46. SIMPOZIJ AKTUALNI ZADACI MEHANIZACIJE POLJOPRIVREDE

Stručni izvještaj
Expert report

# HIGHLIGHTS OF 27TH CLUB OF BOLOGNA MEETING

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## SUMMARY

Club of Bologna, world task force on strategies for development of agricultural mechanisation, at 27th annual meeting in Hannover, presented importance of 4.0 Industry, and applicability in agricultural machinery. It were demonstrated three examples, and new term Agriculture 4.0 was promoted. Further were presented newest achievements related to application of ISO BUS and forestry mechanization. Finally, are considered the problems and possible solutions for sustainable mechanization in developing countries, case Africa.

**Keywords:** Club of Bologna, 4.0 Industry, ISO BUS, forest mechanization, agricultural mechanization for developing countries

## INTRODUCTION

Club of Bologna (CoB), a world task-force on the strategies for the development of agricultural mechanisation belongs, for sure, to the, Worldwide, most important organizations in the field of agricultural and biosystems engineering. It was founded 1989 as a free and nonprofit organization, supported by Italian agricultural and earth moving machinery manufacturers association ***FederUnacoma***. CoB gathers members from 31 countries and has 93 full members. Common, and most significant, CoB's activity is annual members' meetings, held alternatively in Bologna, during exhibition EIMA, and Hannover, during ***Agritechnica***.

## 4.0 INDUSTRY AND AGRICULTURAL MECHANISATION

In his introductory presentation ***Axel Munack*** defined new term 4.0 Industry, as a forth, and the newest, step of its evolution. Industry 4.0, was the first time presented in Hannover 2012. creating what has been called a "*smart factory*". The very essential definition is: "Within the modular structured *smart factories*, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the IoT (Internet of Things), cyber-physical systems communicate and cooperate with each other and with humans in real time, and via the *Internet of Services*, both internal and cross-organizational services are offered and used by participants of the value chain." The motivation of CoB was to tackle implementation of 4.0 principles and practice in industry of agricultural mechanization. At the first moment this new term and approach induces some doubts and resistant to futuristic vision. We may not forget our skepticism regarding Internet or cell phones, and these are now common and almost unavoidable part of our life.

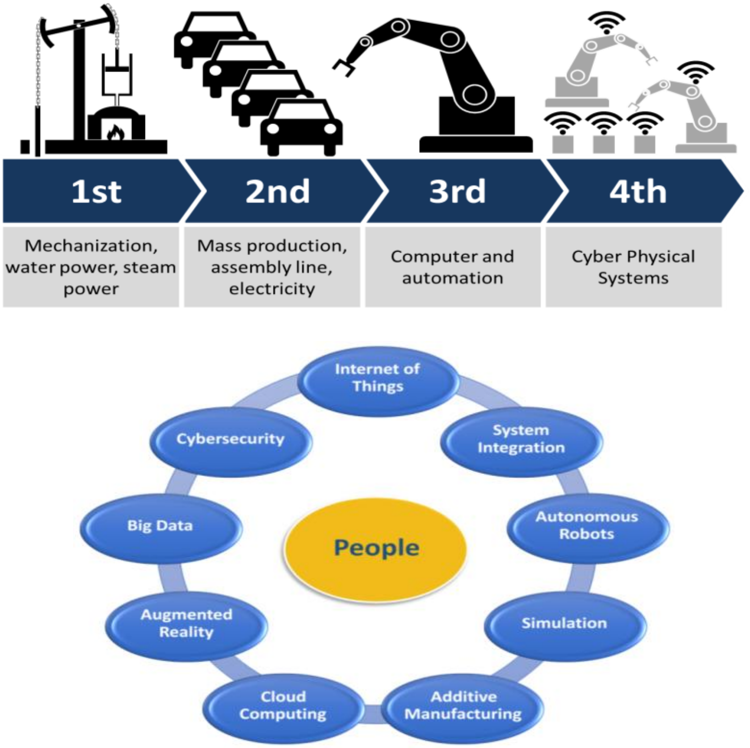


**Figure 1. Industry 4.0 what does it mean**
**(Roser at AllAboutLean.com; Munack, 2017)**

The the first presentation **Industry 4.0: Impact on Both Development and Product** of ***Massimo Ribaldone***, from SDF Group, gave a historic overview on the development of machine design and examples of application by machinery manufacturer. Their intention, as very practical example, is to develop predictive maintenance for tractors and other machinery. By using contemporary sensors and IoT would be imminent failure detected.

