HOLISTIC RESOURCE MANAGEMENT FOR
CLIMATE RESILIENCE OF FARMING

Farmer Workshop Handout
ClimateFarming

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Introduction

Agriculture is at the center of a number of major environmental and climatic challenges. Climate change, with increased occurrences of weather extremes such as droughts and storms, potential shortage of mineral fertilizers, soil erosion, decline of pollinators and other factors are not only exacerbated by farming, but at the same time represent serious challenges for the current agricultural system itself. Our project will equip a new generation of farmers with needed skills and knowledge to implement climate adaptation and mitigation measures in farming. The delivery of an innovative and future-oriented consultation and training on climate mitigation and adaptation will provide practical solutions to transform agriculture landscapes and practices resulting in sustainable cultivation methods and consequently a balanced climate and ecosystem.

The main purpose of the ClimateFarming project is to design strategies for sustainable and climate-resilient transformation of agricultural enterprises in the Czech Republic, Germany and Luxembourg. With our consultation and training offers, we will provide participants skills and knowledge to implement strategies and cultivation methods to respond to the challenges the agricultural sector is experiencing in Europe and worldwide.

The Farmer Workshops are part of Work Package 4: ClimateFarming Implementation. In this WP, we aim to directly apply the outputs from WP1 (Consultation Material) and WP2 (Train-the-trainer materials) and the newly acquired training skills of our partner organizations. With the workshops to be implemented in this WP and the dissemination of our results to a wide audience, we achieve that interested farmers and advisors/teachers/stakeholders learn about climate adaptation and mitigation measures in farming. The Farmer Workshops will raise awareness of the farmers to the urgent need and possible practical application of climate mitigation and adaptation strategies in farming. The workshop was originally targeted to the partner farms implementing the Consultation on their farms. But we decided to open this format to other interested stakeholders and therewith widen the outreach of this educational activity and hence the impact of this WP.

These Workshops were implemented in all 3 project countries (Czechia, Germany and Luxembourg) with minimum 30 participants per country.

This report for the Farmer Workshops conducted in each partner country contains:
1) Information on workshop organisation & content
2) Analysis of participants' feedback
3) recommendation and adaptation needs for improvement of future farmer workshops & materials

Profile of participants: farmers, students/apprentices in agriculture, VET providers and teachers, representatives of Higher Education Institutions.

30 Participants in Farmer Workshop per country

New and Alternative Crops (Focus Drought and Heat)

Description:

The integration of cultivars which are better adapted to altered climate conditions can help to diminish the negative impacts on agricultural production (Jacobs et al., 2019). In addition, increased temperatures and longer growing periods enable the cultivation of new crops, e.g. protein-rich legume species like chickpea (Manners et al., 2020).

Adaptive and mitigative potential:

The adoption of species and cultivars more tolerant is perceived as one of the most promising adaptation measures, especially in Central Europe (Jacobs et al., 2019). The main advantage is the low adaptation barrier, especially with new cultivars of well-known crops, with which not much of the learned routines must be changed. Problematic is the long development cycle of new cultivars (>15 years) and the trade-offs between certain traits, e.g. drought resistance and productivity (Spieß, 2018). The re-orientation regarding cultivar and species selection can enhance crop diversity and consequently reduce production risk (Olesen et al., 2011).This will most likely improve yield stability, but with reductions in maximum yields. This issue is not that critical for new crops, since they are already adapted to different climates, but there is also a limit to abiotic factors. For example, chickpeas can suffer from prolonged periods with temperatures above 35 °C (Gaur et al., 2013). The mitigative potential is related to more stable and maybe higher yields under changed climate conditions (Jacobs et al., 2019). In addition, higher amounts of biomass can improve the amount of carbon stored in the soil. A negative impact could be imaginable if yields are significantly lower with the new cultivars and species compared to high yielding varieties under the same climatic conditions.

Bio-physical assessment

An increase in the diversity of field crops will most likely be beneficial for the broader biodiversity of the agro-ecosystem (Jacobs et al., 2019). Given that biomass production will increase due to changes in crop cultivar or species, the enhanced input in the soil is further beneficial for soil health (Delgado et al., 2011). This can counteract nutrient leaching and improve water quality. There will be most likely no negative effects.

Socio-economic assessment:

The economic viability of this measure will depend on the yields, qualities and prices that can be realized. Rather, new crops like soy and chickpea can compete with economic returns from other crops (e.g. winter wheat; Wolf et al. (2018)) and are potentially interesting for directmarketing. However, the yields are still low in average years compared to conventional crops, yet there is evidence that alternative crops can perform better under drought stress (e.g. Neugschwandtner et al., 2013). Another constraining factor is the challenging cultivation process and the need for processing infrastructure (oekolandbau.de, 2019b). Additionally, before large scale cultivation can take place, markets for the new crops need to be developed first (Spieß, 2018). From a social perspective, no constraints are expected.

