EIP-AGRI Workshop

Tools for environmental farm performance

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Key messages for policy and practice

- **An overall outcome of the workshop is that the participants, including actors from all the main EIP-AGRI groups (farmers, advisers, developers, stakeholders, policy makers and scientists), actively sought solutions and found shared opportunities to improve the use of environmental sustainability tools (EST).** A special feature of the workshop that enhanced its value to all was the strong balance of both tool developers, and farmers and other stakeholders who might use the tools and approaches. This meant that discussions were more practical and realistic, as well as more challenging, than might have been the case without such a balance.
- **"*It is essential to involve farmers from the beginning in the project*" and "*Developers should leave the lab, go to the farm and see the reality!*"** These statements were expressed many times and were widely supported at the workshop, but many existing examples of tools seemed not to have followed this practice. It is perhaps too easily forgotten when technical innovators are looking for funding and support to test out their latest ideas. The idea of farmers as the core tool developers with their own ownership of data was highlighted as an opportunity for EST.
- The workshop organisers began by considering an IT-based approach to Environmental Sustainability Tools, but discussions soon moved away from only this focus**. IT-tools might support a process to enhance environmental sustainability in farming, but should not be the only, or even the most central, element in a successful system**. Some specific issues are suitable for IT-tools, whereas more global or ambitious approaches might be beyond the scope of current IT-tools, and generally need a process to enable shared learning between actors – users, beneficiaries and developers.
- **Seeking to promote a tool without thinking about its potential financial impacts for users is something that should be avoided.** It was stressed how little attention is currently paid to the marketing and governance of these tools which is an eye-opener. It is clear that marketing is a key factor of success, as shown by some examples presented at the workshop which have been developed and promoted over a number of years. As regards governance, seeking a wider endorsement of a new tool (e.g. from farmers' organisations, supply-chain actors, government bodies or from independent NGOs with a high public profile) can help to encourage its uptake.
- **Experience shows that there can be other important 'benefits' (broader than financial) which make a tool or decision-support system attractive**. It can make management tasks easier, or help to even-out workloads on the farm. It can offer a farmer some personal satisfaction or enhanced social standing in a community, linking to other interests of the farmer or their family. Participation in initiatives and approaches within which EST are embedded can offer a valuable mechanism for interaction and collective learning, providing peer support and an interesting and stimulating social environment. It can be fun! Also, it can enrich farmers' own experiences through learning about particular aspects of their farm, such as soil management or biodiversity.
- As regards the content and user-interface, **tools need to be made simpler and easier to use**. In addition, a modular approach including holistic and some tailored methods with some standardisation but clearly governed and successfully market-oriented could be a valuable platform for effective and efficient EST development.

It was suggested that a group could help people to keep up with developments and share innovative experiences. The outcomes of the workshop indicate a **need for further support at Member State level and EU level to spread knowledge and share EST experience**.

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1. Introduction

The European Commission's DG Agriculture and Rural Development, with the support of the Croatian Ministry of Agriculture, held an EIP-AGRI workshop on 7-8 February 2017 in Zagreb, Croatia. This workshop aimed to discuss the uptake and ways to increase the uptake of the broad range of sustainability tools involving environmental assessments, which have already been developed and tested in projects and initiatives by farmers. The workshop also looked for opportunities to promote innovation in this context.

The workshop began from the premise that farmers have an interest in working with tools providing information on the environmental sustainability of the farm or its operations.

Environmental sustainability tools (EST) must meet the demands and interests of different stakeholders. The workshop provided a valuable opportunity to bring together a broad range of stakeholders - farmers, developers and other users or potential beneficiaries of sustainability tools - to share and learn from growing practical experience and thereby strengthen the benefits of their use. EIP-AGRI Operational Groups, which are financed through the Rural Development Programmes 2014-2020, could focus on the development or diffusion of novel sustainability tools such as these.

How to promote "usable" and "useful" environmental sustainability tools for farmers was the underlying aim of the workshop, with a subsequent focus on the following issues:

- To explore the diversity of environmental sustainability tools used in the different Member States / regions;
- To exchange practical experience and lessons learnt about the specificities of each tool, showcasing their usability at farm, chain and agricultural system levels;
- To promote innovation in the ongoing development of environmental sustainability tools that match farmers' expectations and needs.

This report records the outcomes of discussions held at the workshop. More details on the programme and participants' backgrounds can be found in **Annex 1**.

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2. What do we understand by 'Environmental Sustainability Tools'?

Recent years have seen a proliferation of tools, techniques and approaches to facilitate sustainable management practices in agriculture. Despite the variety of tools available, evidence suggests that relatively few are being widely used and questions are being asked by farmers and other stakeholders about the effectiveness of such tools. This seems therefore to be a topic worthy of discussion and further investigation with a view to improving understanding and good practice.

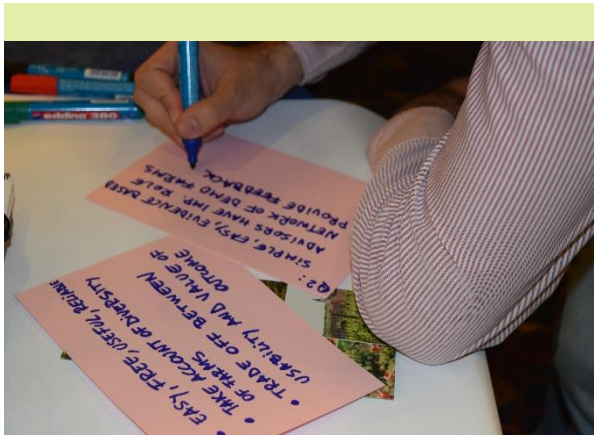
A Decision Support Tool (DST) may be any technical tool, formal checklist or some other guided and structured approach (like a decision-tree or a documented, step-wise audit) that can be used by a decision-maker to help inform or enhance their decisions. For this workshop we considered these tools and associated approaches in the field of *actions to improve the environmental performance of agriculture*. The focus of attention was on these (more or less-formal) **Environmental Sustainability Tools (EST) in agriculture**, and upon how to make them more attractive, useful and operational for farmers and other land managers.

