15/2013. *Komunální technika*, 2013, roč. VII, č. 4, s. 16-18. ISSN 1802-2391.

PLÍVA P.: Kompostáreň Trhový Štěpánov. *Komunálna technika*, 2013, roč. V, č. 4, s. 34-36. ISSN 1337-9011

PLÍVA P.: Kompostárna Jihlava – Henčov – 18/2013. *Komunální technika*, 2013, roč. VII, č. 7, s. 24-25. ISSN 1802-2391.

PLÍVA P.: Kompostárna Strážnice – 19/2013. *Komunální technika*, 2013, roč. VII, č. 8, s. 18-20. ISSN 1802-2391.

PLÍVA P.: Kompostárna Vimperk – 20/2013. *Komunální technika*, 2013, roč. VII, č. 9, s. 16-18. ISSN 1802-2391.

PLÍVA P.: Kompostáreň Vimperk – 20/2013. *Komunálna technika*, 2013, roč. V, č. 9, s. 30-32. ISSN 1337-9011

PLÍVA P.: Správná teplota, významný faktor úspěšného kompostování. *Odpadové fórum*, 2013, roč. 14, č. 2, s. 16-20.
ISSN 1212-7779

PLÍVA P.: Kompostárna Žlutice – 21/2013. *Komunální technika*, 2013, roč. VII, č. 10, s. 18-20. ISSN 1802-2391.

PLÍVA P., KOVAŘÍČEK P., VLÁŠKOVÁ M.: Technologie kompostování zbytkové biomasy ze zemědělské činnosti . *Úroda*, 2013, roč. 61, č. 12, vědecká příloha CD Aktuální poznatky v pěstování, šlechtění, ochraně rostlin a zpracování produktů, s. 68-75. ISSN 0139-6013.

PRAŽAN, R., KUBÍN, K. GERNDTOVÁ, I., Vliv velikosti styčné plochy pneumatik a počtu přejezdů na utužení půdy, *Mechanizace zemědělství*, 2014, roč. 64, v tisku.

PRAŽAN, R., KUBÍN, K., GERNDTOVÁ, I.,PODPĚRA, V., PROKLUZOVÉ CHARAKTERISTIKY PNEUMATIK PRO SKLÍZECÍ MLÁTIČKY, [] *Mechanizace zemědělství*, 2013, roč. 63, č. 6, str. 58 – 61.

SOUČEK, J., PROCHÁZKA, M., BLAŽEJ, D., TOMANOVÁ, D.. Mechanické vlastnosti palivových briket z logistického hlediska. [Mechanical qualities of fuel pellets from a logistical point of view]. Komunální technika, 2013, roč. 7, č. 5 – příloha, s. 94-98. ISSN 1802-2391.

SOUČEK. J. Sklizeň konopí pro technické využití, Úroda 2013, roč. 61, č. 1 s. 46 - 50 *(*

SVOBODOVÁ, A., MAYER, V., KASAL, P., VEJCHAR, D. (2013): Vliv různých způsobů aplikace minerálních dusíkatých hnojiv u brambor na vývoj porostu, výnos hlíz a obsah nitrátů v hlízách. Úroda, 61, 2013, č. 12, vědecká příloha časopisu, s. 347-350. ISSN 0139-6013.

ŠIMON, Josef. Automatické dojicí systémy a český trh. *Zemědělec,* 2013, č. 7. s. 13-14. ISSN 1211-3816.

