

Međunarodno znanstveno savjetovanje FORMEC 2015 i izložba šumarske opreme AUSTROFOMA 2015

U Leibnitzu je od 4. do 8. listopada 2015. godine održano 48. međunarodno znanstveno savjetovanje udruženja FORMEC pod naslovom »Forest engineering: Making a positive contribution« u organizaciji Sveučilišta u Beču (BOKU), odnosno Zavoda za šumarske tehnike i tehnologije pod vodstvom profesora Karla Stampfera.

Cilj je savjetovanja bio predstavljanje novih znanstvenih i operativnih dostignuća ekološki prihvatljivih tehnologija u šumarstvu i drvnjoj industriji te spajanje znanstvenika, istraživača i praktičara iz cijeloga svijeta radi razmjene iskustava, znanja i vještina vezanih uz šumarske tehnike i tehnologije. Članovi Znanstvenoga odbora bili su Raffaele Cavalli (Sveučilište u Padovi, Italija), Hans Rudolf Heinemann (Švicarski federalni institut tehnologije, Švicarska), Tadeusz Moskalik (Poljoprivredno sveučilište u Varšavi, Poljska), Tibor Pentek (Šumarski fakultet Sveučilišta u Zagrebu, Hrvatska), Karl Stampfer (Sveučilište u Beču, Austrija), Rien Visser (Sveučilište Canterbury, Novi Zeland).

Sudjelovalo je 189 znanstvenika iz 28 zemalja diljem svijeta te je usmeno bilo izloženo 96 radova i prikazano 25 postera. Članovi Zavoda za šumarske tehnike i tehnologije Šumarskoga fakulteta Sveučilišta u Zagrebu održali su tri usmena izlaganja.

Savjetovanje je otvoreno pozdravnim govorima prorektora Sveučilišta u Beču Georga Haberhauera, koordinatora 3. IUFRO divizije Woodama Chunga, predsjednika udruženja FORMEC Karla Stampfera te dvaju budućih predsjednika organizacijskih odbora savjetovanja FORMEC 2016 Tadeusza Moskalika i FORMEC 2017 Steliana Alexandra Borza. Nakon stanke savjetovanje se odvijalo u dvjema plenarnim sesijama (moderator je bio Karl Stampfer) u kojima su redom izlagali:

1. Rien Visser: Expanding ground-based harvesting onto steep terrain: A review

2. Marko Paakkunainen: Ergonomics and productivity improvements through machine automation
3. Keith Raymond: Teleoperation of harvesting machinery for a safer future
4. Andreas Gronauer: Precision farming – Successful examples from agriculture
5. Hans Rudolf Heinemann: Forest road network and pavement engineering revisited
6. Thomas Steinmüller: Forest road construction – Old wine in new bottles.

Nakon stanke za ručak otvorena je i posterska sesija, a potom je nastavljeno u trima usporednim sesijama. S obzirom na to da je izrada zbornika savjetovanja još u tijeku, ovdje se navode sva usmena izlaganja kako su bila održana tijekom savjetovanja.

U sesiji A1 pod naslovom »Taking on the challenge – Challenges in forestry« moderator je bio Dirk Jaeger, a u njoj su održana ova izlaganja:

1. Andreja Đuka, Tomislav Poršinsky, Tibor Pentek, Dubravko Horvat: Critical slope in downhill timber skidding
2. Jörg Hittenbeck: Stock and state of forest machines in Germany
3. Emmanuel Cacot, Stephane Grulois, Alain Thivolle-Cazat, Paul Magaud: Mechanization of French logging operations: challenges and prospects in 2020
4. Jussi Manner, Tomas Nordfjell, Ola Lindroos: High resolution forwarding data and evaluation of operator differences by use of TimberLink data
5. Herbert Borchert, Konstantin Benker: The economic situation of forest contractors in Bavaria
6. Mattias Eriksson, Luc LeBel, Ola Lindroos: Management of outsourced forest harvesting operations for better customer-contractor alignment.