This will be followed by timely supply of needed spare parts and will reduce maintenance/reparatory time. The same information, including operation conditions, can be used for design planning and corrections.

Second presenter was ***Franco Oliaro***, coming from company ROJ, Italy, producer of hard and software for industry. In his presentation **Smart Logistic for Effective Process** he described activity of the company of more than 240 employees, related to 4.0 industry and potentials for agriculture and agricultural mechanization.

As example of in own production applied utilization of digital information to trace the different materials and automate their handling, are listed following objectives:

- to reduce the material handling;
- to reduce the inventory failures;
- to implement flexibility with discipline;
- to find one place for everything and everything in its place;
- to set a FIFO (First In First Out) rule;
- to implement the material traceability.

This, smart logistic system, integrated with the ERP (Enterprise Resource Planning), enables application of 4.0 industry approach.

Their intention is to enable same application to agricultural machinery, e.g. for logging the seeding and fertilizing process (lot, operator, date, quantity) and remote diagnostic by using IoT ready systems.

***Ulrich Adam***, Secretary General of European Agricultural Machinery (CEMA), presentation was: **Agriculture 4.0 – the Challenges Ahead and What To Do About Them**. He introduced the term Agriculture 4.0., which should be logical upgrading of Smart and Digital Farming. In *Global Opportunity Report 2016*, developed by DNV GL, UNGC and Monday Morning Global Institute, Smart Farming take, in category Opportunities ranked by potential positive impact on society, first place, among fifteen listed issues.

Author set the question: How will Agriculture 4.0 impact the supply chain? Better use of IT will:

- Optimize the inputs (Precision Farming).
- Manage mechanization more efficiently & use of energy resources.
- Enhance crop storage techniques & reduce crop losses.
- Provide better information about market demand & seasonal fluctuation.
- Improve transport & logistics services.
- Optimize retailer stocking & storage (less waste).

Now, in Agriculture 4.0, are expected many new players. It was illustrated using potato cultivation and potato processing as examples.

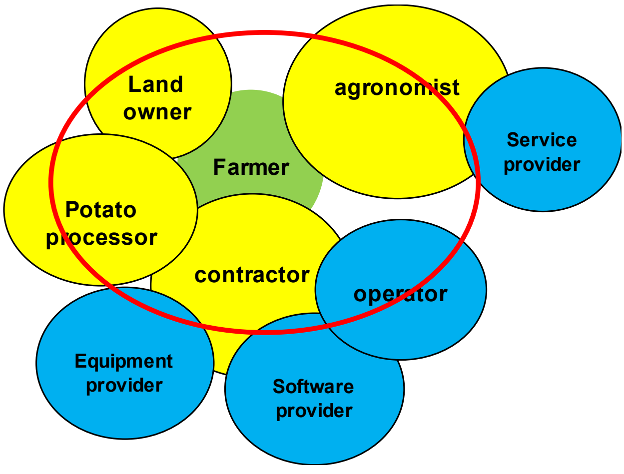


**Figure 2. Complex data exchange system and contractual data sovereignty using potato production as an example (Adam, 2017)**

A farmer is renting land to grow contracted potatoes. A contractor does the work on the field. The farmer is using an external agronomist for data-related activities. It is needed contracts related to data exchange: for the operation of the data systems, for the usage of the data for machinery related purposes, for sharing data with external parties (dealer, sub-contractors), etc.

Connected with this appears the problem of data security and potential misuse. EU started with development of *EU Code of Conduct on Agricultural Data Sharing – Core Objectives* (last update 27th of October 2017), that can help overcoming of this.

Another vast hindrance for performing Agriculture 4.0 is slow renewal of mechanization. Even in developed Germany, with 1.2 million tractors, their average age is 27.5 years. Annual fleet renewal is by only about 33,000 new tractors.