It is recognised that more broadly, environmental sustainability in agriculture may be supported by a much wider range of actions, e.g. the simple provision of information, or attending a training course, or employing a bespoke agronomic or business adviser. However, these were not the core focus of this workshop. These skills and activities may be regarded as additional elements that could help an EST to be made more effective, but they are not EST in their own right.

EST components include:

- checklists or self-audits that farmers can use to assess and choose among practices (e.g. the LEAF online Sustainable Farming Review);
- ICT programmes to help with the gathering, storage, retrieval and organisation of farm data regarding environmental performance, for monitoring (e.g. the SMART farm level sustainability assessment software tool, built upon the international SAFA goals);
- computer-based programmes with a user interface and some internal modelling that enable answers to "What if?" questions, including suggested practices (e.g. COOLFARM tool for carbon);
- downloadable apps for mobile devices which enable ICT-based approaches to be used in the field or in the marketplace (e.g. water saving apps to increase the efficiency of irrigated crop production; apps analysing market demand, for co-operatives deciding when to harvest which crops in the fruit and vegetable sector).

These elements do not always have to be online – some checklists are used as paper copies – but the trend towards tools moving more online over time, seems clear.



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3. What are the drivers of, and barriers to, EST adoption?

A variety of drivers has **encouraged adoption of EST by farmers** across the EU:

- In the commercial domain, supply chain actors may be a driver to obtain price premia or a condition for selling to a particular processor or retailer, who seeks quality-assured products that meet certain standards. This has led to the development and adoption by farmers of EST. For example, in the UK, the supermarket Waitrose has a requirement for all farmers and growers supplying their fresh produce to adopt the LEAF marque and apply the LEAF audit. In the Netherlands, Heineken brewers initially encouraged farmers to set up an initiative which later became known as 'Skylark'.
- In some policy contexts, EST are offered as a way to make compliance with environmental regulations easier to assure. So, regulatory policy can be the driver for which someone designs and promotes an EST, as a simple solution to give farmers confidence that they meet legislative requirements or to reduce the monitoring and control burden upon government administrations by enhancing compliance levels. The EST can also increase awareness or knowledge about the links between management practice and environmental impacts.
- In other contexts, *voluntary initiative among farmers and growers*, independent of specific external incentives, is important. Farmers may recognise the synergies between economics and environment, mostly efficiency-related, and identify the potential for EST to help them to make savings (e.g. on input costs) or to realise additional returns (e.g. with premium pricing for a higher-quality market niche); without compromising on product value. Sometimes this motivation can be strengthened through collective actions, so that groups of farmers learn together how best to benefit from an EST.
- There are also situations where users' *motivations are primarily social*, i.e. where farmers come frequently into contact with other rural actors for whom the use of an EST demonstrates environmentally-responsible practice, which in turn offers farmers increased esteem within the rural community or among their customers when they adopt the tool. There are also instances where farmers are motivated to adopt EST because they appreciate environmental values – for instance, they enjoy managing and seeing breeding birds or species-rich meadows and woodlands – and there is a tool which can help them to better understand and monitor these elements.

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However, it is also important to note that there are many **situations where existing EST are not used by farmers**, even when much time and effort has been devoted to EST design and promotion. Barriers to EST use, or reasons why they may not be useful, include the following.

- EST may be designed by technical experts who perceive a need for them, but who may have a different perception to that of the farmers. If farmers then fail to use the EST, this reflects a failure of specification, because the tool is not recognised by the main users as being 'fit for purpose', useful or necessary.
- Farmers may recognise the relevance of issues for which an EST is designed but there may be other factors which make the tool unattractive. For instance, the tool may use information, data or language that farmers do not easily understand, or the EST may require the farmer to spend a lot of time setting it up or learning how to use it, and maybe these costs outweigh its perceived benefits.
- There may be situations where there is a lack of trust of the motivations of designers and promoters of EST, and farmers fear the EST is being used to constrain them unfairly or unreasonably, or it requires them to share certain details of how they operate which could be advantageous to their competitors, or lead to new regulations being imposed on them.

It therefore needs to be recognised that *for any EST to be useful and used, there has to be firstly, a positive net benefit for the users; and secondly, a benefit that they recognise and value. Thirdly, the EST needs to be offered in a context where there is sufficient trust, understanding and confidence between those who will use it and those who promote it and/or benefit from its use.*

4. Main categories of operational EST and examples in Europe presented at the workshop

A brief analysis of the variety of EST available in Europe, as illustrated by the examples presented at the workshop (described below), helps to understand main categories of EST.

We identified two main dimensions to categorise the EST: the **scope of their operation and the drivers of their development**.

Considering their **scope**, we identify four types of tools ranging from **holistic to specific**:

- a general/holistic type covering a broad range of sustainability issues;
- a general type but with specificity relating to different geographic locations;
- a specific type with a focus on just some aspects of sustainability (e.g. C sequestration, biodiversity, energy usage)
- a specific type with focus on supporting one particular decision process, for instance related to a specific policy trigger (the case of Ecological Focus Areas in CAP greening measures) or a specific practice dilemma (e.g. what to spray; when to spray; and how much to spray on a particular crop).

Considering the main **drivers**: some EST have clearly been **research-driven** (e.g. CoolFarm) whilst others are more **practitioner-driven** (Skylark). Also, some have a greater **involvement of supply chain sector** interests (e.g. LEAF marque), while others have a strong **policy stimulus behind** them (the EFA tool); and there are cases where an EST initiative is much more driven by civil **society actors wanting to empower farmers and other stakeholders via information-sharing** - the www information revolution phenomenon (e.g. Boer en Bunder).

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Cases presented in the EIP-AGRI Workshop – examples of operational EST in Europe

TYPE of EST: Broad holistic / general audit to encourage continuous improvement

Tool name: Skylark (the Netherlands)

Type of tool: Knowledge platform that specifically fits farmer needs, linked to farmer groups following a continuous improvement process

Objective: To achieve healthy and sustainable food

Users: 400 arable farmers and 60 partners from the supply chain

Main features: Farmers participate voluntarily and each develops a sustainability plan with an accredited adviser. Regional groups (10-12 farmers) develop an online sustainability profile based upon agreed interests, set targets and monitor performance together. All participants receive a certification for their effort and commitments. There is now a link between skylark groups and the NL collective agri-environmental schemes delivery.

