Farmers' perspectives about the use and stacking of agroecological practices

EcoStack's objective is to develop and support ecologically, economically and socially sustainable crop production via enhancement of ecosystem services provision and protection of functional biodiversity.

Introduction and context

The application of multiple practices at field, farm or landscape-level agroecosystems can create synergies which improve the diversity and effectiveness of ecosystem services provision. The combination of two or more agroecological practices is expected to lead to synergies, enhancing also functional biodiversity benefits. The concept of 'stacking' of practices has recently emerged and is defined as the addition of one or more "sustainable" practices to simplified agroecosystems in order to maximise positive effects. However, little is known about the efficacy for stacking multiple practices, as well as practical aspects faced by farmers implementing them, along with the constraints and barriers for larger uptake.

Farmer perspectives regarding a shift in focus from implementing single farm management practices to 'stacking' different practices is crucial. Whilst there is increasing awareness of the benefits of agroecological practices, there is still insufficient information and knowledge available about effective strategies for adopting several beneficial practices in combination.

To better understand the levers and barriers for an agroecological management supporting enhanced crop protection on farms, a series of workshops with farmers and farm advisors from different European countries were conducted to facilitate knowledge exchange. Gathering their opinions enhances the effectiveness and legitimacy of agricultural transition with taking into account the diversity of viewpoints.

Methodology

Research issue

The goal of this newsletter is show the breadth of knowledge and perceptions about the agroecological practices from the perspective of different stakeholders. Practices of interest were called 'environmentally friendly practices' (EFPs) as farmers are generally less familiar with the term agroecological practices.

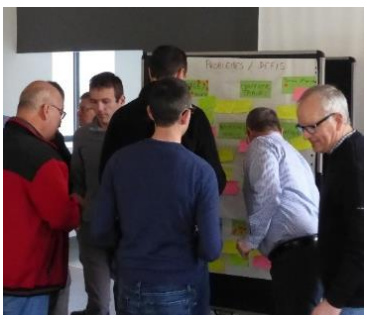
The workshops

A series of workshops with farmers and farm advisors were organised to facilitate knowledge exchange. 11 Results-Feedback workshops were carried out in 2022-2023 in nine European countries. Key results from different research work of Ecostack were presented, and feedback and reactions sought from farmers and farm advisors.

The objectives of these workshops were to better understand farmers' level of adoption of biodiversity-enhancing practices, their motivations, needs and potential trade-offs for the implementation of agroecological practices promoting functional biodiversity, as well as exploring possible solutions. Moreover, participants provided insights about their use of combination of different agroecological practices related to sustainable crop protection, and exploring possible solutions for stacking of practices on their farms.

Countries	Number of participants and profiles		
	Farmers	Advisors	Others
Spain	6	2	3
Portugal	5	5	4
France (2 workshops)	6	14	0
Germany (2 workshops – 1 online)	85	20	2
Finland	15	0	0
Italy	10	3	4
Bosnia-Herzegovina	24	2	6
United Kingdom	10	0	2
Bulgaria	0	2	16

Table 1. Number of participants of workshops and country location



Use of agroecological practices

In the workshops, participants were asked about their current use of agroecological practices (Table 2), which practices they are interested to implement in addition in the future. Moreover, advantages and disadvantages of each of the practices and stacking of practices were discussed among participants.

Table 2. Practices discussed during the workshops

Name of the agroecological practice	Short characterisation
Practices focused on in EcoStack	
Intercropping	Mixture of two or more crops, also undersowing
Cultivar mixtures	Mixture of two or more cultivars
Cover crop	Secondary crop cultivated between 2 main crops, harvested or not (green manure)
Organic mulches	Straw mulch or other organic material is spread between the crop rows
Diversified crop rotation	Succession of 4 or more crops on the same field
Off-crop measures/Landscape elements	Semi-natural landscape element such as hedges, tree lines, thickets, ponds etc.
Other agroecological practices	
Local crop varieties	Use of locally adapted and available crop varieties
Direct seeding	Seeding without pre-tillage (directly into a cover crop or mulch)
Biological control	Use of natural enemies for reducing or mitigating pests
Biopesticides	Pesticides based only on natural ingredients, e.g. Bacillus thuringiensis (BT)
Grass strips	inside a field or on borders of a cropped field
Flower strips	Flower strips inside a field or on field borders

Direct seeding into a cover crop

Barley-clover intercroppping

Flower strip

The three practices currently used most often, as indicated by about one third of farmers present at the workshops, were diversified crop rotations, cover crops, and integration of semi-natural landscape elements (e.g. hedgerows) on their farm. Future new practices farmers considered to be implemented on their farms were intercropping and use of organic mulch.