Final message of the presentation was: Agriculture 4.0 – a Unique Opportunity: Working Together to Master the Challenges/Disruption to Reap the Benefits!

## NEW DEVELOPMENTS IN ISO BUS, THE INDUSTRY PERSPECTIVE

***Marcello Mongiardo*** from CNH presented today's status and future development of ISO BUS as an unavoidable control system of modern agricultural machinery and implements that is now after the 15 years in the market at point to improve its capabilities beyond today's level. **Peter van der Vlugt** from Kverneland Group presented AEF-ISOBUS: State of the Art and Future Directions showing whole development and standardization from the Agriculture Industry Electronics Foundation (AEF) point of view.

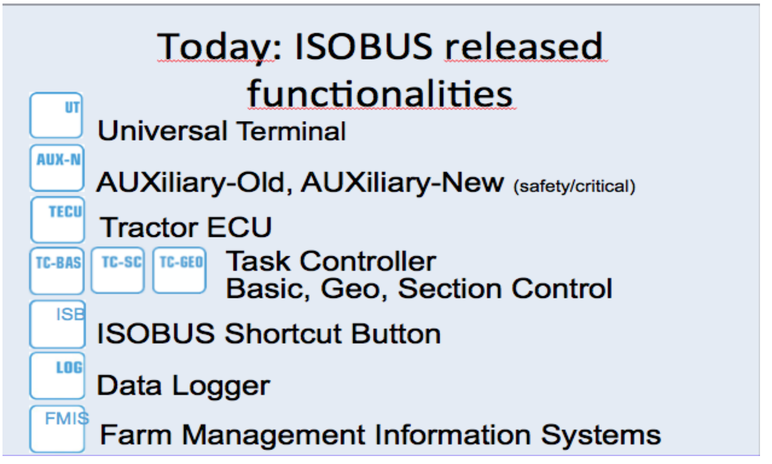


**Figure 3. Today ISOBUS released functionalities (Mongiardo, 2017)**

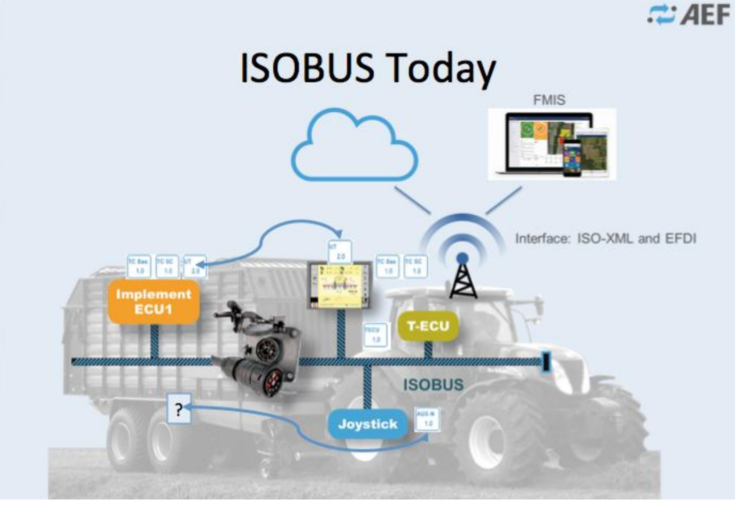


**Figure 4. ISOBUS Today (Van der Vlugt, 2017)**

**Tractor Implement Management** is one of the next steps in the near future. Within AEF manufactures are creating a robust way of opening automation to ”trusted equipments” defining rules to clarify liability and guarantee a ”plug and play” approach to the customers.