VEGRICHT,J., ŠIMON,J., Vliv různých technických systémů podestýlání na emise prach a hluku ve stájích pro chov dojnic, Mechanizace zemědělství 10-2013, roč.LXIII, s.54-58, ISSN 0373-6776, v tisku

VEGRICHT, Jiří, Josef ŠIMON a Mária FABIANOVÁ. Mikroklima ustájení telat – přístřeškové individuální boxy. *Náš chov*, 2013, č. 9, s. 54 - 58. ISSN 0027-8068.
(QH92251)

VEGRICHT, Jiří, Josef ŠIMON a Mária FABIANOVÁ. Mikroklimatické parametry VIB v letním období. *Náš chov*, 2013, č. 7, s. 33 - 36. ISSN 0027-8068.
(QH92251)

VEGRICHT, Jiří, Josef ŠIMON a Antonín MACHÁLEK. Systémy pro krmení skotu na výstavě EuroTier 2012. *Náš chov*, 2013, roč. LXXIII, č. 2, s. 8-11. ISSN 0027-8068.

VEGRICHT, Jiří a Josef ŠIMON. Systémy podestýlání a emise prachu a hluku ve stájích pro chov dojnic. *Mechanizace zemědělství,* 2013, č. 10, s. 42 - 46. ISSN 0373-6776.

ZABLOUDILOVÁ, P., HUTLA, P.: Měření rychlosti reakce amoniaku s ozonem ve vzduchu. Agritech Science, 8 (2014), ISSN 1802-8942 [v tisku]

B - Book

ALTMAN V., BADALÍKOVÁ B., BATRTLOVÁ J., BURG P., HŮLA J., JELÍNEK A., KOVAŘÍČEK P., MIMRA M., PLÍVA P., POSPÍŠILOVÁ L., ROY A., VLÁŠKOVÁ M., ZEMÁNEK P.: Využití kompostu pro optimalizaci vodního režimu v krajině. Knižní publikace. ZERA, o.s., Náměšť nad Oslavou, 2013, 101 s. ISBN 978-80-87226-26-1

C – Chapter in Monography

HAUSVATER, E., ČEPL, J., DOLEŽAL, P., KASAL, P., MAYER, V. a Bohumil VOKÁL. Zásady pěstitelské technologie. In: VOKÁL, Bohumil et al. Brambory. 1. vyd. Praha: Profi Press s.r.o., 2013, s. 60-101. ISBN 978-80-86726-54-0.

MAYER, V., J. HŮLA, J., KASAL, P. a Daniel VEJCHAR. Technika pro pěstování, sklizeň, posklizňové zpracování, skladování a tržní úpravu brambor. In: VOKÁL, Bohumil et al. Brambory. 1. vyd. Praha: Profi Press s.r.o., 2013, s. 120-136. ISBN 978-80-86726-54-0.

SOUČEK. J.: Dřevo ze sadů a vinic jako obnovitelný zdroj energie In: Matáková, B., ed. Inovace v rozvoji zahradnických oborů. Brno. Mendelova univerzita v Brně, 2013., s. 118 – 121. ISBN 978-80-7375-711-3

D – Article in Proceedings

ČEŠPIVA Miroslav, ZABLOUDILOVÁ Petra: Porovnání úniku plynného amoniaku při variantních způsobech zapravení fugátu. Příspěvek na konferenci: Technika a technologie pro využití biomasy jako obnovitelného zdroje energie, Výzkumný ústav zemědělské techniky, v.v.i., Praha, 28.11.2013, ISBN 978-80-86884-75-2

ČEŠPIVA Miroslav, ZABLOUDILOVÁ Petra: Vliv způsobu zapravení statkových hnojiv na obsah dusíkatých látek při pěstování energetických plodin. Příspěvek na konferenci: Technika a technologie pro využití biomasy jako obnovitelného zdroje energie, Výzkumný ústav zemědělské techniky, v.v.i., Praha, 28.11.2013, ISBN 978-80-86884-75-2

ČEŠPIVA Miroslav, ZABLOUDILOVÁ Petra, BORTLOVÁ Klára. Snižování emisí pachových látek při výrobě piva. [The odour emission decreasing during the beer production]. Komunální technika, 2012, roč. 6, č. 5, příloha [CD] Nové směry ve využití zemědělské dopravy a manipulační techniky ve vztahu k životnímu prostředí. Příspěvek 64. 3 s. ISSN 1802-2391.

