Variety testing innovation for new challenges and a more resilient agriculture: The example of oilseeds and protein crops in Switzerland

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Diversification & Digitalisation
Trends that Shape Future Agriculture

BOOK OF ABSTRACTS

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Welcome to XVII. European Society for Agronomy Congress – Diversification & Digitalisation – Trends that Shape Future Agriculture

Dear Friends,

it has been two and a half years, since many of us have been participating in a scientific congress, as we have done so many years before, meeting other fellow scientists, old friends and the new kids on the block, and enjoying being in another place for a couple of days, with different habits, food and landscape. It has always broadened our minds, and we always learned new aspects of agronomy when visiting experiments and research facilities during the mid-congress excursions, as it was a well-appreciated custom during the Congresses of the European Society for Agronomy.

The Covid-19 pandemic has changed our lives, and also the modes of communication in science. Being forced to meet virtually in the aether, we experienced the first online Congress of the ESA in 2020. It worked, surprisingly well, and with the technology getting better and better, and the pandemic losing its evil face, we are now in the comfortable situation to choose whether we take on travels for a meeting, or quickly meet online, saving kerosene and time otherwise being lost at airports or in traffic jams.

Now we are back in 3D. The seventeenth congress of the European Society for Agronomy (ESA) will be held in Potsdam, Germany, from 29 August to 2 September 2022, and an overwhelming majority of you voted for having a "physical" congress, longing for all those side effects that we have been missing in the virtual world. And there is a lot of things we need to do: with yet another heat record this summer, climate change becomes undeniable for almost all of us. At the same time, more and more studies suggest a negative impact of chemical substances being used in agriculture on biodiversity, and the decline of insects and birds in European landscapes has alarmed policy-makers. The eutrophication problem also still is far from being solved. Mitigation of and adaptation to climate change, while reducing the use of agrochemicals and further increasing the efficiency of the resources used requires new ways of thinking. And it is our task, the agronomists and agricultural scientists, to develop this new thinking, with fresh ideas, new evidence and practical solutions. The digital world offers completely new approaches, and technological support we have never dreamt of. And on the other side, our ancestors have optimised their cropping and farming systems over millennia through diversification, and much of this knowledge is still very useful. But how to make best use of it? How to integrate the many ideas, so that all the multiple goals can be achieved in a well-balanced way?

The XVII Congress of the European Society for Agronomy is *the* place to exchange on all this. I hope that you all find an interested audience for your research, and learn many new things from your peers that inspire your future work. Have a safe journey to and fro, and …

Enjoy your time in the beautiful town of Potsdam!

Yours

Claas Nendel
ESA President

Variety testing innovation for new challenges and a more resilient agriculture: The example of oilseeds and protein crops in Switzerland

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The current market calls for the introduction and diffusion of varieties with a stable yield through the adaptation to climatic and sanitary conditions. New technologies for variety testing and recommendation are expected to enhance crop performance and help to adapt to climate change effects. Criteria and methods for plant variety testing must be innovative, global, and efficient to enable the adoption of new varieties that perform better than current ones. Variety testing is presently exclusively based on field experiments in multiple locations, which does not enable to cover all environmental conditions existing within the cultivation area used by farmers. To better characterize the behaviour of varieties in various environments – including abiotic and biotic stress – new criteria must be identified and readily available. Crop modelling could reinforce the evaluation of the suitability of varieties to an extended set of environments that represent better the cultivation area. This study will focus on advances in variety testing using oilseed rape and protein crops as case studies.

Making variety testing efficient and practical requires the involvement of farmers and extensionists. A survey was distributed among farmers to collect information on their expectations. In summary, the survey indicated expectations for the adaptation of the variety to the evolution of cropping systems. There is a need for varieties that are adapted to lower input management and organic farming, for which new criteria for variety evaluation is crucial. Rapeseed growers face an increasing number of insecticide withdrawals, and therefore variety evaluation is expected to increase efforts in assessing tolerance of varieties to insects. Early vigour, ground cover, collar diameter and growth resumption in the spring are under study and could be, in a near future, included as official criteria. In soybean, reducing herbicide use is targeted through the identification of cultivars with high weed competitiveness. Artificial weeds are included in soybean variety trials and image analysis aims at evaluating their performance in sub-optimal conditions. To meet the needs of organic farming systems and systems based on agroecological principles, variety testing should also consider mixed cropping. In Pea, cultivars are characterized for their mixed-cropping potential with barley or lentil. The specific objectives are to compare the productivity, lodging resistance, disease resistance and the competitive relationships of pea cultivars in mixed-cropping.

For a long time, variety testing has relied on visual observations. However, over the last few years, automatisation, robotisation and the use of non-destructive approaches for measurements have made their way into this domain. Digital tools are available for phenotyping as well as for understanding the response of the different varieties to the

environment. A current study aims at incorporating these technologies into the toolkit used for sunflower variety testing. It consists in evaluating the correlation between measured field data and UAV measurements, and thus assessing the potential use of UAVs to determine crop density, crop height, canopy cover, crop phenology and crop water status. Additionally, the use of crop modelling would supplement the information from variety trials by accounting for environmental and agronomic conditions unencountered in trials.

A short overview of the challenges and new practices that are still under development or that have recently become available reveals promising prospects for variety testing: i) integrating sustainability criteria into performance testing, ii) developing digital tools suitable for variety testing, and iii) implementing decision support tools in variety testing.