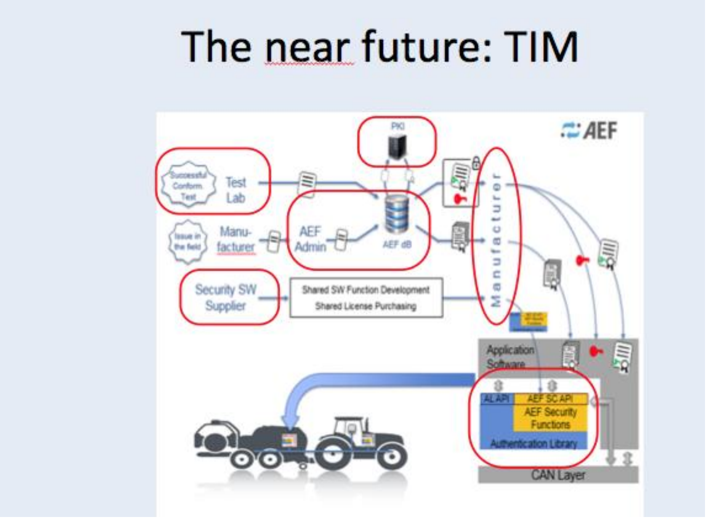


Figure 4. The near future: TIM - Tractor Implement Management (Mongiardo 2017)

**Future challenges in ISOBUS development** are focused at three points:

**1. COPL (Cost Optimized Physical Layer):**

Cost optimization allowing a higher diffusion of the ISOBUS technology (also more suitable for smaller machines). The goal is to reach lower volumes and smaller application.

**2. WIC (Wireless Infield Communication)**:

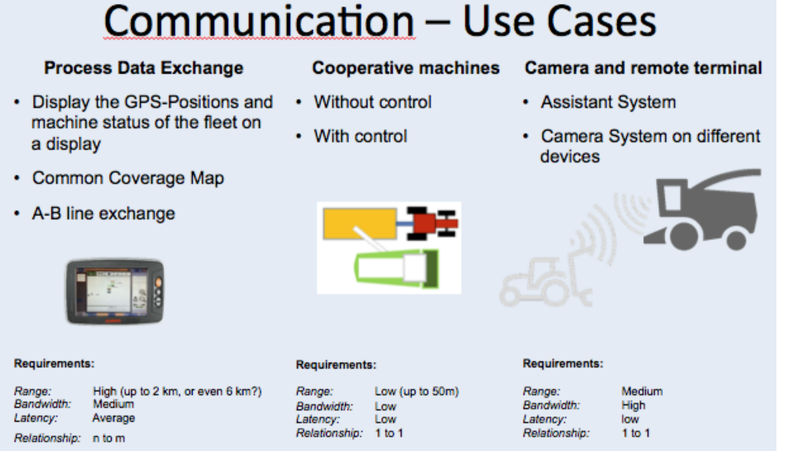


Figure 5. Wireless Infield Communication- Use Cases (Mongiardo, 2017)

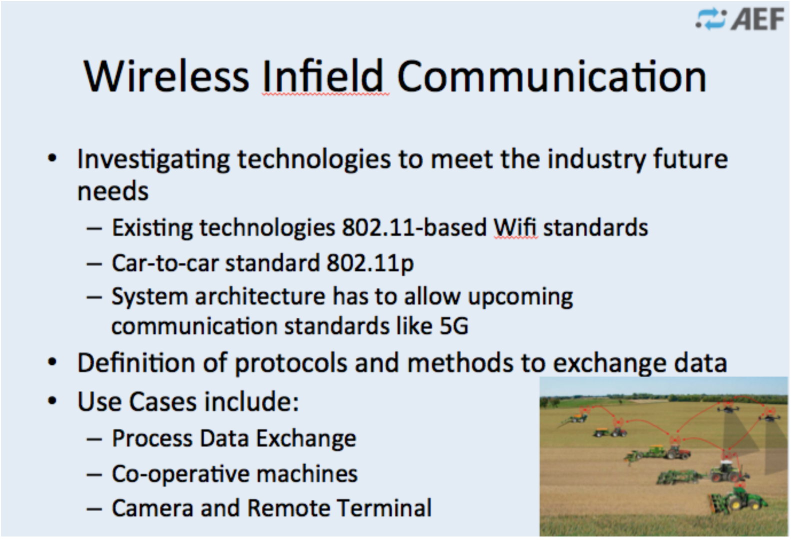


**Figure 6. Wireless Infield Communication (Van der Vlugt, 2017)**

**3. HIS (High Speed ISOBUS):**

- Distributed high resolution position/correction signals.
- Digital Video Systems.
- Improved Service and Diagnosis (flash ECUs, Log-files, raw data streams for debugging).
- Mobile Internet on ISOBUS for dedicated server/client requests.
- High Voltage data Connection.