GUTU D., HŮLA J., KUMHÁLA F., KOVAŘÍČEK P.: The influence of traffic in permanent traffic lanes on soil compaction parameters. In.: Trends in Agricultural Engineering 2013, Prague, CULS Prague, Faculty of Engineering, 2013, p. 186-190.ISBN 978-80-213-2388-9

JEVIČ, Petr a Zdeňka ŠEDIVÁ. Stav a rozvoj biogenních pohonných hmot v ČR do roku 2020 s ohledem na úsporu a snížení emisí skleníkových plynů. [Present State and Development of Biogenic Fuels in the Czech Republic up to 2020 in Relation to Saving and Reduction of GHG Emissions]. In: Potravinová soběstačnost a udržitelná výroba směsných a biogenních pohonných hmot - Stav a rozvoj do roku 2020: sborník přednášek a odborných prací k mezinárodnímu semináři, konanému 28.6.2013 jako odborná doprovodná akce „Národní výstavy hospodářských zvířat a zemědělské techniky“. Praha: VÚZT, 2013, s. 94-102. ISBN 978-80-86884-74-5.

JEVIČ, P., HUTLA, P., ŠEDIVÁ, Z. Kam dál – výroba torefikovaných peletek. Zpracování tuhé biomasy technologickým procesem karbonizace. In: Obnovitelné zdroje energie - zkušenosti a rizika spojená s energetickým využitím fytomasy, Praha: VÚZT, 2013, s. 48-51. ISBN 978-80-86884-71-4.

JEVIČ, P., HUTLA, P., ŠEDIVÁ, Z. Politika v oblasti obnovitelných zdrojů energie v České republice a Evropské unii se zřetelem na biopaliva, nové trendy v bioenergetice, příklady technologií a zařízení ke zplyňování a karbonizaci standardizovaných tuhých biopaliv, zbytkové biomasy a spalitelných odpadů. In: Technika a technologie pro využití biomasy jako obnovitelného zdroje energie. Praha: VÚZT, 2013, s. 14-20. ISBN 978-80-86884-75-2.

KÁRA, J.: Praktické zkušenosti s úpravou bioplynu na kvalitu zemního plynu s ohledem na nákladovost, čistotu finálního produktu a problémy se zaváděním do praxe [Practical experience with biogas to natural gas quality with regard to the cost, purity of the final product and the problems with putting them into practice]. In Bioenergie 2013 Biomasa a bioplyn.: sborník přednášek a odborných prací vydaný 19. února 2013 jako příloha konference. Praha, b.i.d. services , 2013, s. 1-12. ISBN 978-80-87534-50-2.

KÁRA, J.: Využití digestátu [The use of digestate from biogas plants]. In Lednice, Obnovitelné zdroje energie, zkušenosti a rizika spojená s energetickým využitím fytomasy: sborník přednášek a odborných prací vydaný 26. září 2013 jako příloha konference. Praha, VÚZT, v.v.i. , 2013, ISBN: 978-80-86884-71-7

PLÍVA P., KOVAŘÍČEK P., VLÁŠKOVÁ M.: Zpracovávání zbytkové travní hmoty. In.: Ekológia travneho porastu. Zborník vedeckých prác., Centum vyskumu rastlinnej výroby Pišťany, 2013, s. 182-187. ISBN 978-80-89417-48-3, EAN 9788089417483

ROY., A. Kompostování biomasy na experimentální kompostárně VÚZT, v.v.i. Sborník odborného semináře, obnovitelné zdroje energie Lednice 2013 vydal: Výzkumný ústav zemědělské techniky, v.v. i. ISBN: 978-80-86884-71-7

SOUČEK. J. Analýza energetických parametrů dopravních operací při sklizni kukuřice pro potřeby bioplynové stanice In: sborník z odborného semináře Energetické využití biomasy, Lednice, 25.9.2013

