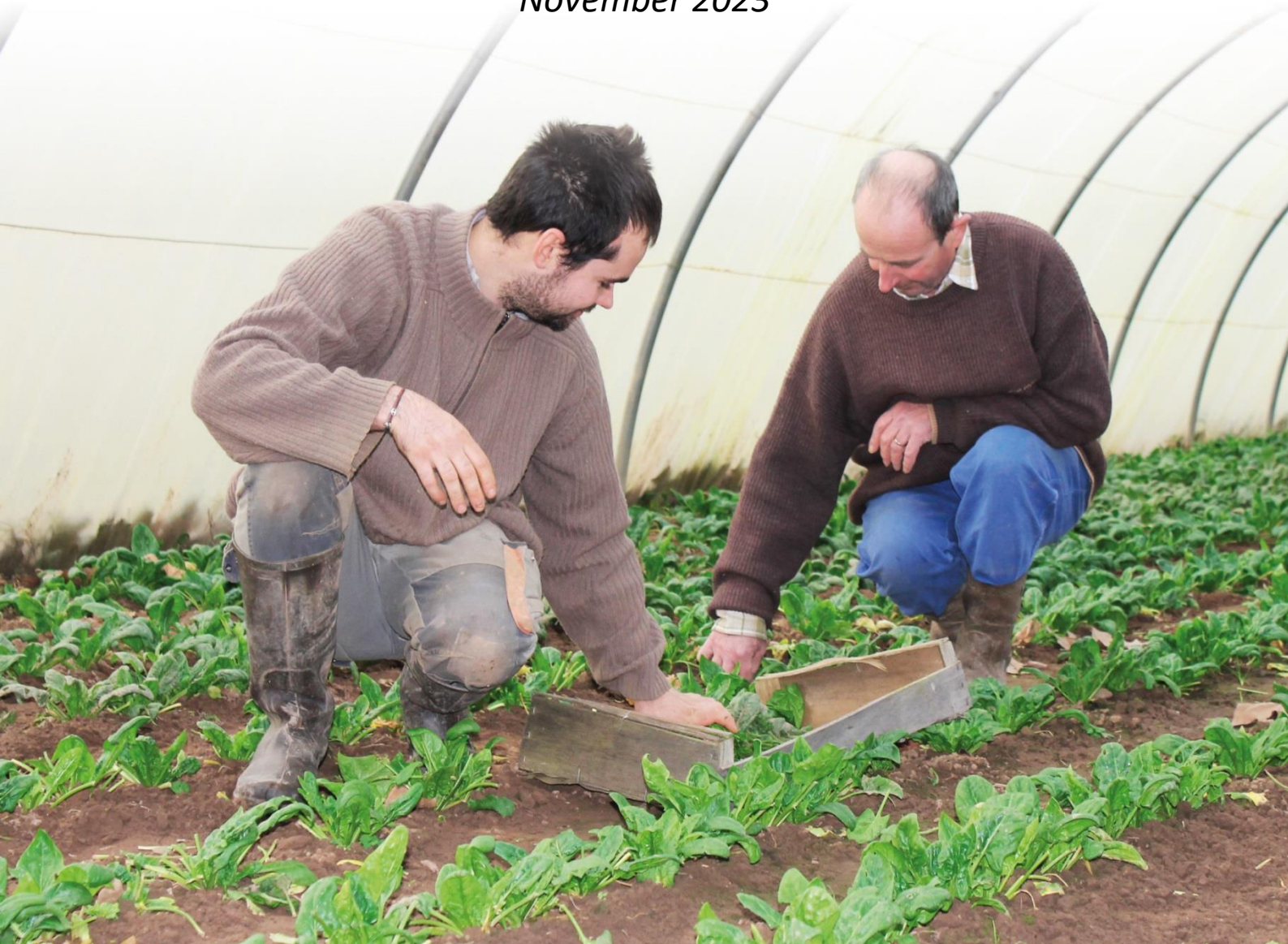
i2connect

INTERACTIVE INNOVATION

Deliverable 2.5

Second series of individual reports from the field reviews of practical cases

November 2023



Task 2.5

Carry out field reviews of individual practical cases

Deliverable 2.5

Second series of individual reports from the field reviews of practical cases

10 November 2023

This report only reflects the views of the authors.

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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Summary

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1. Introduction

1.1 Background

The aim of the i2connect project is to "empower advisors and their organisations to engage and support farmers and foresters in interactive innovation processes".

WP2 focuses on analysing practical cases where experiences in interactive innovation support have been successful to identify the strategies, practices, actions, motivations and environment that constitute and support these good practices. This analysis is carried out through the field peer review approach drawn under T2.4.

Relying on the cross-fertilization of ideas and practices to develop actors' knowledge and skills, the field peer review implements a multi-actor approach, which allow different players to experience and reflect on best practices in action in different practical cases and their contexts.

The field peer review is run on practical cases/projects of successful interactive innovation, which are identified by the i2connect partners in the different countries/regions and selected by a panel of expert members (T2.3), according to selection criteria aimed at ensuring fairness and value to the project (T2.1)

In July 2020, ten pilot cases were selected to participate in the first field peer review round (T2.5), addressed to test the review process to be implemented in two further selection rounds.

Drawing on the first draft of the field peer review methodology, T2.5 leader organized the peer review panels, assigning to each of them a practical case to analyse. A training session for the reviewers was held in November 2020 to explain the methodology and deliver the review support material.

The ten pilot Field Peer Reviews were carried out between 1 December 2020 and 15 February 2021. Due to the Covid-19 pandemic, all of them were conducted online.

