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Session: 3. Agronomic strategies and environment

Uncovering Legume Soil Fatigue for Sustainable Expansion of European Grain Legume Cultivation (LeFaSus)

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Grain legumes are essential crops in Europe that provide plant proteins for human nutrition and animal breeding. Furthermore, grain legumes can reduce mineral fertilizers application by nitrogen-fixation reaction, this process allows the sustainability of the agroecosystems by reducing the input requirements. However, if grain legumes are inserted too frequently in the crop rotation, soil-borne diseases may occur. The main biotic diseases that can be identified in legumes field are insects (e.g. weevil, aphids, bugs and beetles) and fungi (e.g. Pythium, Rhizoctonia, Fusarium). Especially, fungi spores can last for many years in the soil causing the phenomenon called soil fatigue; it occurs where farms are specialized for the cultivation of certain crops and where short crop rotation or monocropping is adopted. The LeFaSus project is involving many partners around Europe [University of Kassel, University of Ferrara, Institut for Organic Agriculture Research and Development, Norwegian Institute of Bioeconomy Research, Norwegian University of Life Sciences] in order to study soil fatigue in many environmental conditions and give a clear definition of legume fatigue. Indeed, Legume Soil Fatigue phenomenon is studied along European countries: Norway (Northern Europe), Germany and Luxembourg (Central Europe) and Italy (Southern Europe) to identify bioindicators located in the soil that could help in prevent or reduce soil fatigue. The project wants also to suggests good agronomic practices that could act positively by reducing soil-borne diseases. Furthermore, farmers involvement allows the creation of network with many farms but could also start long term experiments if significant data will be collected. Firstly, the project foresees the involvement of farmers specialized in grain legume cultivation. Selected farms will be involved in questionnaires compilation which allow to understand the information about farm management (e.g. size of the farm, crops cultivated, crop rotation, type of fertilizers adopted) related to the last 10 years period. Each farmer will share the field destinated to legume cultivation to make the assessments demanded by the project. Indeed, the second part of the project requires the identification of areas where optimal and critical crop establishment will be used for measurement at three different phenological stages (emergence, flowering and harvest); Totally, 120 - 150 farms will be involved in all agro-environmental conditions. At the emergence, seedlings morphological traits are measured (height, plant density, seed depth and coverage) and

emergence disease assessment are made. Also soil samples are collected to identify soil microorganisms (DNA extraction, nematodes and protists analysis) and soil physic-chemical characteristics. At the flowering stage leaf and root assessment are made and root samples are collected to identify diseases origin. Finally, at the harvest, pods are collected for yield and damage estimation.