SOUČEK. J. Logistika energetické biomasy In: sborník z odborného semináře Technika a technologie pro využití biomasy jako obnovitelného zdroje energie,, Praha, 28.11.2013, ISBN: 978-80-86884-75-2

SOUČEK, J., BJELKOVÁ, M., SVĚTLÍK, M.: Aspekty využití lněného stonku pro výrobu palivových briket. In: sborník z konference. Výsledky výzkumu, vývoje a inovací pro obnovitelné zdroje energie Konference OZE. Kouty nad Desnou. 17. -19. 4. 2013

II. Category – Results of Applied Research

P – Patents

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. *Zařízení pro měření sil.* Původce: PODPĚRA, Václav, SYROVÝ, Otakar a František VOTÍPKA. Int.Cl.G 01 L 1/00, G 01 L 5/13, G 01 L 5/00, A 01 B 59/04. Česká republika. Patent, CZ 304215. Udělen: 27.11.2013.
Dostupné z:
http://isdv.upv.cz/portal/pls/portal/portlets.pts.det?xprim=1279361&lan=cs
http://spisy.upv.cz/Patents/FullDocuments/304/304215.pdf

Ztech – Tested Technology

PLÍVA, P., HANČ, A.:Technologie vermikompostování ve funkčním vzorku dvoumodulového vermireaktoru. Ověřená technologie, VÚZT Praha a ČZU v Praze, 2013.

HUTLA P. Znalost optimálních parametrů technologie velmi rychlého termického rozkladu biomasy., Ověřená technologie, VÚZT Praha , 2013

Fužit – Utility Design

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. Kompost s přídavkem popele. Původce: SOUČEK, Jiří. Int.Cl.C 05 F 9/04, B 09 B 3/00. Česká republika. Užitný vzor, CZ 25020. Zapsán: 7.3.2013.
Dostupné z:
http://isdv.upv.cz/portal/pls/portal/portlets.pts.det?xprim=1850172&lan=cs
http://spisy.upv.cz/UtilityModels/FullDocuments/FDUM0025/uv025020.pdf

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. Krmný vůz. Původci: PRAŽAN, Radek, PODPĚRA, Václav, KUBÍN, Karel, a Ilona GERNDTOVÁ. Int.Cl. B 60 P 9/00, B 60 P 5/00, A 01 F 25/16, A 01 K 5/00. Česká republika. Užitný vzor, CZ 25573. Zapsán: 20.6.2013.
Dostupné z:
http://isdv.upv.cz/portal/pls/portal/portlets.pts.det?xprim=1979942&lan=cs
http://spisy.upv.cz/UtilityModels/FullDocuments/FDUM0025/uv025573.pdf

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. Zařízení pro aplikaci ochranného roztoku. Původci: VEJCHAR, Daniel, KUBÍN, Karel a Václav MAYER. Int.Cl. A 01 C 1/00, A 01 C 9/00. Česká republika. Užitný vzor, CZ 24877. Zapsán: 28. 1. 2013.
Dostupné z:
http://isdv.upv.cz/portal/pls/portal/portlets.pts.det?xprim=1914394&lan=cs
http://spisy.upv.cz/UtilityModels/FullDocuments/FDUM0024/uv024877.pdf

VÚZT, v.v.i., PRAHA, ATEA PRAHA, s.r.o. Zařízení pro rovnoměrný rozptyl prachových částic. Původci vynálezu: Václav BEJLEK, Petr HUTLA. Int. B656 65/28. Česká republika. Patentový spis 304 262.27.12.2013
Dostupné z: http://isdv.upv.cz/portal/pls/portal/portlets.pts.det?xprim=1895633&lan=cs

Fprum – Industrial Design

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. Generátor zvuku. Původce: ČEŠPIVA, Miroslav. LOC(8)Cl/14-03. Česká republika. Průmyslový vzor CZ 35732. Zapsán 6.9.2013.
Dostupné z: http://isdv.upv.cz/portal/pls/portal/portlets.vzs.det?xprim=1740898&lan=cs

