From its roots, organic inspires science, and vice versa

Book of Abstracts of the Science Forum at the Organic World Congress 2021, September 8-10, 2021

Rennes, France

Gerold Rahmann, Frédéric Rey, Reza Ardakani, Khalid Azim, Véronique Chable, Felix Heckendorn, Paola Migliorini, Bram Moeskops, Daniel Neuhoff, Ewa Rembiałkowska, Jessica Shade, Marc Tchamitchian (eds.)

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FABA BEAN: A POTENTIAL INTERCROP IN ORGANIC VEGETABLE PRODUCTION IN A EUROPEAN PERSPECTIVE?

Sindhuja Shanmugam* [1], Margita Hefner[1], Koen Willekens[2], Alessandra Trinchera[3], Kivijärvi Pirjo[4], Chris Koopmans[5], Dirk Van Apeldoorn[6], Liga Lepse[7], Joran Barbry[8], Constantino Valero[9], Hanne Lakkenborg Kristensen[1]

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Abstract: Intercropping can provide ecological and yield benefits when selecting crops and management practices that balance the competition for resources. A field experiment was carried out under temperate conditions to study the effect of intercropping faba bean (*Vicia faba* L.) and pointed cabbage *(Brassica oleracea* var. *capitata* f. *conica)* on yield and plant nitrogen (N) uptake.

Both crops were grown in mono cropping (MC) and intercropping systems (IC). The yield of pointed cabbage per meter row was 28% higher under IC compared to MC. The ratio between marketable yield and total yield of pointed cabbage was also higher in IC. However, faba bean yield per meter row was reduced by 15% under IC.

There was an indication of higher total N accumulation under IC followed by cabbage-MC and faba bean-MC. Soil mineral N at harvest (0-2.5 m depth) was lower in cabbage-MC, followed by IC and faba bean-MC. The intercropping system had a positive land equivalent ratio (LER) of 1.06, which points to the potential of using faba bean as an intercrop in sustainable organic vegetable production systems with higher N use efficiency.

Results will be discussed in the wider perspective of several European trials on intercropping from the SureVeg-project (Strip-cropping and recycling for biodiverse and resource-efficient intensive vegetable production) and point to new knowledge for farmers wanting to implement intercropping.

Keywords: Land equivalent ratio, Nitrogen use efficiency, soil mineral nitrogen, Vicia faba L.

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*STRIP-CROPPING SYSTEMS*STRIP-CROPPING SYSTEMS ROBOTIZATION: PROTOTYPE DESIGN GUIDELINES FOR TARGETED FERTILISATION

A. Barrientos[1], C. Valero[2], J. del Cerro[1], A. Krus[2], J.J. Roldán[1], J.J. Ramírez[2], M.C. Lima[2], Koen Willekens[3], Chris Koopmans[4], Walter Rossing[5], Alessandra Trinchera[6], Sari Himanen[7], Joran Barbry[8], Liga Lepse[9], Hanne Lakkenborg Kristensen[10]

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Abstract: Organic agriculture has an increasing demand, driving conventional farmers to change their businesses [1]. In some cases, the lack of attention for biodiversity and soil fertility of current practices may damage the credibility of organic products [2]. The SUREVEG project focuses on the implementation of strip-cropping in organic production to improve soil fertility and biodiversity throughout Europe.

The aim is to enhance resilience, system sustainability, local nutrient recycling, and soil carbon storage [3]. However, husbandry crops grown and mixed in a strip design pose new challenges regarding mechanisation, which in many cases can only be overcome by increasing human tasks [4]. To counteract the additional labour of a multi-crop system, one of the main objectives of this project is the development of automated machinery for the management of strip-cropping systems.

A robotic tool is proposed, which will be operating upside down, attached to a wide-span mobile carriage similarto gantry systems used in Controlled Traffic Farming. Within the project framework, a modular proof-of-concept version is being produced, combining sensing technologies with actuation in the form of a robotic arm.

Despite many robotic developments recently presented, which are designed for weed removal, this proof-of-concept will focus on providing precise organic fertilization. Fertiliser needs will be identified in real-time and carried out on a single-plant scale. Design guidelines of the proposed prototype have been detailed.

The planning and control of the manipulator are being developed in two ways: using conventional algorithms and applying machine learning techniques. First results have been also obtained with the sensorics onboard the robotic platform, by using a combination of LiDAR systems and multispectral cameras to localize single plants, and to detect their status, according to fertilisation demands.

Keywords: fertilization, LIDAR, manipulator, multispectral camera, robotics, strip cropping

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