As technology evolves, manufacturers must take advantage of new opportunities with the end goal of providing farmers with a higher productive, higher quality and more efficient farming cycle.

## FORESTRY MECHANIZATION

***Ute Seeling*** head of the German Centre for Forest Work and Technology presented a broad overview on "**Challenges and Drivers for Forest Technologies and Techniques in Forestry"**. She introduced a historical overview of the development of mechanisation in forest management and a classification of the processes and machinery available today according to its suitability for use in sloping terrain (fig. 7).

Developments in management with permanent tramlines resp. logging trails and aspects of working conditions (safety, physical and psychological workload), economic efficiency and environmental aspects were presented with a specific focus on German situation. In Germany the Forrest workers decreased approx. to the half within the last 20 years and fully mechanised processing reached 90 % of harvesting. Future developments focuses on safety and soil protection (also related to increase of machine weight (fig. 8) and regarding to digitization (caused by related developments in sensors, positioning, telecommunications and big data management) on automatization, robotics.

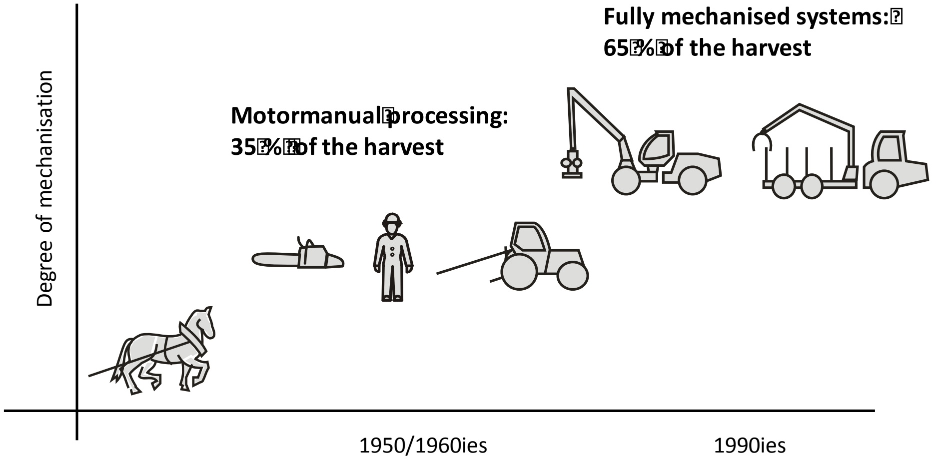


**Figure 7. Development of forest mechanisation a historical view (Seeling, 2017)**

Profound changes are expected in regard to:

- increased productivity;
- improved security;
- increased soil protection;
- improved environmental protection;
- reliable certification.