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. Dvoukomorový kompostér. Původci: PLÍVA, Petr a Aleš HANČ. LOC(8)Cl/09-03. Česká republika. Průmyslový vzor CZ 35674. Zapsán 2.7.2013.
Dostupné z:
http://isdv.upv.cz/portal/pls/portal/portlets.vzs.det?xprim=1704652&lan=cs

VÝZKUMNÝ ÚSTAV ZEMEDĚLSKÉ TECHNIKY, V.V.I., PRAHA. Dvoukomorový kompostér. Původci: PLÍVA, Petr, HANČ, Aleš. LOC(8)Cl. 09-03. Česká republika. Průmyslový vzor, CZ 35674. 2013-07-02.

Gfunk – Functional Sample

ČESKÁ ZEMĚDELSKÁ UNIVERZITA V PRAZE. Modifikovaný dvoumodulový vermireaktor. Funkční vzorek, 2013. Původci: PLÍVA Petr, HANČ Aleš. Lokalizace výsledku: Praha – firma Eurest.

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. SENAGRO A.S. VÝZKUMNÝ ÚSTAV BRAMBORÁŘSKÝ HAVLÍČKŮV BROD, S.R.O. Hrázkovač – důlkovač za dvouřádkový sázeč brambor Reekie. Původci: MAYER, Václav, Josef DOVOL a Josef VACEK. Funkční vzorek, 2013. Lokalizace výsledku: Výzkumný ústav bramborářský Havlíčkův Brod, s.r.o., středisko Valečov.

VÝZKUMNÝ ÚSTAV ZEMĚDĚLSKÉ TECHNIKY, V. V. I. SENAGRO A.S. Lopatkový drtič odpadních brambor na manipulátoru Manitou. Původci: VEJCHAR, Daniel, Václav MAYER a Josef DOVOL. Funkční vzorek, 2013. Lokalizace výsledku: bioplynová stanice, SENAGRO a.s., Senožaty.

VÝZKUMNÝ ÚSTAV ZEMEDĚLSKÉ TECHNIKY, v.v.i.., PRAHA. Laboratorní zařízení pro sběr a úpravu dešťové vody. 2013. Původci: MACHÁLEK, A., ŠIMON, J. VEGRICHT, J., BRADNA, J. Lokalizace výsledku. VÚZT, v.v.i.

Hneleg – Results Projected in Guidelines and Prescipritions of Non-Legislative Nature, Obligatory Within the Competence of Respective Provider

JEVIČ, Petr. ČSN 65 6508 Motorová paliva – Směsné motorové nafty obsahující methylestery mastných kyselin (FAME) – Technické požadavky a metody zkoušení
[ČSN 65 6508 Automotive fuels – Diesel fuel blends containing Fatty acid methyl esters (FAME) – Requirements and test methods]. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, únor 2013. 12 s.

JEVIČ, Petr. ČSN 65 6516 Motorová paliva - Řepkový olej pro spalovací motory na rostlinné oleje – Technické požadavky a metody zkoušení. [ČSN 65 6516 Automotive fuels - Fuel from rapeseed oil for vegetable oil compatible combustion engines – Requirements and test methods]. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, duben 2013. 16 s.

N – Applied Certified Methodology

HUTLA, P., BÍMA, V., MIČÍN, R., ČEŠPIVA, M.: Modelová řešení osvětlovacích soustav ve vybraných zemědělských objektech. Certifikovaná metodika. Praha, VUZT 2013. ISBN 978-80-86884-72-1 [v tisku]

ANDERT, David, ABRHAM, Zdeněk, GERNDTOVÁ. Ilona. Metodika přípravy tvarovaných a směsných fytopaliv“ Vydavatel: Výzkumný ústav zemědělské techniky, v.v.i., Praha 2013. ISBN: 978-80-86884-73-8