U sesiji B1 pod naslovom »Doing it Better! – Productivity & efficiency I« moderatorica je bila Natascia Magagnotti, a u njoj su održana ova izlaganja:

1. Martin Strandgard, Rick Mitchell, Mauricio Acuna: Impact of slope on forwarder load size and productivity
2. Kalle Kärhä, Tuomas Anttonen, Teijo Palander, Asko Poikela, Sirkka Keskinen, Ari Laurén, Yrjö Nuutinen, Pekka T. Rajala: Cutting productivity of windfalls in Finland
3. Felix Rinderle, Udo Hans Sauter: Long log harvesting by harvesters and combination forwarders
4. Adrian Enache, Martin Kühmaier, Rien Visser, Karl Stampfer: Current practices and efficiency gaps in logging operations from European mountain forests
5. Martyna Rosinska, Mariusz Bemberek, Zbigniew Karaszewski, Piotr S. Mederski: Comparing the effectiveness of harvester use for thinning operations in beech and birch stands of 4th age class
6. Pavel Kalinin: Effectiveness of selection cutting in Russian Federation.

U sesiji C1 pod naslovom »Dirt track or Boulevard? – Road construction & maintenance« moderator je bio Eric R. Labelle, a u njoj su održana ova izlaganja:

1. Leo Gallus Bont: Reengineering of Forest Road Networks – Integrated harvest and road network layout planning including road up- or downgrading
2. Andrea Laschi, Cristiano Foderi, Enrico Marchi: Forest road network planning: a GIS-based evaluation in Italy
3. Hulusi H. Acar, Ersin Dursun: Reconstruction of the forest road network model with linear fuzzy modelling in the conversion of the coppice companies to high forest enterprises
4. Jindrich Neruda, Radomír Ulrich, Martin Pajkoš, Igor Vecerka, Vera Vrtenová: Technology of paving carriageways of permanently passable forest roads by shedding cover aggregates with the thixotropic mixture
5. Ivica Papa, Tibor Pentek, Hrvoje Nevecerel, Kruno Lepoglavec, Tomislav Poršinsky, Željko Tomašić: Maintenance of Macadam Forest Roads in Mountainous Terrain – Case Study for Management Unit »Belevine«
6. Tomi Kaakkurivaara, Pauli Kolisoja, Nuutti Vuorimies, Jori Uusitalo: Fly ash for forest road rehabilitation.

Nakon održanih predavanja sudionicima je priređena pozdravna večera, tzv. *welcome dinner*, na Dunavu brodom MS Kaiserin Elisabeth II.

Drugoga dana savjetovanja održana su preostala 72 predavanja u po tri usporedne sesije tijekom cijeloga dana.

Sesijom A2 pod naslovom »Down and dirty – Harvesting & soil protection« moderirao je Tadeusz Moskalik, a u njoj su održana ova izlaganja:

1. Jörn Erler: Ground pressure is a poor indicator for ecological and technical compatibility
2. Martina Cambi, Rodolfo Picchio, Stefano Grigoletto, Enrico Marchi: Effects on soil physical characteristics after forwarder passes for logging operations
3. Eric R. Labelle, Dirk Jaeger, Benjamin Poltorak: Assessing the ability of hardwood and softwood brush mats to distribute applied loads
4. Tomas Nordfjell, Alexander Östlund: Forwarding on soft soils, comparison of rutting with and without wooden bridge sections
5. Florian Schnaible, Dirk Jaeger, Gero Becker: Automatic wheel load control system as a contribution to improve soil protection and technical trafficability
6. Dagnija Lazdina, Andis Lazdins, Andis Bardulis, Janis Liepins, Uldis Prindulis, Agris Zimelis, Kristaps Makovskis, Aris Jansons: Mounding as method of reforestation of wet and »problematic« forests on organic soils in Latvia.

Sesijom B2 pod naslovom »Chopping it down and chopping it up – Bioenergy« moderirao je Raffaele Spinelli, a u njoj su održana ova izlaganja:

1. Natascia Magagnotti, Raffaele Spinelli, Eugenio Cavallo, Lars Eliasson, Alessio Facello: How drum design can affect chipper performance
2. Elena Canga, Sandra Sánchez-García, Alba Fanjul, Juan Majada: Use of synthetic rope in the extraction of stems and whole tree in a radiata pine thinning on steep terrain in the North of Spain
3. Örjan Grönlund, Dan Bergström, Maria Iwarsson, Lars Eliasson: Evaluation of the Flowcut prototype head designed for early, biomass dense, thinnings
4. Paula Jylhä, Dan Bergström: Productivity and cost of harvesting short-rotation birch stands on cut-away peatlands in northern Finland
5. Daniel de Souza, Tom Gallagher, Dana Mitchell, Mathew Smidt, Tim McDonald: Determining the Effects of Felling Method and Season of Year on Coppice Regeneration
6. Rick Mitchell, Martin Strandgard, Mauricio Acuna: Impact of number of stems retained per stool

on harvester productivity and fuel consumption in Eucalyptus globulus second rotation coppiced plantations in south west Western Australia.