Benefits:

- encourage farmers to think, learn and modify practices;
- identify cost reductions on the farm.

Tool name: LEAF (United Kingdom and international suppliers)

Type of tool: A multi-layer approach which is farm- specific and involves many tools facilitating knowledge generation and exchange e.g. LEAF Demonstration Farms, LEAF Sustainable Farming Review (self-assessment on-line management tool), market opportunities, e.g. LEAF Marque, engaging the public in food and farming, e.g. Open Farm Sunday.

Objective: Developing and promoting Integrated Farm Management -environmental responsibility across the whole business: resource management (soil, labour, water, energy, nutrients, Integrated Pest Management); biodiversity conservation and enhancement e.g. habitats, boundaries, pollinators.

Users: 3,000 Farmers, key actors in the food industry and many consumers.

Main features: LEAF sustainable farming review helps farmers monitor performance, identify strengths and weaknesses, reflect on business priorities, set targets for improvement and benchmark year-on-year and against others. It also helps the industry, examining trends over time, identifying areas of focus, celebrating achievements, showing commitment. LEAF Marque is a linked certification scheme to raise environmental standards in fresh produce, used by one major food retailer.

Benefits: To inspire and enable sustainable farming that is prosperous, enriches the environment and engages local communities. To farmers it offers increased income through attention to detail; resilient businesses by optimising inputs and resources; better prepared for the market, extreme weather, future legislation; shared learning: new ideas, practical solutions, forward-looking. It also benefits the sector by building local public engagement.

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Tool name: SMART (Switzerland)

Type of tool: Comprehensive farm level sustainability assessment software tool built upon the international SAFA goals.

Objective: Initially designed to help researchers assess different systems. Now promoted to support farmers in definition of management improvements, based on results.

Users: Researchers, Farmers, farmers associations/ companies, and consumers.

Main features: 327 indicators measure goal achievement in the 58 sub-themes of SAFA. Assessments carried out by trained auditors with expertise in specific fields. Assessments take around 2 -3 hours and include: on farm data collection; data processing and analysis; report generation (automatic). Results are shared with farm managers.

Benefits:

- Farmers: motivation to improve their sustainability performance.
- Farmer associations/Companies: perform a "Hot Spot Analysis"; supply chain monitoring; for certification (=standard setting), labelling.
- Researchers: comparison of different farming systems (i.e. organic vs. conventional); comparison of similar farm types across different regions; comparison of different productions standards (= labels)

Tool name: "DIAGNOSIS OF Sustainability" Tool of Réseau Civam (farmers' organisation for farm sustainability improvement) (France)

Type of tool: Software tool for diagnosis of economic, social and environmental farm sustainability.

Objective:

- To create a reference for benchmarking and reporting performances of sustainable farming systems;
- To increase decision-making autonomy of farmers.

Users: Advisers, farmers, public authorities, students (obligatory tool in agricultural classes)

Main features: It considers the three pillars of sustainability and uses a farming system approach. The indicators are selected by the farmers themselves and are quantitative and qualitative. Three sections, each with seven performance criteria calculated by seven indicators: Nitrogen balance, Pesticides, Biodiversity; Lengths of hedges, Soils conservation, Energy dependency, Climate change contribution (CO2 and CH4 units released). It takes 3-4 hours to complete it. Results: three radars and a scoring scale + comments; raw data are collected for benchmarking and analysis. Used in collective meetings to initiate exchanges and discussions. Advisers are trained and act as facilitators

Benefits:

- For farmers: To adopt a 'global' approach of their farming system; To benchmark their data to share practices and experiments; To determine relevant indicators that meet their personal expectations and then define and quantify target; To have environmental practices recognized and valued.
- For the environment: To consider environmental pillar of sustainability as important and to make links between the three pillars; To measure environmental impacts of policies.
- For students: 1st sustainability tool used by students in France (50 visits/day); Adopts a global approach of the farming system in their territory.

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TYPE of EST: General tool designed for specific geographical situations

Tool name: HNV EST project – Eco-pastoral diagnosis (pan-EU project, building from French case study experience)

Type of tool: A diagnostic tool co-created between farmers, advisers and technical (ICT) experts to enable environmental management and economic sustainability via inventory, participatory diagnosis and decisions

Objective: Improve the farmers' use of natural resources & the state of conservation of agro-pastoral habitats in marginal HNV regions

Users: Farmers in marginal HNV systems

Main features: Global understanding: Identify farmer objectives and expectations, Monitor and support his technical choices, evaluate impact of changing practices, Eco-pastoral diagnosis, Understand interactions between practices and landscapes, Evaluate ecological issues

Benefits: One major point in this method is that the diagnosis is co-constructed to cross complementary competences: pastoralist, naturalist and farmer

Tool name: Boer en Bunder (Netherlands)

Type of tool: Open data repository for various environmental and agricultural datasets in GIS accessible formats, updated regularly

Objective: To enable farmers and any other interested parties to access and use this data for analysis and enhanced practices

Users: Farmers, others wishing to visit rural areas, policy makers, NGOs - ?

Main features: No specific aims or goals other than to enable greater access to a wide variety of potentially useful information on farms, climate, other environmental and agronomic variables and trends

Benefits:

- Free, open access
- Non-profit
- Gives access to information on every plot
- Shows multiple open data sets (different types)
- It is social

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TYPE of EST: Considering one aspect of sustainability

Tool name: Carbon navigator (Ireland)

Type of tool: Environmental Farm Performance software tool focused on greenhouse gas emissions (GHG). There are Dairy and Beef versions.

Objective: To show farmers 'win-win' efficiency gains (nutrient balance), how to reduce emissions (nutrient management plan) and increase profitability.

Users: Dairy and beef enterprises.