KUMHÁLA F., GUTU D., HŮLA J., CHYBA J., KOVAŘÍČEK P., KROULÍK M., KVÍZ Z., MAŠEK J., VLÁŠKOVÁ M.: Technologie řízení přejezdů po pozemcích. Uplatněná certifikovaná metodika. Praha, ČZU v Praze, 2013, 42 s. ISBN 978-80-213-2425-1

HANČ, A., PLÍVA, P.: Vermikompostování bioodpadů. Uplatněná certifikovaná metodika, Praha, ČZU v Praze, 2013, 35 s., ISBN 978-80-213-2422-0

R – Software

ABRHAM, Z., RICHTER, J., MUŽÍK O., HEROUT, M. SCHEUFLER, V.,: Modelování a ekonomika výrobního záměru v RV

ABRHAM, Z.: Expertní systém pro rozhodování o ochraně rostlin podle ekonomických prahů škodlivosti

III. Category – Other Results

M – Conference Organization

PLÍVA P.: Spolupořádání konference - Biologicky rozložitelné odpady – Optimalizace technologie v regionu, IX. ročník, 18.9. – 20.9. 2013. Náměšť nad Oslavou. Spolupořádání v rámci grantu NAZV QI91C199 Optimalizace technologie faremního vermikompostování.

ŠEDIVÁ, Zdeňka a Petr JEVIČ (Ed.). Potravinová soběstačnost a udržitelná výroba směsných a biogenních pohonných hmot - Stav a rozvoj do roku 2020. [Food Self Sufficiency and Sustainable Production of Blended and Biogenic Fuels - Present State and Development up to 2020]: sborník přednášek a odborných prací k mezinárodnímu semináři, konanému 28.6.2013 jako odborná doprovodná akce „Národní výstavy hospodářských zvířat a zemědělské techniky“. Praha: VÚZT, 2013. ISBN 978-80-86884-74-5. 140 s.

O – Other Results

AMITAVA, R., SOUČEK, J., PLÍVA, P., HANČ, A.: Energetické využití kompostů. Sborník z odborného semináře Technika a technologie pro využití biomasy. 2013, Praha 6 – Ruzyně: 1-6.
HANČ, A., PLÍVA, P., Vermikompostování – perspektivní metoda pro zpracování bioodpadů. Sborník z IX. konference - Biologicky rozložitelné odpady. Náměšť nad Oslavou: 1-11. ISBN: 978-80-87226-29-2.

BRADNA, Jiří a Jan MALAŤÁK. Skladování zachovávající požadovanou kvalitu. Farmář, 2013, roč. 19, č. 11, s. 25-27, ISSN 1210-9789.

JEVIČ, Petr a Zdeňka ŠEDIVÁ. Stav a možné dopady přijetí návrhu nového zaměření odvětví výroby biopaliv v EU. In Systém výroby řepky, systém výroby slunečnice: sborník referátů z 30. vyhodnocovacího semináře Hluk 20.-21.11.2013. 1. vyd. Praha: Svaz pěstitelů a zpracovatelů olejnin, 2013, s. 81-97. ISBN 978-80-87065-50-1.

KOTLÁNOVÁ, Alice, Petr JEVIČ a Zdeňka ŠEDIVÁ. ČSN EN 16214-4 Kritéria udržitelnosti pro výrobu biopaliv a biokapalin pro energetické využití - Zásady, kritéria, ukazatele a ověřovatelé - Část 4: Metody výpočtu bilance emisí skleníkových plynů s použitím analýzy životního cyklu. [ČSN EN 16214-4 Sustainability Criteria for Production of Biofuels and Bioliquids for Energy Applications - Principles, Criteria, Indicators and Verifiers - Part 4: Calculation Methods of the Greenhouse Gas Emission Balance Using a Life Cycle Analysis

Approach]. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, srpen 2013. 36 s. (MZE0002703102)

MACHÁLEK, A., K automatizaci dojení a softwaru v chovu dojnic, Náš Chov, 2013, roč.LXXIII, č.8, s.43-44, ISSN 0027-8068

MACHÁLEK, A., Inovace v oblasti dojicí techniky, Náš Chov, 2013, roč.LXXIII, č.2, s.69-70, ISSN 0027-8068

MACHÁLEK, A., ŠIMON, J.:Způsoby a možnosti ochlazování stájí. Zemědělec, 2013, roč. 21, č. 45, s. 13-15, ISSN 1211-3816.