In September- October 2022 the second round of pilot cases have been selected for peer review. From the 16 selected cases unfortunately 6 cases have not been carried out mainly due to obstacles at the farmers and advisors. Submitted projects has been closed already, which made it difficult for participants to engage in peer review activities. From the remaining 10 cases 4 has been conducted at the beginning of 2023, the other 6 cases are planned for July, October and November 2023. In order to ensure sufficient amount of cases for T2. a 'buddy system' has been set- up under Task 2.2, where partners from WP2 are coaching i2connect partners to submit suitable cases. With this action WP2 lead want to ensure that for task 2.3 the KPI can be accomplished.

This report describes the 4 cases carried out in round 2 and one remaining case from round 1.

1.2 The Field Peer Review methodology

The Field Peer Review consists of the **review of a practical case innovation** process, with a particular focus on advisory services, by colleagues (peers) from another innovation case, with the double purpose of investigating and learning from the way how innovation has been realized by others.

The Field Peer Review process contributes to the overarching goal of i2connect by:

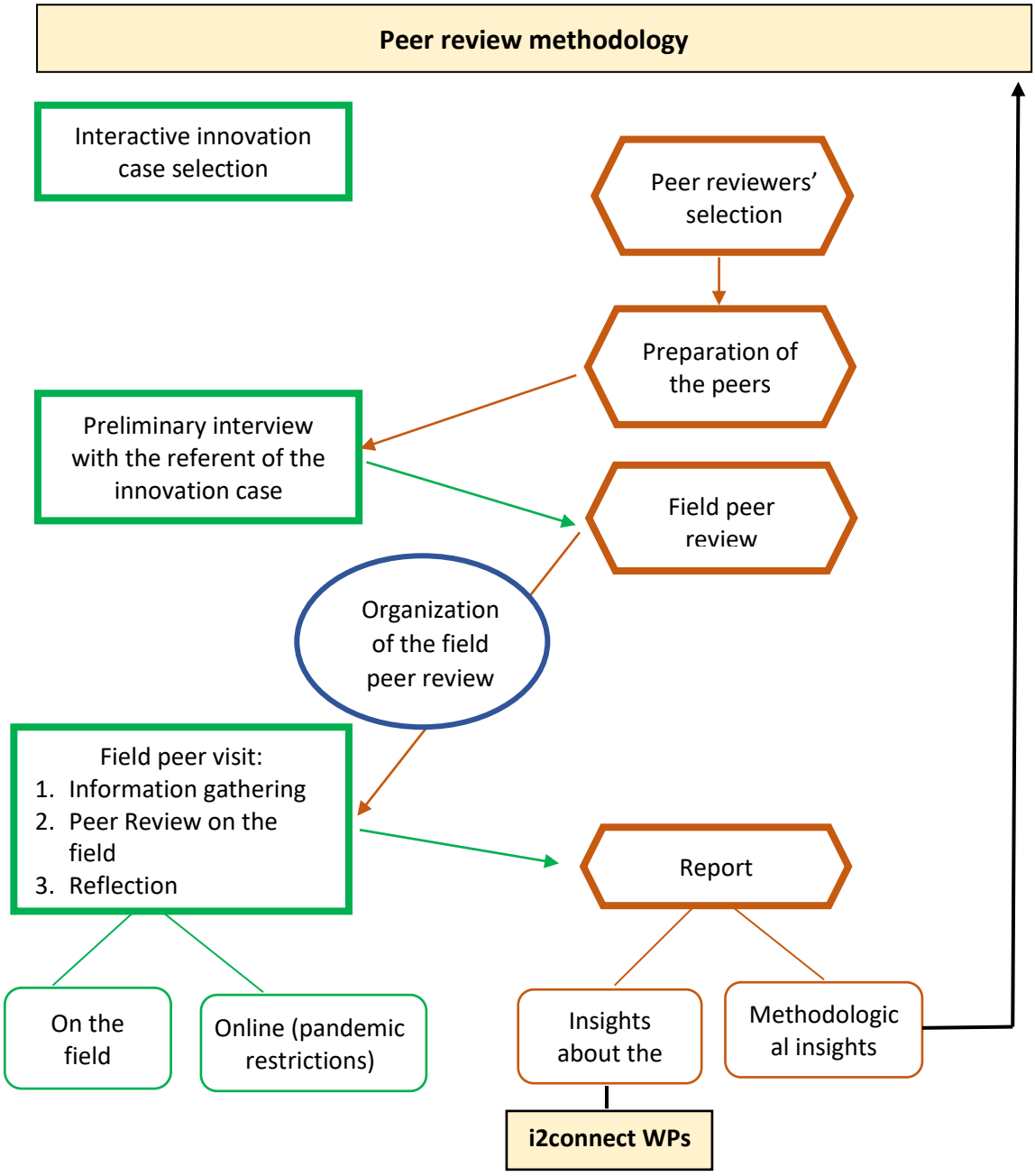
- **providing a framework for analysing** the roles of various actors and policy instruments,
- **creating a thorough inventory of practices** (with a particular focus on advisory services) which define an enabling environment for interactive innovation processes,

- providing insights to **develop training programs**, **materials and tools** for capacity building of advisors, advisory teams, decision makers and managing authorities.

To fulfil these tasks, a comprehensive peer review methodology was designed, including both a detailed set of questions (analytical framework) and an exhaustive operational programme.

The overall methodology (fig. 1), which encompasses interviews, key actors' reflexive evaluations, peer observations and other evidences, draws on the cross-visits experience of the AGRISPIN project and the method of peer review of teaching, which is increasingly being used for managing and improving the quality of Vocational Education and Training (VET) organisations, as well as of services they provide.