Advantages and disadvantages of practices and stacking

During the workshops, the participants were asked to select and discuss the main reasons for using or not using the practices were discussed in the workshops (Table 3), as well as potential constraints and barriers for combining agroecological practices, but also potential synergies.

Table 3. Main pro and cons for different practices

Practice	Advantages	Disadvantages
Diversified crop rotation	Maintenance of soil fertility; reduced presence of weeds and diseases	Not possible to specialize in a single crop
Cover crop	Prevent weed development; produce fresh biomass as green manure; prevent nutrient leaching; keep soil moisture	Seeds are expensive; under drought conditions, cover crops do not germinate and establish well
Intercropping	Increase of diversity in cropped area; input of nitrogen ; limitation of fertilizer need ; can enhance weed control; improved soil cover; attracts natural enemies of pests; undersown crop can be used as fodder for livestock	Only for some climates and weather patterns; different maturation times of mixed crops; weed management more difficult; fertilization more complicated; processing costs of harvesting mixed crops (sorting, sieving) is a constraint
Cultivar mixture	Useful for improving protein rate in cereals; getting higher yield; can reduce diseases and pest populations; limits problems of freezing for early maturing varieties; lagging pattern of the 'normal' cycle of cropping because of climate change; limitation of financial risks as stabilizing yield; limitation of fertilizer need	Different growing times; difficult for sale because as not pure cultivar; seed costs and difficulty to have the adequate seeds (certified seeds in organic agriculture); lack of tools and additional costs related to sowing; difficulty and complexity to mix the cultivars; needs infrastructure to separate the harvested seeds
Organic mulching	Improved water availability in soils; maintenance of moisture in the soil; plants are growing better; clear effects on erosion reduction; weed control; reduction of aphids and virus transmission; low cost of implementation for organic farmers because they collect the harvest residues or fresh grass at their own farms	Time-consuming; distribution of mulch in bigger fields without specialized machinery requires new investment; increased fuel consumption due to higher use of additional machinery or payment for intervention of provider/contractor; high costs related to production or mulching material for conventional farmers
Off-crop measures (flower strips, grass strips, hedgerow)	Not so expensive for small plots; attracts pollinators for crop pollination and natural enemies for pest control; shelter for beneficial insects and wildlife; improved aesthetic value of the farm and landscape; natural barrier on the farm	Expensive for large plots; takes away productive area; lack of appropriate flower/grass mixtures for local conditions; not desirable shading of crops; competition with trees for water; time-consuming maintenance

Participants were also asked to indicate and discuss their reasons for adopting agroecological practices. The most important reasons for adoption were 1) getting subsidies for the practice, there are 2) proven results about them, and they are 3) easy to implement and have low costs (Table 4).

Table 4. Ranking of the reasons for adopting agroecological practices (all participants combined)

Rank	Reason
1	Subsidies
2	Proven results
3	Easy to implement
3	Low cost

Stacking of practices

In a final exercise and debate participants indicated practices they would combine to gain the best benefits. The color scheme shows the 'lead practice' in different countries found in combination with other practices and can thus be seen as the target practice for a stacking strategy (Table 5).

Table 5. Preferred practices to be stacked. Colored practices are the four practices overall found as mainly used in combination with other practices

Rank	France	Italy	Finland	Bosnia and Herzegovina	Spain
1	Diversified crop rotation – Cover crop	Biological control - Biopesticides	Diversified crop rotation - Cultivar mixtures	Biological control	Cover crop - Organic mulch
2	Diversified crop rotation – Direct seeding	Cultivar mixtures - Local crop varieties	Diversified crop rotation - Biological control	Intercropping	Biological control -Flower strip
3	Cover crop – Direct seeding	Flower strips - Landscape elements	Cover crops - Diversified crop rotation	Local crop	Diversified crop rotation - Cultivar mixtures

The practices most selected for combination with others were 'diversified crop rotation', 'cover crop' and 'biological control'. Preference for stacking of practices varied between countries. Due to lack of knowing the effect of some agroecological practices, it might be that farmers mentioned practices to be combined for which they feel they understand their effect, know using them, and for which they have the appropriate machinery to implement.

Conclusion

Main findings

- Many farmers across Europe are already adopting many agroecological practices and they are also combining these practices together, either on their farm or on the same field.
- Farmers can have different reasoning and strategies why to adopt agroecological practices despite numerous constraints across scales and levels they also see for them. When they have a good knowledge of a practice, their decision to implement them is a compromise between the advantages and disadvantages they see for the respective practice.
- Main barriers associated with the adoption of sustainable practices from the farmer perspective were lack of knowledge, appropriate financing, market opportunities, lack of information on the quantification of the synergistic effects of the combination of two or more agroecological practices.
- Creation and dissemination of knowledge came up as a critical factor, and accompanying change. Financing and technical support seems to be further of large importance.

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