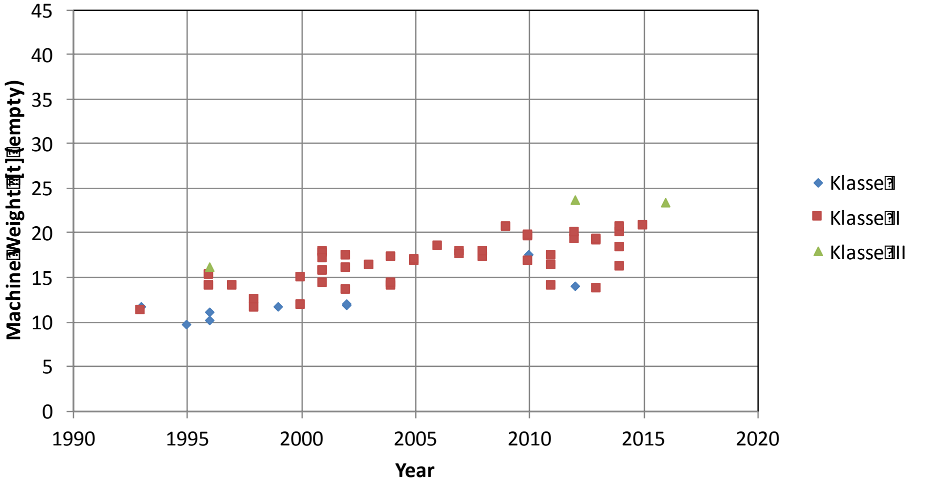


**Figure 8. Development of machine weights within 20 years (example forwarder) (Seeling, 2017)**

The next steps in the development of the forestry on the one hand will implement digitalization (work preparation via GIS/GPS, optimized bucking, logistics via GIS/GPS and internet, documentation via GIS/GPS, Data-communication via E-Mail/Cloud computing) and on the other hand transparently trace the interconnection of data flows in a "forestry 4.0" system, which integrates the whole chain from forest cultivation to wood processing industry right up to the end customer.

The presentation by ***Raffaele Cavalli*** from Department of land, environment, agriculture and forestry University Padua shed light on the topic **"Ground Yarding Operations in Mountainous Terrain"** and its importance taking into account that mountain forests represent a remarkable 23% of the Earth's forest cover and the necessity that forest operations have to be subordinated to the multifunction of mountain forests (ecosystem services). Beside traditional tree harvesting techniques (see fig. 9) new steep-slope harvesting machines with specialized undercarriages and carriers have been shown to safely access and operate on terrain up to 70% slope, like winch-assist systems (different man driven machines up to robots).

Its benefits can be seen in aspects of safety, productivity and additivity to local conditions and design of logistics. New developments focus on remote control and tele-operation. Last development, the tele-operation method interrupts the physical connection between the forest worker and the working area, which means that the forest worker is directly connected to the working machine using cameras, sensors, microphones and additional positioning software in a protected environment (virtual reality). Increase of safety, comfort and productivity of the operator can be expected. Conclusion summarized "The implementation of tele-operated, semi-autonomous and fully autonomous forestry equipment, in conjunction with constantly improving winch-assist technology, will provide a platform for safely extending the range of ground-based equipment to previously infeasible terrain conditions."

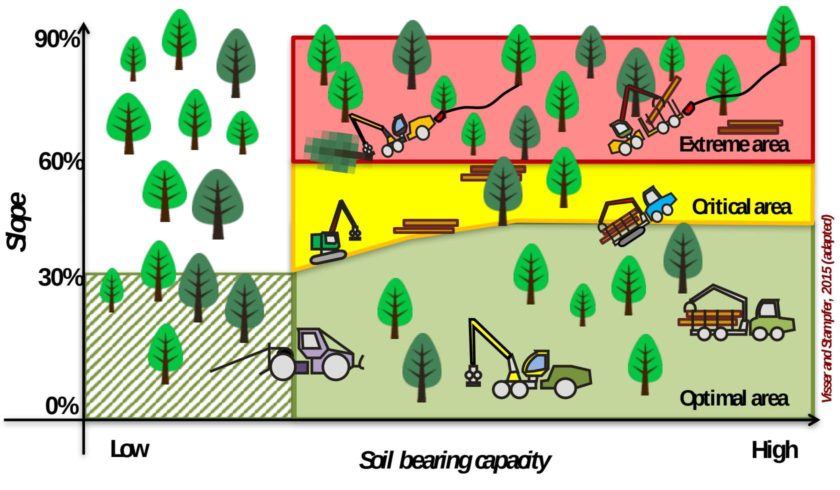


**Figure 9. Steep-slope ground based harvesting operations in mountain forests (Cavalli, 2017)**

## NAIROBI CONFERENCE REPORT

Social and ethic aspects are highly respected by CoB. This is demonstrated by introduction of agricultural mechanization problems in underdeveloped and developing countries in annual meetings. By this meeting was reported about situation in Africa, related to Nairobi Conference **Sustainable Agricultural Mechanization**, and reported by ***Josef Kienzle***, FAO-Group leader of Mechanization group. Based on discussed problems it was proposed to consider possible aids of developed countries to find appropriate solutions for sustainable mechanization in developing countries. One of tasks can be development of adequate and affordable tractor.

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**NOTE:** Literature references can be requested from the authors. All presentations and written papers are available at: http://www.clubofbologna.org/en/meetings-proceedings.php.