MALAŤÁK, Jan a Jiří BRADNA. Posklizňová úprava v halových skladech. Zemědělec, 2013, roč. 21, č. 6, s. 12-17, ISSN 1211-3816.

Poster – European Association for Potato Research, Post-Harvest Section, EAPR Post-Harvest Section Meeting , October 22-24th, 2013 in Warsaw (Poland).

MAYER, V, VEJCHAR, D: Spotřeba energie a paliv na skladování brambor v závislosti na klimatických podmínkách skladovací sezóny. [Consumption energy and fuellings on storage potato in dependencies on climatic conditions storage season.

PLÍVA, P.: Kompostáreň Městec Králové. [Composting Městec Králové]. Komunálna technika, 2013, roč. IV, č. 1, s. 32-33. ISSN 1337-9011.

PLÍVA P.: Centrálna kompostáreň Brno, a.s.. [Composting Městec Králové]. Komunálna technika, 2013, roč. V, č. 2, s. 32-34. ISSN 1337-9011

PRAŽAN, R., KUBÍN, K. GERNDTOVÁ, I., Hlavní faktory technogenního zhutnění půdy. Mechanizace zemědělství, 2014, roč. 64, v tisku.

SOUČEK. J. Energetické využití biomasy, Environmentální aspekty rozvoje regionu [přednáška], Třebíč, I2E – Inovační, environmentální a energetické centrum, o.s., 16. května 2013

SOUČEK. J. Energetické využití odpadů ze sadů a vinic. Od vzdělání k praxi [přednáška], Lednice, 8.3.2013

SOUČEK. J. Energetické využití rostlinné biomasy. Partnerské sítě pro vzdělávání a architekturu [přednáška], Lednice, 22.5.2013

SOUČEK. J. Doprava jako součást logistiky energetických surovin při produkci bioplynu Energetické využití biomasy [přednáška], Lednice, 25.9.2013

SOUČEK. J. Logistika energetické biomasy Technika a technologie pro využití biomasy jako obnovitelného zdroje energie [přednáška], Praha, 28.11.2013

SOUCEK J.: Řezačky - perspektivní stroje v rostlinné výrobě, Zemědělec, 2013, roč.21, č. 10, s. 15-18

SOUČEK, J a kol. Mechanické vlastnosti palivových briket z logistického hlediska. Energie 21, 2013, roč.6, č. 6, s. 12-13, ISSN 1803-0394

SOUČEK. J. Kombajnová sklizeň a energetické využití stonku lnu, Sklizeň olejného lnu, Loštice, 22.8.2013

SOUČEK, J a kol. Využití zbytkové biomasy na bázi lnu ve formě palivových briket. Energie 21, 2013, roč.6, č. 6, s. 12-13, ISSN 1803-0394 (NAZV č. QI92A143)

ŠIMON, J., Automatické dojicí systémy a český trh, Zemědělec, 2013, č.7, s.13-14, ISSN

VEGRICHT,J., ŠIMON,J., MACHÁLEK, A., Systémy pro krmení skotu na výstavě EuroTier 2012, Náš Chov, 2013, roč.LXXIII, č.2, s.8-11, ISSN 0027-8068

Research Institute of Agricultural Engineering, p.r.i.

Drnovská 507
161 01 Praha 6-Ruzyně
T: +420 233 022 274, F: +420 233 312 507
e-mail: vuzt@vuzt.cz, web: www.vuzt.cz
CZECH REPUBLIC