Main features: The tool is completed by adviser/consultant and farmer together. They input current herd and management details, then Discuss and set targets to reduce GHG with adviser. Tool uptake is linked with funding and/or assurance scheme requirement. Dairy Carbon navigator is part of Bord Bia Sustainable Dairy Assurance; Beef Carbon navigator part of Beef Data and Genomics Programme.

Benefits: Increase profitability by increasing resource efficiency.

Tool name: Cool Farm Management Tool (EU-wide)

Type of tool: Carbon calculator and monitor of biodiversity and resource (water, input) use – farmer-focused, industry-backed, with global applicability and able to deal with both crops and livestock enterprises

Objective: To help encourage ongoing monitoring, evaluation and continuous improvement in farms' and food chains' environmental performance (considers product attributes too)

Users: Owned by a large alliance of agri-food sector companies, environment and farmer NGOs, for use by farmers

Main features: Co-investment vehicle for supply chain:

- Credible, standardised measures
- Multi-sector approach, covering mixed enterprises, big agribusiness to small-holder situations,
- Multi-lingual (English, French, Spanish)
- Offers Benchmarking, Peer to peer Training and Management

Benefits:

Free for farmers:

- Intuitive and rapid
- Runs 'what if' scenarios

Researcher-led:

- Independent
- Offers open technical documentation

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TYPE of EST: Focused tool designed to help with one particular decision-process on the farm

Tool name: EFA (Ecological Focus Areas) calculator (JRC- European Commission)

Type of tool: Software tool

Objective: Raising awareness and support farmers to implement the 5% LFA target

Users: Aimed at farmers and advisers (not yet being used)

Main features: Calculates the potential of different features on ecosystem services, biodiversity and management. The tool needs to be promoted and tested it in different farm types.

Benefits: Guide farmers to implement features that offer the greatest potential benefits minimising burdens and maximising benefits.

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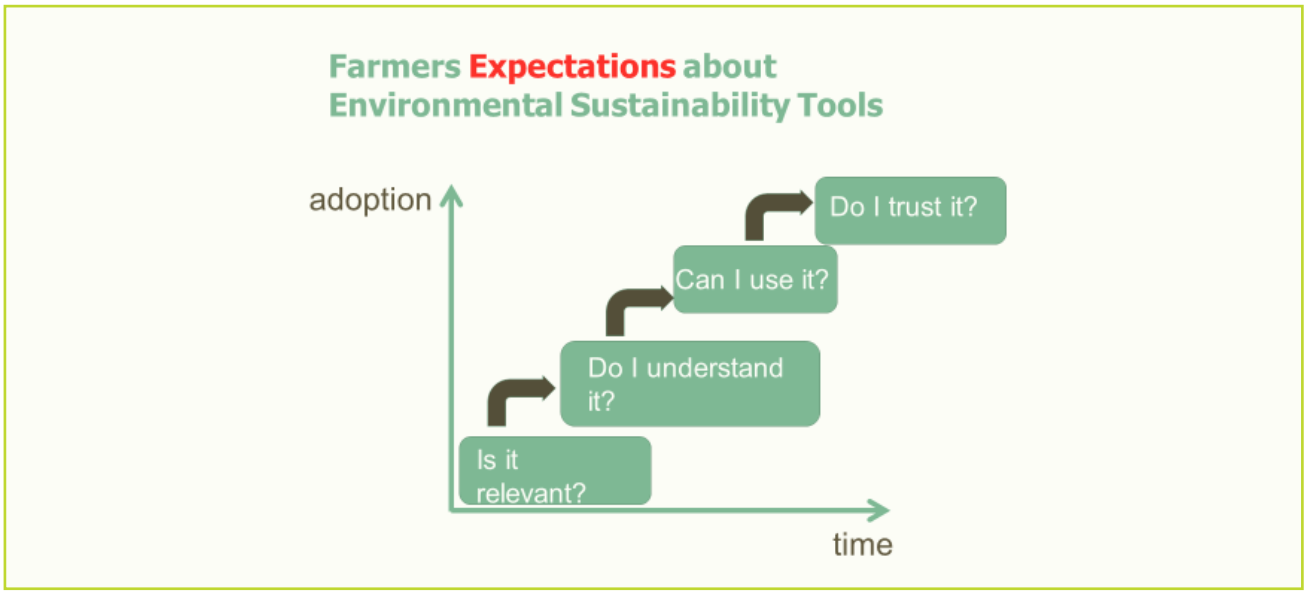
5. What are the challenges for effective EST uptake?

A four-step process can be used to examine the adoption of EST by farmers. These steps are characterised by key questions representing farmers' expectations about the EST, as shown in the figure below:



The farmers' questions can be viewed as challenges that need to be addressed in order to achieve effective uptake of EST. Figure 1 below helps to identify the specific issues of the EST that need to be resolved for each challenge.

- For the challenge: 'The tool seems not relevant to my farm/business', the main issues to be resolved relate to the tool being fit for purpose and including appropriate content, rather than any issues of the usability of the interface and the user's trust in the tool, which play a secondary role;
- The challenge: 'The tool is too complex to use / understand – I cannot see the benefit' implies that the tool may be already considered relevant for the farmer, but the tool's content and user interface are not matching the farmer's expectations;
- 'It takes too long to set up / learn how to use effectively – these costs outweigh benefits, for me' is basically linked to the tool's interface and implies that the tool may nonetheless be relevant and the content appropriate for the farmer;
- Finally: 'The tool may impose practices or obligations upon me, or it breaches my business confidentiality' implicitly means that farmers lack trust in the tool, regardless of whether or not they find the tool relevant, and its content and user-interface appropriate.

When analysing why farmers do not adopt EST, the diagram above helps to identify the key EST issues that need to be approached to encourage adoption. For example, 'trust in the tool' may be the main challenge faced by the EFA tool to convince farmers of its usefulness, rather than the tool's fitness for purpose, its content and its user interface.