Figure 1. Peer review methodology scheme



1.3 The framework of analysis

The set of questions through which to carry out the peer reviews has been developed laying on a careful literature analysis concerning the methods used for the assessment of interactive innovation. The analysis also included similar tools already used in other H2020 projects, such as AGRISPIN and LIAISON, and the Innovation Capacities Scoring Tool developed by FAO.

The question framework allows investigating roles, functions, skills and competences of advisors in supporting innovation processes, the effectiveness of this support and the enabling context within three different areas of interactive innovation, which correspond to the different dimensions on which a collaborative innovation partnership can generate effects:

- the first area concerns the co-operative processes and the approach and the level of interaction among partners of II (internal learning and coordination, the specific role of facilitators, etc.), which lead to co-produce practical solutions for farming;
- the second area deals with the strengthening of social capital and the ability to interact with local innovation systems, which, in the long term, contributes to boosting innovative capabilities in agriculture;
- the third area involves the scaling of the innovation, meaning the shift from the first circle of users/co-innovators to a wider circle of users.

It is worth noting that the terms advisor, advisory services and advisory system are to be understood in a broad meaning (i2connect D1.1). In the i2connect project, advisors are agents who assist clients in innovation processes, for example through linking clients to relevant knowledge and actors, and through facilitating the co-innovation process (i2connect D3.6).

The question framework builds on a complex analytical framework, sounded on a wide corpus of literature concerning advisory functions ((ADE, 2009; Allebone-Webb et al., 2016; Birner et al., 2009; Borrás and Edquist, 2013; Faure et al., 2016; Heemskerk et al., 2011; Howell, 2006; Kilelu et al., 2013; Kivimaa et al., 2018; Klerkx and Leeuwis, 2009; Knierim et al., 2017; Labarthe et al., 2013; Leeuwis and van den Ban, 2004; Mathé et al., 2016; Ndah et al., 2018; Röling and Jong, 1998; Steyaert et al., 2017).

Particularly, the key analytical concepts of the Field Peer Review are the Innovation Journey (Van de Ven et al. al., 2000) and the Spiral of Innovation (Wielinga et al. 2007). According to the innovation journey methodology, the innovation process can be understood as a challenging journey from the initial conception through to final implementation that demands a great set of skills for each step of the innovation process to make ideas thrive. The innovation journey approach has been adapted to interactive innovation by matching with the seven-phase model of the Spiral of Innovation (Wielinga et al., 2007; AGRISPIN project), which is used to orient free actors within different steps in the innovation process, namely the initial idea, inspirations of supporters, planning, developing new ideas or practices, implementation, dissemination and embedding changed practices into the institutional environment.

Basing on these concepts, the i2connect framework of analysis focuses on three main issues:

- The contribution of advisors in supporting individuals or groups involved in interactive innovation. The leading evaluative questions are: which support is being (or should be) offered? By whom? Through what methods and tools?
- The effectiveness of advisors in innovation, that is how this support helps the process to move to the next phase.

- The conditions, both internal (advisor's characteristics) and external (environment), that enable the specific actor(s) to play support functions.

The analytical framework follows the "best fit" approach (Birner et al., 2009), aimed at identifying elements that "fit for" specific cases and the environmental conditions that enable them, rather than those that are indifferently defined to be "best practices". Therefore, the enabling environment, in terms of innovation and agricultural policies, but also mind-sets and attitudes and practices, are intrinsic parts of this framework. Moreover, the assessment of the effectiveness of advisory in innovation is carried out by using the reflexive evaluation methodology, aimed at triggering a collective reflection on the results of actions undertaken within the innovation case under review.

Given the diversity of practical cases to be reviewed, the dynamics and the actors involved, the design of an outline for the interviews has not been considered appropriate, preferring to leave the peer panellists to design the most suitable interview scheme. However, interviews must allow obtaining a standardised classification of collected data and asking the right questions in the right order.

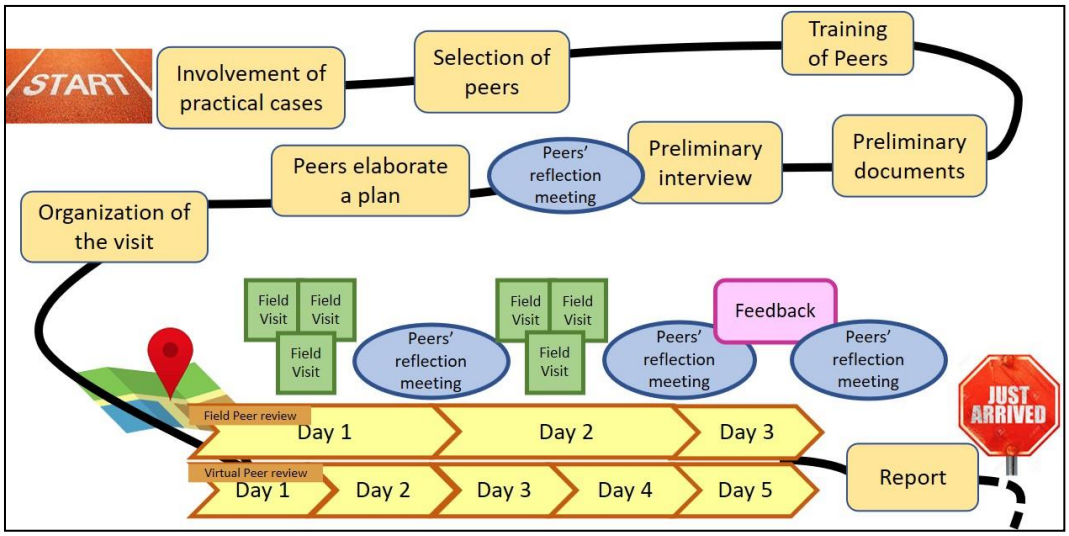
To allow a correct use of the question framework, avoiding poor drafting of the interviews that could lead to practical problems during data processing, a flow chart and a checklist to be used to check what information has been collected and what is still missing and to reflect on relevant elements for the assessment of the best practices, have been drawn.