U sesiji C2 »We need roads to see the trees – Extraction & Transport« moderator je bio Rien Visser, a u njoj su održana ova izlaganja:

1. Raitis Lacis, Kristaps Gode, Edgars Rudzitis: Modular portable composite bridge systems for forest industry applications – review of a research program
2. Selcuk Gumus, Taha Yasin Hatay: The estimation of extraction (haulage) distance for forest harvesting using terrain model of 3D Virtual Globe of GoogleEarth®
3. Mohammad Reza Ghaffariyan, Mark Brown: Payload management of forestry trucks using different weighing systems in Australia
4. Zdravko Pandur, Dubravko Horvat, Marijan Šušnjar, Marko Zorić, Marko Knežević: Load space utilization of forwarder Valmet 860.4
5. Balázs Kisfaludi, Péter Primusz, József Péterfalvi: Semi-automated traffic counting method for forest roads
6. Amir Hossein Firouzan, Mahsa Hakimi Abed: Forest road network planning accordance to single selection silvicultural method and environmental considerations based on AHP method using GIS.

Sesijom A3 »Doing it even better – Productivity & efficiency II« moderirao je Hans R. Heinimann:

1. Toshio Nitami: Management and evaluation on team logging operation by GPS – efficiency and process improvement
2. Mauricio Acuna, John Wiedemann, Martin Strandgard, Rick Mitchell: Economic analysis of a Eucalyptus globulus stocking and harvesting trial in Western Australia
3. Piotr S. Mederski, Mariusz Bembenek, Zbigniew Karaszewski, Agnieszka Lacka, Anna Szczepanska-Álvarez, Martyna Rosinska: Estimating harvester productivities in pine stands of different ages and thinning intensities
4. Jiri Dvorak, Pavel Natov, Grzegorz Szewczyk, Sadik Caglar: The propose of performance standards for forwarders
5. Mehmet Eker, Davut Özer: Selection of debarking technique for Pine logs in cut-to-length harvesting method
6. Hadi Bayati, Akbar Najafi: Performance evaluation of artificial neural networks to modelling winching time of Timber Jack 450C.

Istodobno je održavana i sesija B3 »Improving your Bio(energy) – Bioenergy & quality improvement« kojom je moderirao Keith Raymond:

1. Jyrki Raitila, Veli-Pekka Heiskanen: Profitability of drying wood chips integrated into fuel wood supply
2. Johanna Routa, Marja Kolström, Johanna Ruotsalainen, Lauri Sikanen: Validation of prediction models for estimating the moisture content of small diameter stem wood
3. Kalvis Kons, Dan Bergström, Fulvio Di Fulvio: Effect of sieve size and assortment on wood fuel quality during chipping operations
4. Fabian Schulmeyer, Karl Hüttel, Herbert Borchert: Accurate estimation of wood chip volume to increase efficiency in allocating chipper and transport capacities
5. Yrjö Nuutinen, Matleena Rytönen, Dan Bergström, Fulvio di Fulvio, Bo Dahlin, Ismo Tiihonen, Aaron Petty: Quality and productivity in comminution of small-diameter tree bundles
6. Christian Kanzian, Martin Kühmaier, Gernot Erber: Effects of moisture content on supply costs and CO₂ emissions for an optimized supply network.

U sesiji C3 »Looking after Mama Nature – Environmental & Human Impacts« moderator je bio Jörn Erler:

1. Sven Pasemann, Jörn Erler, Jörg Hittenbeck: Influence of wheel load and wheel slip on rutting in forest operations
2. Weiguo Liu, Jingxin Wang: Life cycle assessment and techno-economic analysis of energy crops utilization for biofuels in the Northeastern United States
3. Joachim B. Heppelmann, Eric R. Labelle, Johannes Windisch, Herbert Borchert, Fabian Schulmeyer: Evaluating the influence of root collar on stump height following mechanized forest operations
4. Tadeusz Moskalik, Rafal Sokulski: Impact of traditional and arboricultural timber harvesting methods on the extent of damage to natural regeneration in the shelter wood
5. Stephanie Lynch, Mathew Smidt, Elizabeth Maples, Richard Sesek: Noise and vibration exposure in full-tree logging systems in the South-eastern U.S.A.
6. Stelian Alexandru Borz: Skidding performance in reduced accessibility conditions – productivity and time consumption.