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Figure 1: Diagram to illustrate the relevant issues for EST developers, considering the farmer adoption process, in order to achieve effective EST use. (Key: Red = this EST issue is a barrier to use; orange = this EST issue is not relevant to achieving the challenge; green = this EST issue is solved)

EST ISSUES				
EST ADOPTION CHALLENGES	**Tool's fitness for purpose**	**Tool's content**	**Tool's user interface**	**Trust in the tool**
The tool is mis-specified – it is not relevant to my farm/business				
The tool is too complex to use / understand – I cannot see the benefit				
It takes too long to set up / learn how to use effectively – these costs outweigh benefits, for me				
The tool may impose practices or obligations, or it breaches my business confidentiality				

6. What conditions help to create a useful and usable EST?

The EST issues cited above help to frame those conditions identified by the workshop participants as key to creating a useful EST.

Understanding farmer demands and expected benefits (fitness for purpose)

Any tool should have clear and transparent goals that respond to **farmer demands,** which implies that the designer needs to know clearly who is the end-user. The demand for a tool can be:

- policy motivated, based on a societal demand, e.g. for biodiversity, or for a specific kind of agriculture;
- driven by economic interests, e.g. resource efficiency;
- driven by consumers, as translated by retailers and others in the food supply chain.

The purpose can be to raise general awareness among users, or it can be very specific, aimed at achieving a particular environmental impact. The time frame for tool use may be long term or short term/one-off, e.g. to highlight a particular challenge.

There will be a hierarchy of goals, the order will vary per user/group of users or beneficiaries, considering sectoral and wider social aspects as well as the environment. In that context it is important to consider the tools as being one element which is embedded in a broader, holistic approach, rather than assessing only the tools: an overall approach may combine a (number of) tool(s) tackling different, specific problems, along with other ingredients like advisers, farmer discussion groups, demonstration farms, events and so on.

Benefits: the expected returns are increased knowledge; some economic/management gains, and benefit for the environment.

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Understanding the farmer's context (fitness for purpose)

Developers of tools have to 'come to where the farmers/ users are' and listen to what is needed or valued in each particular situation, before they develop the tools that they wish these people to use.

Tools should offer added value to complement and extend farmers' existing knowledge, not ignoring it or under-valuing it, but recognising and working with it.

Often, effective tool(s) are embedded within a wider system of actors and networks which enhance the way in which the EST works; including advisers, demonstration farms, farmer groups, and/or supply chain actors. It is this whole system which can really make a difference to farms' sustainability performance – the EST is only one part of it.

Effective tools are those designed with a clear understanding of users' specific concerns and drivers. It is valuable if approaches look first to identify the business, farming and/or economic and management benefits that they can help to deliver: identifying what will address farmers' own priorities whilst also promoting better environmental outcomes.

We should also recognise that different stakeholders will typically have different motivations and expectations from effective EST (Table 1).

Table 1. Typical different motivations and expectations of EST

Farmers	NGOs	Researchers
• Private interest • Pragmatic • Credibility • Only some interested in targets	• Public interest: environmental performance of a group • Ambitious • Credibility • Delivering key targets (WFD, CC mitigation) • Potential performance • Demonstrates positive sustainability of outcomes	• Environmental performance driven • From scientific development towards co-development with users

Matching the tools' features (content and user interface) to the farmers' needs and context

A variety of approaches is required for different types of farmers in different situations. Farmers' needs for such tools will vary according to size of farm (small, large), the country or region in which they operate, type of farming system and management, age of the farmer, levels of (digital) education and whether they work as a single farmer or are part of a co-operative or group of farmers, etc. Some users will have specialist needs for a tool to address, while for others, they are seeking generalist or all-round enhancements in farm performance. These different perspectives will give rise to different priorities – see table 2.

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Table 2. Contrasting features of general and specialist EST

Generalist	Specialist
Simplicity (easy to understand)	Complexity ('a farm is not linear')
Data is not the end: awareness, understanding of process	Need for accurate data (for certification)
Holistic (covers all relevant aspects of sustainability)	Specific (could be many specific as part of a toolkit) need to understand outcomes
Short-term (economic returns; quick feedback on performance)	Long-term benefits (trends)
Adding economic sustainability is crucial!	

Some tools are designed to achieve very simple outcomes, while others may be more 'bespoke' / commissioned to address particular situations. In some situations, both these types could be combined in an integrated, nested or tiered approach – so a user might access both a generalist tool for initial tasks and planning and then more bespoke EST for specific tasks. To this end, EST designers could consider creating some 'core' open-source software or datasets that different tool users / technicians / advisers can take and adapt to their own needs.

How should tools be developed and tested to create trust in the tool?

Many tools are already available. Before thinking about new tools, it could be important to monitor and evaluate the use/usability of existing tools (testing): 'why are they used or not?' - also, identifying gaps: fine-tuning tools to make them more specific or effective. When designing, consider well the local situation in which the tool will be applied: who are the stakeholders, how will it be implemented, who are the key influencing parties to ensure successful use? Local dialogue should be established. Tools can be tested on demonstration farms and via benchmarking activities to help gain the trust of a wider user group.

For new tools or tool development, co-development with the relevant stakeholders (users and those representing beneficiary groups) from the start, is essential. Development may best be iterative – producing a pilot, testing with users, refining, re-testing – and ensuring that the tool can adapt to each user's situation.

The tool data policy, respecting the privacy of individual data for farmers is crucial to create trust and enhance use by others.

The approach within which the tool(s) are used should ideally have a strong social component (encouraging peer-to-peer learning, inclusion of up- & down-stream actors, supported by advisers, etc.). Engaging in a community of users needs to be FUN!

Co-use of EST by advisers and farmers together can help. Advisers understand the language of the farmers so they may have an important role in supporting the uptake and appropriate use of a tool.

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Consequently:

EST should be *co-designed with target farmer groups* as early as possible in the process, to ensure that what you are creating is relevant and valued. There may be as much value in the development process, when designers are working closely with all partners, testing, advancing awareness and understanding, as there is in the tool itself, once produced and applied.

No tool can be perfect – do not expect too much and do not 'over-sell' the potential benefits of using EST: you need to *be honest*, to gain credibility and respect from users and potential users.