1.4 The steps of the Field Peer Review

The peer review process (fig.2) consists of 4 steps which take about two months to be prepared and organized:

1. peer reviewers' selection and training;
2. preliminary interview/documents and organisation of the field visit;
3. field visit;
4. peer review report.

Fig. 2 *Field Peer Review process*



1.4.1. Peers selection and training

Field Peer Reviews are carried out by teams of 3-4 peer reviewers. The field review panel consists of one farmer, one advisor and one i2connect partner or third-party organisation.

The i2connect partner plays the role of **peer coordinator**: he/she **organises** the peer review activities, **facilitates** the interaction, **records** the outcomes of the field reviews and **drafts the Field Peer Review Report**.

The **farmer** and **advisor** reviewers are chosen from each of the selected practical cases (but not from the same case). They are expected to assess the practical case from their own perspective, based on their own experiences and impressions and should actively engage in exchanging questions and answers with the practical case.

A second person from a partner or third party of i2connect may participate as an observer, to record the field peer review from a **quality control** perspective. In view of testing and improving the methodology, at least one i2connect partner participated as an observer in one out of ten pilot Field Peer Reviews.

The peers' assignment is to: 1) read the provided documents and collect the preliminary information, 2) elaborate a plan for the peer review (who is to be interviewed, questions to be asked to each subject, etc.), 3) conduct the Peer Review (collect information, conduct interviews, analyse results, provide feedback, etc.) and draft the final report. They also must attend the "Peer Training Program" aimed at providing them with the information needed for the job of reviewer.

1.4.2. Preliminary information gathering and organisation of the field visit

A key factor for maximizing the effectiveness of the Field Peer Review lies in motivating (encouraging) the participation of all actors involved in the practical case. To this aim, the case representative is promptly informed about the goals of the Field Peer Review: a common understanding on key substantive issues to be addressed and information to be gathered needs to be developed between the practical case and the peer group.

On the other side, each selected practical case is asked to identify one farmer and one advisor to act as peer reviewers of other cases, and a facilitator to provide support to the peers during all phases of the review process.

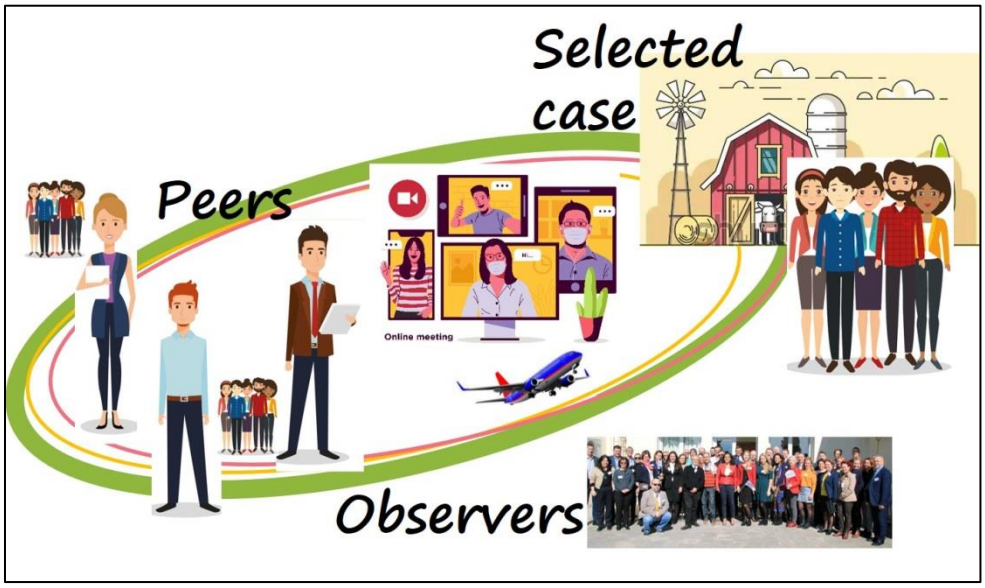
The peers gather preliminary information about the selected case through: a) an Initial Information Sheet, that includes contact information and details concerning all persons involved in the practical case; b) documents concerning the practical case, including previously assessments and reviews, which are already available in English language; c) a preliminary interview (using a common outline) with a key actor to gain an overview of practical case in its complexity.

Based on this data gathering, the peers develop a review plan which defines: i) the subjects to be interviewed (specific actors or typologies); ii) the questions to be asked to each actor/group of actors, according to the role played in each phase of the innovation process; iii) the methods of collecting information (e.g. how many individual/group interviews, guided visits, etc.); iv) the estimated time for the visit.

1.4.3. The Peers' Visit

The *Field Peer Visit* is the core activity of the Peer Review procedure.

Fig. 3. Actors involved in the Field visit



Due to the Covid19 pandemic, the visit is carried out online (*Virtual Peer Visits*). The Virtual Visits are challenging because they seriously reduce the possibility to interact and customize the relationship with the people involved, as also the use of some information collecting tools, such as observations and guided visits. The development of a methodology as successful as possible requires a careful observation of the pilot Peers Visits and will be implemented by doing.

The review approach is built on interviews (individual or group), focus groups and observations. Peers discuss and compare all the data collected in each activity, to assess its relevance and representativeness, immediately after its conclusion. The discussion is structured around the question flow and the peer review checklist, whose questions drive the reflection towards the final assessment.

