INTERNATIONAL CONFERENCE "Management of Genetic Biodiversity by Plant Breeding and Sustainable Agricultural Technologies"

THE SMART TRACTOR AS A DRIVER OF FINANCIAL PERFORMANCE IN MODERN AGRICULTURE

Cristina Gabriela Vasciuc (Săndulescu)[1], Lavinia Udrea[2] , Dumitru Săndulescu[3] Partal Elena[4]

[1]Valahia University of Targoviste, 13, Sinaia Alley, Târgoviste, Romania

[2]Valahia University of Targoviste, 13, Sinaia Alley, Târgoviste, Romania

[3]Colegiul Tehnologic Viaceslav Harnaj, Sector 1, Bucharest.

[4]National Agricultural Research and Development Institute Fundulea, Romania

***Corresponding authors. E-mail: moise_l74@yahoo.com**

INTRODUCTION

The greater complexity of production systems that characterize the agroecological transition requires the use of multiple skills, with training needs for advisors that are not always met. The aim is to support risk-taking, especially for the most mature companies, and risk-sharing between investors and innovative actors.

METHODOLOGY

In this study, we analyzed digital technologies in agriculture in developed countries. This type of innovation is now generally found more in the agri-food industry sector. Then, the second type of innovation concerns organization. In the agricultural sector, innovation in the organization of the sector was gradually created with the development of upstream and downstream sectors, structuring a division of tasks within the sector. Finally, the third and last type of innovation is that of processes.

This study was conducted to design, calibrate, integrate and validate a compact general-purpose system for the precise measurement of tractor performance parameters by using a new interface technology, HMI.

RESULTS AND DISCUSSION

Farmers have already adopted technologies such as the internet, geographic information systems, wireless sensor networks, radio frequency identification, Bluetooth, near field communication, long-term evolution, robotics, automation, programming and recently introduced smart technologies. Farmers who invest in digital technologies seem to improve the economic, environmental and social performance of their farms.

Hardware and SoftwareHMI hardware and software allow the operator to interact with the machine using graphical screens that can be programmed to display the information required by the users. The outstanding features of HMIs, such as low hardware, ease of use, excellent communications, and reliable messages, lead to their universal applications in engineering practices (Shafaei et al., 2019). Therefore, an attempt was made to develop an integrated, HMI-assisted, and low-cost system for measuring, storing, and visually presenting in real time various field performance parameters of any implement attached to the tractor with a high degree of accuracy.An integrated system with HMI-assisted visual interface was developed to measure, acquire, and display in real time various performance parameters. The developed system was installed in the tractor. The developed system comprised a visual interface based data acquisition system and 16 different special purpose transducers/sensors for measuring different performance parameters such as actual and theoretical speed, implement working/operation depth, fuel consumption, traction, wheel slip, PTO torque and tractor geolocation. The sensors were selected based on their market availability, ease of use, affordable price and high operational efficiency with minimal or no measurement errors.

Testing the system developed with rotavator. HMI, human-machine interface. Source: wileyonlinelibrary.com

Mounted elements:1- encoder 1,2- data acquisition unit,3- encoder 2,4- encoder 3,5- flowmeter,6- encoder 47- encoder 5

CONCLUSIONS

The tractor is the main source of energy in the agricultural production process, being used in a wide range of operations — from soil preparation to transport activities. However, due to inefficient management of tractor-machine combinations, the maximum capacity of the tractor is not exploited optimally. This mismatch leads to power losses, decreased operational efficiency and, implicitly, to increased total costs of agricultural production.However, these problems can be significantly reduced by proper equipment management, based on precise monitoring of performance parameters. Careful monitoring of the tractor's behavior in the field allows the operator to choose the appropriate tractor-machine combinations depending on the soil condition and the type of work. Thus, operational costs can be reduced and the total cost of production can be optimized.Tractor performance depends on a number of key parameters, such as fuel consumption, ground speed, wheel slip, power take-off (PTO) torque and speed, drawbar drawbar pull, and working depth. To improve field performance in terms of traction, power, and energy efficiency, it is necessary to introduce advanced monitoring systems in educational and research institutions.Farmers also need modern solutions that help them select the optimal tractor-machine combination for specific field conditions. Currently, most farmers make these decisions based on experience or recommendations from other farmers, which can lead to the selection of unsuitable equipment and a decrease in overall performance.