It may be valuable to *seek wider endorsement of a new tool*, to encourage its uptake. This could be from farmers' organisations, from supply chain actors, from government bodies or from independent NGOs with a high public profile. Endorsement by any or all of these groups could help to make the tools more sought-after by farmers and/or more appreciated and understood by the public.

It may be important to recognise that not everyone, or every situation, is ready for tools. In certain contexts simpler, *more personal approaches involving talking, listening, direct practical demonstrations of change*, etc., may be more effective than a tool. In many cases, both can be more effective when used together, than when offered alone.

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7. Conclusions

The characteristics of an effective and efficient EST

The different user groups identified the following **characteristics** that help to make a tool effective and efficient in reaching its goals, which are closely linked to those specified in Figure 1:

Fit for purpose:

- Effective – it must stimulate improved farm management and have a net positive environmental impact.
- Affordable in the context in which it is expected to be used, i.e. very low cost for marginal producers, whereas high-value agro-industrial production systems might be willing and able to invest more, in order to gain more.
- It is sufficiently specific to meet users' expectations but not so narrow that it omits key interactions (e.g. if it recommends changes on environmental grounds then it should alert the user to possible knock-on impacts such as costs or cost-savings).
- It should be flexible, capable of adjusting to different types (sizes) of farm and be capable of adjusting to farm change, over time.
- Whilst some EST may work for different types of actors- farmers, rural actors, researchers, educators, NGOs, practitioners and thus are very **general**, there is also a need for **specific tools**.
- It should be easy to explain the benefits provided by the tool (they should be "communicable"), both to farmers and to other users and beneficiary groups, including consumers.

Easy to use:

- Ideally, specific and general tools should 'talk to each other'; i.e. be modular and compatible. There needs to be some balance between a flexible approach and one which is targeted. Flexibility to the context and user's situation is important (not making general assumptions which might not hold in each case), but targeted at really making some environmental difference.
- The data collection, and any interpretation/judgements required from the user, and the friendliness/transparency of the user interface are important, they have to be simple to understand and not depend on a lot of complex or time-consuming data input. A modular approach, mentioned before, could be one way to make the tool easier to use as different modules could be activated gradually, over time, by a user learning about the tool and its value. In software, designers should consider drop down options, and think about providing not only environmental, but also financial data on the impact of suggested changes.
- Trust: based on facts and producing reliable results, farmers and other users must be able to trust it.
- Accessible and attractive: It should have a memorable name, and be visually attractive, e.g. producing nice and clear outputs that can be posted on the farm office wall or dairy parlour or machinery shed. There will be language issues not only related to use in different Member States (national languages) but also within the various sectors (each with their own technical vocabularies) – designers need to pay significant attention to using the most appropriate language to suit the particular user groups involved.

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The different users perspectives on how to develop a successful EST

A farmer's perspective:

The tool should be developed on the farm where all relevant stakeholders meet. Developers can look at the real needs of the farmers on the farm, looking at livestock, parcels, crops, watercourses, … so they have a clear, integrated view of the specific situations (challenges, needs, opportunities) on the farm. The first question to ask is: is a technical tool the right solution or do we need something else? A tool could be as simple as knowing how to use a spade to have a look and understand the soil structure and quality and from this to know what sort of cultivation is needed. Discussion about a specific problem could trigger the identification and use of other, unexpected tools. E.g. a new test on a soil or crop sample. Understanding interactions at the farm level is essential to meet farmers' requirements.

Researcher's perspective:

It is important to consider the scientific credibility (is the tool sound?) of a tool, and look at the relevant data needed for the tool, taking into account region-specific information.

Tool developer's perspective:

The tool needs a good business plan, starting with the clear identification of demand, and need/benefit. It should be clear who will pay for the development of a tool both at the outset, and then once it is applied in practice. There will be ongoing costs to different parties which should be considered, as well as the benefits. Tool developers can act as facilitators, brokers and bridge-builders between different actors, if they are sensitive and responsive to these issues. They need to be able to evaluate the success of their tools, showing farmers the benefits (not only environmental but also financial) and /or the outcomes of using the tool. They also need to have clear implementation plans, identifying how the tool will be promoted, supported, explained and refined.

Environmental NGO perspective:

Is the tool delivering what needs to be delivered for the environment? Does it pick the most important priorities from an environmental perspective? Can it encourage effective changes in practice and does it include provision to identify and quantify the environmental impact of these changes? Can we measure and track environmental improvement? Is there real evidence of farmer compliance, farmer learning and attitude change, and environmental change? Can we demonstrate additionality: that there is a link between the use of the EST and a measurable beneficial outcome which would not have happened without it? Does the EST offer other benefits for promoting environmental awareness among consumers and citizens?

Who should be involved in developing EST?

- **Representatives of farm organisations** argued that they had an important role in representing farmers' needs to those seeking to design or promote tools.
- You need an "**honest broker**", someone who can bring together the different interests without having a biased position, to facilitate understanding and communication.
- **Farmer** engagement is essential, one way to achieve it is by **incentivising** the use of tools, in quite a broad sense – i.e. working with the farmer's interest in some way. This may involve farm-level benefits or benefits in respect of guaranteed returns or market outlets, from those higher up in supply chains.

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- **Advisers** can play an important role. Excellent but isolated examples of tool adoption are OK but remain limited in terms of impacts - extension services can spread use among a much wider number of farmers. Solutions for environmental issues such as water quality, soil organic matter preservation or lowering air pollution may need significant scale of uptake across large areas of territory or among all the major suppliers in a particular sector, so extension agents can be key to achieving this level of impact.
- **Public administrations, environmental authorities and NGOs** can get involved in partnership with farmers and jointly promote/test the use of tools. Funding authorities may help by supporting the testing of tools by farmers, ideally in co-operative approaches that involve other relevant stakeholders.
- **Social scientists** may be necessary to help different actors to understand and translate the wishes of each to the other – e.g. consumers to farmers, or to monitor and alert actors to problems or issues arising in the use of tools. Other researchers can also be important, e.g. in helping to fine-tune or update tools that use assumptions based upon evolving scientific knowledge.
- **Food chain** stakeholders can play a significant role by making links to territorial and social aspects. E.g. a horticultural processor seeking to promote a tool which will improve the timeliness of harvesting to better match both market and environmental conditions.
- **ICT or technical developers** are necessary, and people capable of translating the identified needs into a product that programmers can use as input to their work.