At the end of the Peer Review, the Peers schedule a feedback meeting to share the results with the reviewed practice case and request for further explanation, while stimulating a reflexive assessment

by the actors. The core objective of this verbal exchange is a complete understanding of the feedback. The visit ends with a final retrospective examination of the Peer Group.

The time frame of the visit depends on the complexity of the reviewed practical case (type and number of involved actors, innovation typology, etc.), even if short visits or online sessions spread over several days are recommended.

1.4.4. Report and feedback

The findings of the Field Peer Review are presented through a Field Peer Review Report, which is drafted according to a provided outline. The goal of the report is to provide a short narrative of the innovation case by following the questions flow and articulating around the different phases of the innovation process.

The Report includes the peer reviewers' reflections about the practical case and the key findings concerning interaction between actors, the support actions performed, the conditions, both internal (advisor's skills and capabilities) and external (environment), that enable the specific actor(s) to play support functions.

Reviewers' feedback on the field peer review process is shared with T2.4 and T2.5 leaders within dedicated workshops, aimed at highlighting strengths and weaknesses (bottlenecks, dead times, lack of time, communication difficulties, language issues, etc.) and providing insights for the improvement of the methodology.

1.5. Data privacy

In line with I2Connect deliverable 7.1 Ethics a sorrow data privacy protocol has been established for conducting the filed peer reviews.

Before the panels started all participants were asked to fill in an online informed consent form. A minority of the given consent have not been received appropriately and/or in time. This shall be repaired with the panellists involved as this is needed to remain compliant with the GDPR and therefor data may be used for further research within this research. If for some reason the consent for a panellist cannot be repaired, this data will be removed from the dataset. The project assumes that this will not be necessary, and it will be resolved promptly and in accordance with requirements through earlier agreements with the panels involved.

1.6. Literature

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2. Field peer review reports

From the selected cases in round two 4 has been conducted at the beginning of 2023. This report describes the evaluation of the cases together with the Irish Leitrim case from round 1.

Table: List of panels

Panels	Country	Panel Coordinator
Controlled feeding of corn silage in cattle feed rations	Slovenia	Sasa Plestenjak (KGZS)
Operation group Precision agriculture in Citrus irrigation and fertilisation	Spain	Iratxe Díez Delgado (MAPA)
Developing salad Potatoes	Ireland	Shay Phelan (Teagasc)
Contract rearing	Ireland	Tom Call (Teagasc), Terhi Taulavuori, (ProAgria)
Innovation Gates	Lithuania	Lina Zukauskiene,

Field Peer Review Report

I. Contract rearing group Co. Leitrim, Ireland

Main author

Peer coordinator Terhi Taulavuori, Association of ProAgria centres

With contributions from

Tom Coll Advisor, TEAGASC

Farmer Samuli Kallio, Finland

Advisor Karolina Świstak, CRD

I2connect partner Geoffrey Hagelaar WUR

Observer Jane Kavanagh, TEAGASC

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1. Introduction

The Field Peer Review process was supposed to be implemented face-to-face, on the field, but unfortunately, due to the Covid-19 crisis, this was not possible. Therefore, we used email and videoconference (Teams) to prepare and fulfil the field peer review. The methodology and guidelines developed within the i2connect project (Outline for preliminary interview, Question flow and Check list) were followed. Peer review teams were put together in such a way that people from different countries and different practical cases found themselves in the same panel.

Preparation of the field peer review

A training session for panel coordinators and facilitators was arranged 11.11.2020 (3 h). After the training session Kati Kastinen (panel coordinator of case "Contract rearing group Co. Leitrim – Ireland") and Jane Kavanagh (panel coordinator of case "Sharing best practice in discussion groups – Finland") planned by email the preliminary information meeting. They decided to organise the first round of field reviews together.

Objectives of the Field Peer Review

The objective of the i2connect Field Peer Review is to:

- assess the roles and function of advisors in supporting innovation processes, and
- assess the effectiveness of this support and the enabling environment.

The Field Peer Review process will provide an inventory of practices (with a particular focus on advisory) that define an enabling environment for interactive innovation processes, providing a framework for analysing the roles of various actors and policy instruments. It will provide insights to develop training programmes, materials and tools for capacity building of advisors, advisory teams, decision makers and managing authorities.

The peer review methodology is designed to accurately assess the advising practices within the interactive innovation cases under review. This includes information about roles and functions, skills and competencies, key actors' reflexive evaluations, peer observations and other evidence.

Recording of preliminary information meeting:

i2connect Preliminary Interview; cases Ireland and Finland-20201211_120301-Kokouksen tallenne

After the first meeting panel coordinator Kati Kastinen, advisor Anu Ellä and observer Terhi Taulavuori had a short reflection on the Irish case.

Field peer review

During the field review one team session has been organised (2021-01-11), and furthermore the communication took place by e-mail correspondence with Tom Coll answer (by 2021-02-09).

The team has decided to choose that one theme meeting will be sufficient based on the preliminary interview and the number of participants involved.

2. Factsheet of the case

Leitrim is a remote part of Ireland with lots of small drystock farmers, who are elderly and/or working off farm. They traditionally farm sheep and beef cows at low stocking rates. The land is relatively poor in quality and suffers from high rainfall, resulting in short grazing seasons and longer winters. As a consequence, big areas of the farmland have been planted over the last 40 years with commercial forestry and this has impacted the viability and sustainability of the rural communities.