Limits and uncertainty:

The usage of different crop cultivars and species is limited, like conventional species, by abiotic and biotic factors, yet at other thresholds. E.g. current chickpea varieties suffer significantly under hot periods with temperatures >35 °C or drought at sensible growth phases (Devasirvatham and Tan, 2018). Uncertainties are related with the temporal scope of breeding new varieties (Spieß, 2018), the establishment of markets (Manners and van Etten, 2018) and the still relatively small research basis of alternative crops like protein-rich legumes (Manners et al., 2020).

Maladaptation check:

Due to the limited temporal scope and the flexibility of the measure, introducing new cultivars and species is most likely not maladaptive. Even though it is not a no-regret measure when better yields could be achieved with conventional crops, the losses are still limited, since the investments only comprised time and seeds. This is not the case if initially large investments were made for new machinery or processing infrastructure. Additionally, the adoption of new cultivars and species can be tested on small plots, which makes it less risky.

Additional information:

https://www.lfl.bayern.de/mam/cms07/publikationen/daten/informationen/059723_kichererbse.pdf

https://www.oekolandbau.de/landwirtschaft/oekologischer-pflanzenbau/spezieller-pflanzenbau/ackerbau/koernerleguminosen/kichererbsen/

https://ltz.landwirtschaft-bw.de/pb/,Lde/Startseite/Kulturpflanzen/Kichererbse

Compost Use

Description:

Composting is the transformation of raw organic materials into a biologically stable form, with humic-like properties (Rynk et al., 1992). In the case of on-farm manure management, it is an option to recycle readily available inputs in order to minimize external input dependency (Ceglie and Abdelrahman, 2014).

Adaptive and mitigative potential:

The application of manure is associated with several beneficial aspects like the improvement of soil structure and health (incl. water holding capacity), the reduction of pathogens and seed and the potential positive impact on plant health through the suppression of soil-borne diseases (Rynk et al., 1992; Ceglie and Abdelrahman, 2014). Another benefit are the multiple usages of compost, e.g. as substrate for vegetable production (Mazuela et al., 2012). Disadvantages are the loss of nitrogen mainly due to nitrification and the small amount of readily plant available nitrogen when applied (Rynk et al., 1992). Regarding the mitigation of GHG emission, the overall impact of composting is debated and research results are partly contradicting (e.g. Bai et al., 2020; Pattey et al., 2005). On the one hand, there are substantial GHG emissions during the composting process (Pergola et al., 2018), while the extent is dependent on the process and management. In addition, the active production of compost requires generally the work of diesel powered machinery (Rynk et al., 1992). On the other hand, the application of compost can improve C-sequestration and decrease need for external inputs, e.g. fertilizers and pesticides (Pergola et al., 2018).

Bio-physical assessment

Especially positive about composting, if done properly, is the reduction of leachable nitrogen and the reduction of odours, which improve water and air quality (Rynk et al., 1992). As mentioned earlier, it is also beneficial for the improvement of soil physical properties, what is beneficial for belowground microbial activity (Pergola et al., 2018). Nevertheless, the compost production requires additional land and is also not odour free during the production process (Rynk et al., 1992).

Socio-economic assessment:

The treatment of manure to compost is hard to assess due to its numerous implications. First of all, the replacement of manure with compost could reduce crop yields, at least in the short term, due to the lack of available nitrogen (e.g. Sommer, 2001). Furthermore, composting requires a fundamental amount of time, knowledge and machinery. However, if compost application result in significant improvements in soil health and consequently in more stable yields, it could outweigh the costs. This could be supported by the usage of compost for other purposes, like vegetable production or as bedding material (Rynk et al., 1992). Socially, the usage of compost is most probably more acceptable since the odour nuisance is minimized (Font-Palma, 2019).

Limits and uncertainty:

Major uncertainties are connected with the long-term impact of compost application and the consequent reduction of manure application. Since the quality of the compost is dependent on the skills of the producer and the composting materials (Ceglie and Abdelrahman, 2014), the learning phase could be long. Additionally, composting requires water and manure as inputs. Thus, it is directly dependent on the viability of livestock keeping and the availability of rain and/or other water resources.

Maladaptation check:

Composting and compost use is relatively safe to be not maladaptive due to the several usages of the compost and its low starting cost. A test trial can easily be done with machinery that is available (Rynk et al., 1992). Again, the main input here is time. Furthermore, even with investment in more professional machinery, the option to economically improve the composting operation is existent by taking manure from other farmers who have a storage problem or by start co-composting with other biodegradable resources. Problematic is the potential higher share of GHG emissions, which must be contrasted with the ecological impacts of direct manure application.

Additional information:

https://noek-hessen.de/

https://www.oekolandbau.de/landwirtschaft/pflanze/grundlagen-pflanzenbau/duengung/kleegras-kompostieren/

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https://www.baselland.ch/politik-und-behorden/direktionen/volkswirtschafts-und-gesundheitsdirektion/landw-zentrum-ebenrain/sk_files/spezialkulturen/kurzanleitung-feldrandkompostierung.pdf/@@download/file/kurzanleitung%20feldrandkompostierung.pdf

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