Finally: What is the ideal EST?

A single ideal tool does not exist because EU farms are not all the same. The type of agriculture (extensive or intensive, market-oriented or semi-subsistence, pluriactive or specialised) will affect what sorts of tool are most useful. Nevertheless, we should consider different categories of tools. On one hand, tools measuring overarching performance against a range of environmental parameters can have value as a general, holistic learning and adaptation device that can be usable on most farms. On the other hand, tools targeting specific issues or performance (e.g. minimising water usage, emissions, enhancing soil quality) may need to be specifically designed just for a small user group in a particular situation. Both these types of tool can be valuable, in different contexts.

More broadly, the **'best-possible' tool** should be one that is designed according to what **we want to achieve**: we must clearly define its objective / purpose (we need to identify the need). It should be linked to a long-term vision, and may serve multi-purposes for different user groups (e.g. farmers, retailers) or beneficiaries (consumers, citizens, environmental groups). To understand these, there is a **need for cooperation between farmers**, **researchers, environmental organisations, authorities and market actors**.

This **tool needs to bring a benefit** to the farmer (economic, managerial/logistical or other) and at the very least, the farmer should not lose money by using it. It should fit well into the normal management routines of the farmer, farm manager and/or key workforce.

The tool should **respect privacy of their individual data** for farmers, while supplying aggregated or anonymatised information for wider learning and use by others.

Development needs a reflexive process (continuous improvement), this will require time, despite the time-constraints of financing schemes for tool design.

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8. Potential role of EIP-AGRI Operational Group on EST uptake

Operational Groups can be supported by the EIP-AGRI initiative, through funding offered by the Member States within their Rural Development Programmes. These groups can be multiple, small clusters of interested stakeholders coming together to work on different challenges and opportunities. The key is that they combine potential users of whatever is developed with developers, NGOs and researchers who can help to develop these things, and that they are seeking to achieve innovation within the local context.

To form an Operational Group, it is important to **define the issue** that a group of users and researchers will work on, then to **find the most relevant partners** to address this issue together, and finally to ensure that your own **national authorities recognise and provide finance** to address this issue through your proposed project. It was suggested that Operational Groups could usefully seek to enhance the effective design and application of EST in different contexts across Europe. Participants in discussion groups at the workshop responded to this suggestion in a variety of ways, summarised below.

What is needed to form an Operational Group?

Trust is the most important issue. It should be achieved by means of transparent governance and funding. Trust should lead to farmers' engagement in the Operational Group, along with other actors. Environmental goals are also important to clarify. The group needs to be open, involving environmental NGOs and seeking clear and measurable results.

The project could start with a clear **identification of the environmental need(s)** and the question of whether EST is the right approach. There should be an initial check/audit of whether appropriate tools already exist, to serve the need (there are already many tools available).

The OG should then identify the **opportunity** in respect of both farmers' and beneficiaries' perspectives. Examples: develop a tool or a decision-support system to compare the carbon footprint between organic and synthetic fertilisers; or a tool to determine the soil organic matter and mineral content, to enable management to improve soil function. Considering the Coordinated Management of Ecological Focus Areas at landscape scale - these are an obligation, so farmers and environmental NGOs might as well try to get the best outcomes from them, together. The cumulative impacts of co-ordinated planning and implementation of farms' EFA might have positive impacts on farm management, and co-ordinated approaches at landscape/watershed/… level might be able to deliver ecosystems services at levels where farmers see a resulting benefit for their farm (e.g. better pollination, flood/drought control, …).

The OG should involve all concerned stakeholders (as was mentioned already) and create a strong partnership through meetings between farmers and partners to identify farmers' needs and existing practices. This means involving a critical number of farmers in the targeted landscapes/regions where environmental benefits are sought. It might be easier to work via farmers' associations to achieve this, or advisers and their client networks. Tool developers and scientific support should be involved, also NGOs could help to communicate the farmers' efforts and achievements to members and to the wider society. Key supply chain actors should also be there, to aim to achieve a return from the market for farmers' delivery of environmental goods.

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After an interactive approach at farm-level between different stakeholders, the development of an EST would begin. Having determined the specific focus of the tool and its objectives, the right indicators and approaches for data collection/input would need to be co-designed with farmers and stakeholders. Then a process of calibration, validation and evaluation begins - an important step because tool improvements can thereby be identified. This should assess the effects it has on the farmer/end users: do they understand, does it deliver expectations in terms of cost/benefits, what is the time investment, what labour does it need, can it be integrated in the day to day work? This staged process needs to be repeated several times until all are satisfied that it will work.

After the tool is made fit for purpose the implementation phase starts. Attention must be given to marketing and ensuring good access to the tool, using stakeholder assessment and/or support by advisory services. The **maintenance of a tool** is very important to keep it updated and this should be considered in the initial development phase, from the beginning. Evaluation is also necessary – users and beneficiaries should monitor whether the tool continues to be useful and consider how it could be enhanced or adapted over time, as circumstances change.

One discussion group recommended a tool to measure the territorial, dynamic effects of individual farm management decisions, or a farm book: an anonymous benchmarking tool to exchange best environmental practices and linked price/cost information. But these would only succeed if the farmers could see a clear benefit from their use. Another group suggested a tool to address e.g. water issues at regional level, testing existing tools in specific national and local contexts. Tools could include use of new technologies: e.g. satellite data collection, GPS-based precision farming. Another option would be to develop bespoke tools for Natura 2000 and HNV areas, seeking environmental actions which could simultaneously improve the economic sustainability of the farms in these areas (e.g. suggesting marketing tools for these small farmers' many products).

Many options are potentially available to those who are interested to pursue them, within the EIP-AGRI Operational Group format.