Advisors and farmers have improved the quality and productivity of the remaining drystock farms but are keen to adopt new enterprises or systems that are more economically viable and fit better with elderly or part-time farm operators. One advisor (Tom Coll) has worked with these farmers and helped them to set up a contract rearing service group. This group is facilitated by the advisor who helps them to take in young calves from larger dairy farms and rear them to an agreed age where they are taken back to their farm of origin.

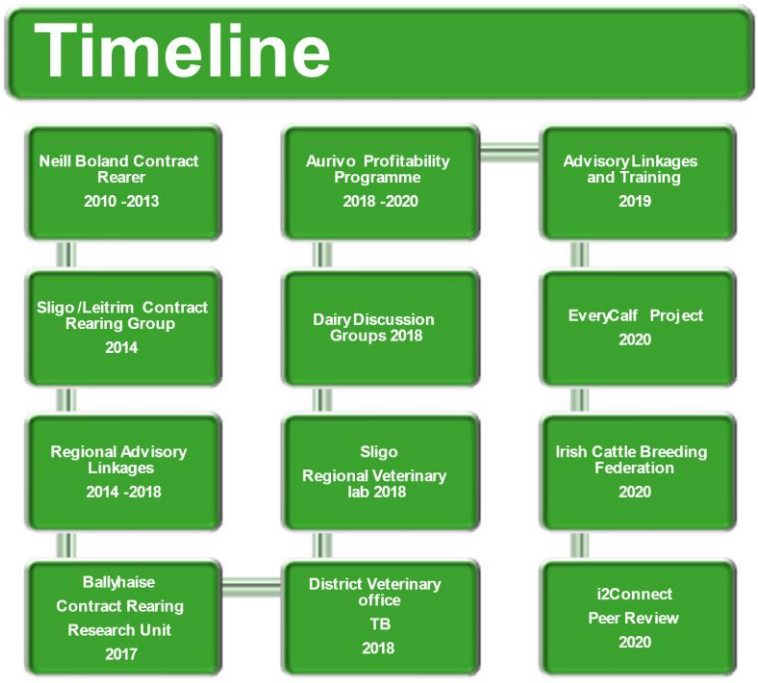
Contract rearing of dairy heifers has become more popular in recent years. The increase in popularity is driven mainly by expanding dairy herds but also by dairy farmers who want to streamline labour at their current scale. In that sense, farmers seem to have their own specific reason or reasons to start contract rearing, depending on their particular farm situation. Farmers also develop their own path in implementing the contract rearing farming activity in their own farm (e.g. when starting contract rearing, this takes up 50% of all farm activities and over the years % contract rearing takes up 100% of all farm activities). As with any collaborative farming structure, there are benefits and risks for both parties involved. It is perhaps fair to say that the majority of information published to date has focused on the issues at hand for the dairy producer.

Group Profile:

- Cattle and sheep farmers
- Contract reares in conjunction with existing enterprise
- Sole enterprise in some cases
- Generally one owner, one rearer

The Sligo/Leitrim contract rearers group consists of 19 farmers currently rearing 2,090 dairy heifers. The numbers reared on individual farms range from 30 heifers by farmers starting out to 300 heifers in the more established farms. The age at which heifers arrive on farm differs between farms from 3 weeks, 12 weeks and 9 months of age. Initially some members have summer grazed heifers before moving into longer-term contracts. In general most contracts consist of one owner and one rearer, although owners have supplied multiple rearers and rearers are rearing for more than one dairy farmer. The group is made up of contract reares in conjunction with an existing suckler or sheep enterprise and members where contract rearing is now the sole enterprise on the farm. The group have established benchmarking linkages with the Aurivo farm profitability programme and with the Teagasc Ballyhaise heifer rearing unit.

Actor types	More specifically:	Name of organisation and sector (public or private)	Nature of involvement/Official role
Individual farmers or foresters	*e.g. pioneer farmer, organic farmer*	*Sligo/Leitrim Contract Rearers Group*	*work package leader*
Researchers or R&D departments	*e.g. researchers at institutes or universities, R&D departments*	*Donal Patton & Noel Prunty, Teagasc Ballyhaise Dairy Research Unit*	*field trials*
Education	*e.g. primary education, (agricultural) schools, universities in their role as educator*	*Kieran Henry Farmer*	*communication*
Support organisations	*e.g. advisors, representative of supporting organisations, financial actors (banks, venture capital, business angels), network organisations*	*Vincent Griffiths Aurivo profitability programme co-ordinator*	*communication, field trials*
Market actors - supply side	*e.g. business, suppliers (e.g. raw materials), manufacturers, service providers*	*Sligo/Leitrim Contract Rearers Group*	*work package leader, coordinator, communication, field trials*
Market actors - demand side	*e.g. business, processing or marketing SME, processing or marketing producer organisation, retailers, consumers and their organisations, other companies (B2B)*	*Matt Ryan, Agricultural consultant working with dairy farmer groups* *Teagasc Dairy Advisers* *Vincent Griffith Aurivo*	*communication*
Civil society	*e.g. NGOs, local community groups, LEADER groups*		*e.g. work package leader, coordinator, communication, field trials*
Administrative bodies	*e.g. local municipality, regional government, national government, ministries, departments, EU institutions*	Teagasc Mohill Co. Leitrim	*coordinator*



3. The initiation period

Initial idea

Tom Coll Teagasc
Neill Boland Farmer

After taking over the family farm in the '90s, Neill Boland moved to convert the dairy enterprise into suckling as the land was fragmented in small parcels and they couldn't carry the number of cows to make dairying viable. Back in 2009, Neill was faced with the dilemma to either increase suckler cow numbers or to look at alternative methods of generating a viable income on his 56ha farm. The prospect of a regular income attracted Neill Boland to convert from running a suckling enterprise to contract rearing. Contract heifer rearing is where a dairy farmer pays another farmer to rear his replacement heifers.