Nakon pauze za ručak nastavljeno je s predavanjima u trima usporednim sesijama.

U sesiji A4 »Going places – Improved planning I« moderatorica je bila Andreja Đuka:

1. Abdullah Emin Akay, Orhan Erdas, Halit Büyüksakalli, Dursun Sakar: Assessment of Winter Harvesting Operation in Mediterranean City of Kahramanmaraş in Turkey
2. Martin Ziesak, Daniela Rommel, Stephan Ying, Patrick Preusch: Sensor-based, automated monitoring of fully mechanised harvesting processes – including options for automated process control
3. Gianni Picchi, Martin Kühmaier, Juan De Dios Diaz: Evaluation of RFID UHF tags for electronic marking of standing trees
4. Gianni Picchi, Martin Kühmaier, Juan De Dios Diaz: Survival test of RFID UHF tags in timber harvesting operations
5. Ola Lindroos, Emil Brangefeldt: Evaluation of the educational influence on forwarding planning capacity
6. Daniele Magliocchetti, Federico Prandi, Giulio Panizzoni, Davide Lotto, Raffaele De Amicis: SLOPE, a 3D forest virtual system to support harvesting operations in mountain areas.

Tom Gallagher bio je moderator sesije B4 »Getting it there – Wood chip supply chains«:

1. Kalle Karttunen, Juha Laitila, Tapio Ranta: Main innovation types of forest biomass supply chains
2. Enda Coates, Brian Cronin, Tom Kent: A trial to evaluate three harvesting methods in a conifer first thinning in Ireland: cut to length harvesting, integrated harvesting, and whole tree harvesting
3. Raul Fernandez-Lacruz, Dan Bergström: Developing biomass supply systems for forested marginal lands in Sweden
4. Witold Zychowicz, Arkadiusz Gendek: The efficiency of the logistics of energy wood procurement chain in the north-eastern Poland
5. Fulvio Di Fulvio, Dan Bergström, Yrjö Nuutinen: Effects of harvested tree size and density of undergrowth on the operational efficiency of a bundle-harvester system in early fuel wood thinnings
6. Lyubcho Trichkov, Dinko Dinev: Wood harvesting and processing of non-standard wood to chips for bioenergy.

Sesijom C4 »Flying High – Cable yarding« moderirao je Pierre Ackerman:

1. Carolina Lombardini, Fabio De Francesco, Giovanni Aminti: An analysis of whole tree harvesting in North Italian cable logging operations

2. Benjamin Engler, Christina Förster, Jörn Erler: »Lowland cable yarder« in four different process variants
3. Christoph Huber, Karl Stampfer: Efficiency of topping trees in cable yarding operations
4. Bruce Talbot, Stephan Hoffmann: Terrain-going cable yarders: Systems alternatives and conditions for application
5. Thornton Campbell, Hunter Harrill, Rien Visser: Case study of the Active 70 cable yarder in New Zealand plantation forests
6. Ebru Bilici, Tolga Öztürk, Muhittin Inan: Evaluation of cable yarding method by means of multi-decision making and GIS in post fire harvesting.

Nakon pauze za kavu održane su tri posljednje usporedne sesije A5, B5 i C5.

Sesijom A5 »Going even more places – Improved planning II« moderirao je Bruce Talbot:

1. Marek Pierzchala, Knut Kvaal: Computer vision – context aware aided, cable logging process
2. Kalle Kärhä: Towards better pre-clearance guideline of undergrowth on first thinnings: Case study Stora Enso Wood Supply Finland
3. Manfred Mittlboeck, Johannes Scholz, Ralph Jank: Harmonizing measurements from wood harvesting machines to support near real time spatio-temporally enabled dashboards for process control
4. Martin Opferkuch: LiDAR-based forest warehouse concept
5. Gunnar Svenson, Patrik Flisberg, Mikael Rönqvist: Development and implementation of new features in a route selection and distance measurement system



Slika 1. Večera u pivovari Josef uz proglašenje nagrađenih radova
Fig. 1 Dinner at the »Josef« brewery and announcement of rewarded papers and poster



Slika 2. A) osmokotačni harvester John Deere; B) gusjenično-kotačni harvester WFW 570D; C) osmokotačni harvester Ponsse Scorpionking i D) bager s raznim inačicama cjepačkih glava Woodcracker

Fig. 2 A) John Deere eight-wheel harvester; B) WFW 570D harvester; C) Ponsse Scorpionking eight-wheel harvester and D) various Woodcracker splitting tongs.