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9. Annex 1: Workshop Structure and Participants

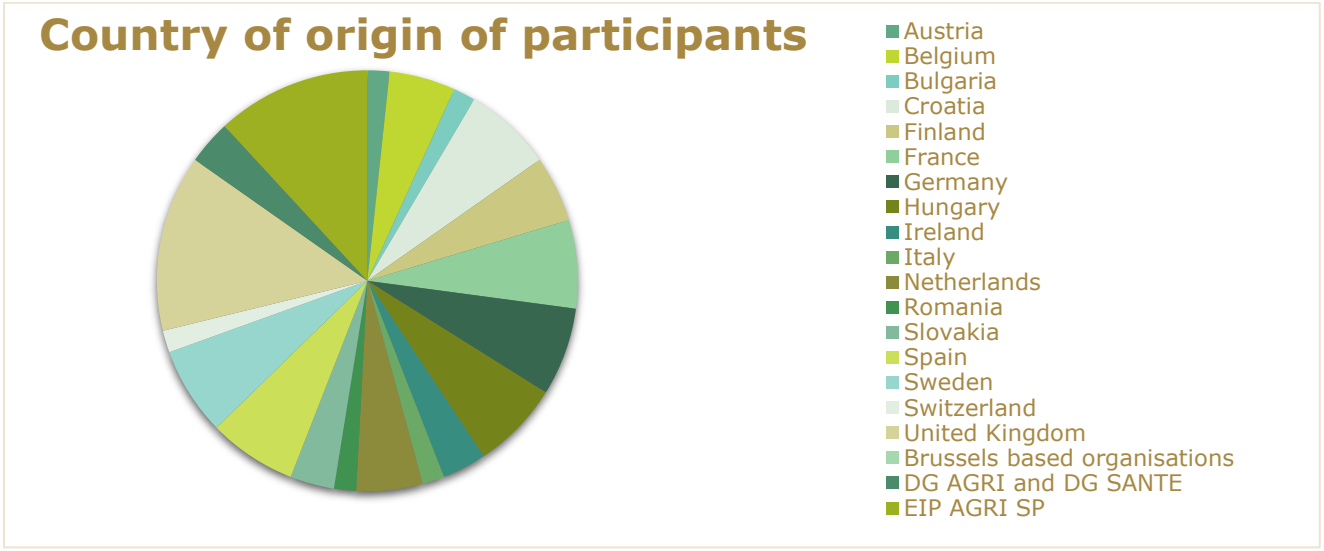
Workshop structure

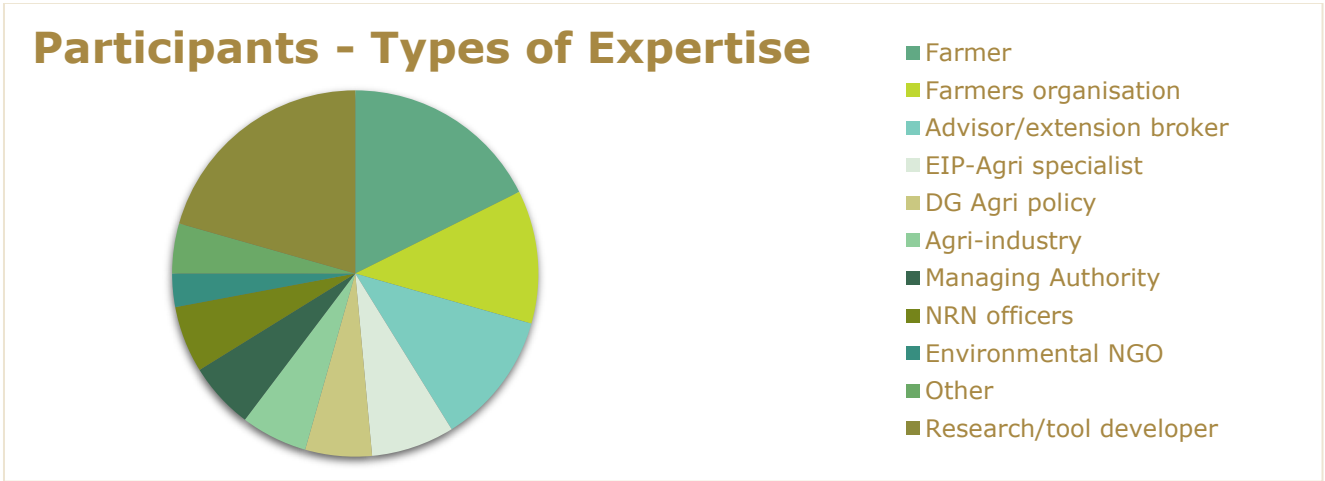
The workshop followed a step-wise process, as follows:

- **Day 1** was devoted to sharing many examples of different EST from around Europe, offering a chance to examine and assess them, and then working in groups to discuss what could be the key needs and the key opportunities and challenges with existing EST ;
- **Day 2** considered future opportunities to enhance the design and application of EST in EU agriculture; with discussions focused upon specifying how new or improved EST could work, and identifying opportunities for better co-ordination and co-operation on EST, in future.

Participants

A broad range of participants were invited, including tool developers, existing and potential users, and those whose interests might benefit from farmers' use of these tools including NGOs, citizens' groups, policy makers and food retailers or processors. Workshop participants (over 60 people) came from many different Member States in the European Union, representing farmers and farmer organisations, food supply chain representatives, environmental organisations, researchers and tool developers.





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The European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI) is one of five EIPs launched by the European Commission in a bid to promote rapid modernisation by stepping up innovation efforts.

The **EIP-AGRI** aims to catalyse the innovation process in the **agricultural and forestry sectors** by bringing **research and practice closer together** – in research and innovation projects as well as *through* the EIP-AGRI network.

EIPs aim to streamline, simplify and better coordinate existing instruments and initiatives and complement them with actions where necessary. Two specific funding sources are particularly important for the EIP-AGRI:

- ✓ the EU Research and Innovation framework, Horizon 2020,
- ✓ the EU Rural Development Policy.

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Join the EIP-AGRI Network & Register via www.eip-agri.eu

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