After speaking to a dairy farmer, Neill was presented with the option of contract rearing. Neill: "A friend of mine was expanding his dairy enterprise and I was at the stage where I was looking at increasing my suckler herd. He asked me whether I was interested in contract rearing and I started with 30 heifers." Neill was the first farmer in the area to contract rear dairy heifers. From rearing 30 heifers in 2009 from a neighbouring farm Neill made the decision to sell all his own stock and go full-time contract rearing in 2012. Tom Coll was monitoring the profitability of Boland farm already before changing from suckling to contract rearing.

Tom Cole suggested to Neil Boland to start a discussion group on this and when Neil agreed, Tom invited other farmers who were interested and or searching for other activities than what they were currently doing on their farm.

Inspiration

Tom Coll Teagasc
Neill Boland Farmer

John Quinn

John O'Connell

In November 2015, a number of drystock farmers in the Sligo/Leitrim area came together to investigate the potential of contract rearing dairy heifers as a means of increasing stocking rate and increasing the profitability of their farms. John Quinn (vet/farmer) and John O'Connell were key persons to organise this first meeting and build up a new discussion group for contract rearers. An initial meeting was held on Neill's farm that had been successfully contract rearing heifers since 2010. The Sligo/Leitrim contract rearers discussion group was duly formed by Tom Coll. A barrier, if one may call it that, was that not all invited farmers were immediately convinced contract rearing was the thing to do, considering some of the risks involved. Examples are risks such as converting their farm in one sweep from what they were

doing to contract rearing and the uncertainty of rearing somebody else's herd. Changing the infrastructure of the old farm to meet the requirements of the new contract rearing setup didn't seem to be a problem. What stimulates the bond between the farmers in the discussion group is that they also have some social events (e.g. going to a pub together).

Additional information was sought by Tom Coll and found in the person of Donal Patton, a researcher. This researcher sets up field trials. However, according to the group of farmers, the farmers learn from each other and the researcher learns from the farmers. The latter because the researcher is developing in his organisation rearing facilities. One of the farmers sees the information exchange between farmers as 'invaluable'.

Neill has a contract rearing agreement in place and feels he has a good working relationship with the dairy farmers he rears for. "Good communication and trust are vital" says Neill. "We sit down in January and plan out the year ahead and look back on how the agreement is working." Neill regularly weighs the heifers and sends the information to the dairy farmers so they can monitor animal performance. "Done right, it works well for everybody," he concludes.

The fodder shortage in the south and east of the country, in contrast to the relatively good grass-growing year experienced in the north-west, increased the demand for contract rearing, either on a short-term over-winter basis or in a long-term agreement.

Dairy farmers in Ireland used to be limited by milk production quota. This is no longer the case and has led to a 40% increase in dairy cow numbers. This has increased the need for contract rearing.

4. Planning and development

Planning

Tom Coll

James Keane Teagasc

Matt Ryan

Vincent Griffiths

Discussion group decided to increase farm profitability

- By increasing farm stocking rate

- Increasing overall farm output
- Maximising grass production and utilisation
- Increasing number of grazing days
- Producing high quality silage
- Minimising labour
- Building long-term relationships
- Achieving targets

The farmers in the group were all relatively good grassland managers, some were on the PastureBase grassland measurement system, and all had the ability to make high quality silage. They all looked on contract rearing as a means of increasing stocking rate with little capital outlay, to grow gross output and the overall profitability of their holdings.

Development

Tom Coll

John Quinnn Vet/Farmer

Neill Boland Farmer

John O'Connell Farmer

Neill Boland has been a member of the Sligo/Leitrim Contract Rearers' Group from the beginning of the group and is a Focus Farm as part of the Teagasc/ Aurivo Farm Profitability Programme.

The Profitability programme was in conjunction with the local Dairy Co-op. Mainly Dairy monitor farms were set up to look at on-farm efficiencies that would improve their financial performance.

Neill was also included as a contract rearing monitor farm looking at improving grassland management, silage quality and breeding to enable him to increase his farm profit, his stocking rate and achieve targets as economically as possible. Farm walks were organised to disseminate the findings.

The discussion group format enables farmers to share experiences and knowledge; it also helps build confidence to initially take the first step and then develop the enterprise.

5. Implementation

Realisation

Tom Coll

John Quinn Vet/Farmer

Neill Boland Farmer

John O'Connell Farmer

Matt Ryan Agricultural Consultant

Vincent Griffith Aurivo Farm

The group was made up of members who contract rear in conjunction with an existing suckler or sheep enterprise and members where contract rearing is now the sole enterprise on the farm. The group has established benchmarking linkages with the Aurivo farm profitability programme and with the Teagasc Ballyhaise heifer rearing unit. One group member, Neill Boland, participates in the Aurivo Profitability Programme, and another, Michael Fitzgerald, runs the Teagasc Ballyhaise contract-rearing unit. John, the vet, provides his veterinarian services only to his own clients, but he would give advice to the group at group meetings.

The Sligo/Leitrim contract rearers group are focused on farm income and want to build long-term contracts with suitable dairy farmers. They treat the heifers as their own and take pride in reaching targets. The heifers reared by group members far exceed the performance of heifers reared on dairy farms nationally.

Five rearing stages are:

- Calf rearing up to 12 weeks old.
- First grazing season from 1 May to housing.
- First winter housing period.
- Second Grazing Season from mid-February to housing.
- Second winter housing period.

Heifers arrive on the farm at 2-3 weeks of age in March and return to the owner the following November of the next year at 20 months of age with a target 95% in-calf rate. Each rearer will usually have 2 groups of animals, the 0- to 1-year-olds and the 1- to 2-year-olds.