6. Sattar Ezzati, Akbar Najafi, Pete Bettinger, Ljusk Ola Eriksson: Terrain evaluation to identify landing locations in mountain areas using soft computation techniques.

Tomas Nordfjell bio je moderator sesije B5 »Going the right way – Logistics«:

1. Sandra Sánchez-García, Miguel Pérez, Covadonga Prendes, Elena Canga: Optimization and logistics of chip distribution using LiDAR technology and network analysis in a mountainous region of Northern Spain
2. Kazuhiro Aruga, Yoshiko Mizuniwa, Ryo Uemura, Chikara Nakahata: Optimum bucking method for clear-cutting operations in Nasu Forest Owners' Co-operative, Tochigi Prefecture, Japan

3. ForstInVoice – Optimizing logistics service pattern in fully mechanized harvesting procedure

4. Seppo Huurinainen, Björn Urbanke, Hans-Ulrich Dietz, Ute Seeling, Thomas Wehner: Real-time managing of timber and biomass procurement, harvesting and supply based on multiple end-users demands in mountain forests

5. Juha Rikala, Kyle Eyvindson, Aaron Petty, Veli-Pekka Kivinen, Bo Dahlin: Optimizing logistics of saw logs for a medium sized sawmill

6. Dalia Abbas: An assessment of the logistics, cost and life cycle of supplying wood products in Tennessee.

Zadnjom sesijom C5 pod naslovom »Not easy on the slopes – Steep terrain« moderirao je Raffaele Cavalli:

1. Raffaele Spinelli, Rien Visser, Oliver Thees, Hans Udo Sauter, Nike Krajnc, Catherine Riond, Nascia Magagnotti: Cable logging contract rates in the Alps: the effect of regional variability and technical constraints
2. Stefano Grigolato, Francesco Marinello, Andrea Pezzuolo, Sandro Forigo, Luigi Sartori, Raffaele Cavalli: Self-charging wireless module for remote monitoring of forest machines
3. Paul Magaud, Francis De Morogues, Mahmoud Chakroun: Yarding with a tethered balloon, a new start in the French Alps
4. Dzhamal Amishev, James Hunt: Steep-slope timber-harvesting research in Western Canada
5. Vladislav Klubnichkin, Evgeny Klubnichkin: Research of kinematics and dynamics of tracked timber harvesting vehicle running gear
6. Oliver Thees, Fritz Frutig, Renato Lemm: Sensor Based Data Collecting on Motormanual Wood Harvesting Operations.

I ove su godine dodijeljene novčane nagrade (slika 1) u iznosu od 800 € ukupno za najbolju prezentaciju,

drugu najbolju prezentaciju te najbolji poster. Nagradu za najbolji poster, prema rezultatima glasovanja svih sudionika savjetovanja, dobila je Nopparat Kaakkurivaara za poster pod naslovom »Feasibility study of timber harvesting systems on steep terrain in Thailand«. Nagradu za drugu najbolju prezentaciju dobio je Ola Lindroos »Management of outsourced forest harvesting operations for better customer-contractor alignment« dok je najbolju prezentaciju na savjetovanju, prema mišljenju Znanstvenoga odbora, imao Christian Kanzian »Effects of moisture content on supply costs and CO₂ emissions for an optimized supply network«.

Trećega i četvrtoga dana savjetovanja za sudionike je organiziran skupni posjet izložbi šumskih strojeva AUSTROFOMA 2015 (slika 2). Sajam je održan u Stift Schlögl – Hochfichtu, a prema službenim podacima organizatora (<http://www.austrofoma.at/presse.html>) posjetilo ga je 18.850 posjetitelja. Posjetitelji su mogli vidjeti šumarsku opremu, vozila, strojeve i alate od 145 izlagača na prezentacijskoj trasi duljine oko deset kilometara. U radu su prikazana najnovija šumarska vozila od skidera, forvardera, harvestera, harvardera, šumskih žičara i kamiona sve do iverača, cjepača i strojeva za proizvodnju šumske biomase.

Andreja Đuka