The weight gain of the heifers was found to be a key indicator of good performance. Regular weighing at intervals during the rearing period is a key management practice that benefits the rearer while reassuring the dairy farmer. Weighing allows lighter animals to be separated into smaller groups and reduces the number of animals that have to be fed meal. This contributes greatly to the profitability of the enterprise for the rearer.

Successful rearing requires 95% of the heifer's are in calf after six weeks' breeding. Weight gain plays an important role in this but practical skills such as heat detection are hugely important.

The farmers draw up and sign a contract rearing agreement, where all possibilities are addressed decision is made weather the animals are on grass and in sheds for the winter. There are specific individual animal targets weights for bulling and in-calf targets set in the contract and penalties for not reaching targets. The contract rearing agreement is based on farmer trust.

A written agreement is essential to keep a record of what has been agreed between the two farmers. The arrangement must be built on good communication, honesty and trust between the parties from the beginning. The written agreement should set out the key elements of

what is agreed between the dairy farmer and the rearer. It must document practical issues such as weighing dates, vaccination dates, responsibilities, payment rate and payment date. Flat rate, and 'weight bonus' template agreements are available to download from www.teagasc.ie.

The contract reared animals are usually kept separate as far as possible from the rearer's. A health plan is drawn up with the local vet but there are health risks and it's a case of mitigating against the risks.

There are three options for the average suckler to weanling farmer to get into contract rearing. Option 1: Continue with suckling and take in heifers on part of the farm. Option 2: Get out of suckling and contract rear heifers at the same farm stocking rate. Option 3: Get out of suckling and increase the farm stocking rate to 1.92 lu/ha.

The contract rearers are paid on a monthly basis by direct debit.

Contract rearing is a win-win for dairy and drystock farmers. The dairy farmer has the use of the contract rearers land, labour and buildings which should reduce his own labour

requirement and need to invest in additional building for heifer rearing. The drystock farmer, who has good animal husbandry skills, is technically efficient, is a good grassland manager and makes excellent quality silage, will meet the dairy heifer rearing targets and generate a viable farm income.

6. Dissemination

Tom Coll

Matt Ryan

Neill Boland

John O'Connell

Kieran Henry

Donal Patton/Noel Prunty Teagasc Ballyhaise

The Profitability programme was in conjunction with the local Dairy Co-op. Mainly Dairy monitor farms were set up to look at on-farm efficiencies that would improve their financial performance. Neill was also included as a contract rearing monitor farm looking at improving grassland management, silage quality and breeding to enable him to increase his farm profit, his stocking rate and achieve targets as economically as possible. Farm walks were organised to disseminate the findings.

The discussion group consists of contract rearers and farmers who intend to contract rear in the near future. To look first at the farmers in the group, they were all relatively good grassland managers, some were on the PastureBase grassland measurement system, and all had the ability to make high quality silage. They all looked on contract rearing as a means of increasing stocking rate with little capital outlay, to grow gross output and the overall profitability of their holdings.

Embedding

Tom Coll

Neill Boland Group Chairman

The Sligo/Leitrim group have taken a leap of faith and encouraged new members to become contract-rearers.

At first, the farmers had many reservations, but as a group the farmers worked with the advisor and others to ensure that the service was of high quality and offered a fair and valued option to both the dairy farmer and the contract rearing farm. The group works as a discussion group and promotes its service through the advisory service network. Contract rearing groups have been set up by other advisors in other regions and are supported by a wider pool of Teagasc researchers and specialists.

Tom Coll evaluated that the major cause to make contract rearing production more effective compared to the previously run conventional production is:

- The animals are lighter and are suitable for extending the grazing season on grass. They do not require as much winter forage in the form of silage so most of the weight gain comes from grazed grass which is more economical.
- Regular weighing allows the farmers to identify the animals that require concentrates to reach weight target. The remainder of the animals are able to reach their winter weight gain targets on good quality high DMD silage.
- Because the animals are lighter, rearers can increase the stocking rate on the farms and maximise the days spent grazing.
- The application of lime is a must to correct soil pH. The application of N, P and K is in line with soil analysis results and stocking rate and how much grass the farm needs to grow to match the stocking rate.

Tom Coll recommends the grass seed varieties are sown to suit the particular farm looking at persistency, ground cover, yield and especially heading dates. He would also use varieties tested in Ireland under the pasture profit index. In Ireland they usually combine perennial ryegrasses and clover in the mix. Tom only recommends reseeding for the higher stocked farms.

Contract rearing is mainly for dairy heifers. However, it is also being carried out for beef animals. In Ireland they are rearing male calves from the dairy herd for resale at 14 months of age for further finishing.

Group members named key factors and targets that should be put in place and agreed upon between dairy farmer and rearer in advance of the first animals arriving on farm:

• A detailed contract agreement specific to the farms involved put in place and agreed including terms and conditions, a herd health plan, target weights at arrival and return and a breeding plan.

• Planned meetings with the local district veterinary officers by both farmers.

• Regular weighing of stock should be undertaken to identify underperforming animals for timely corrective action. The ICBF weight recording link will allow the dairy farm to view weighings and monitor heifer performance.

• In the first year of the contract agreement, both parties found it beneficial for the dairy farmer to hold onto a percentage of the heifers and rear them himself as a means of comparison. This can be used as an aid in the trust building process.

• The use of heat synchronisation and tail paint/patches as an aid to heat detection to ensure pregnancy rate targets are reached and reduce workload on the rearer.

• The use of an independent intermediary person appointed by both parties to dissolve disputes and find solutions when things don't go to plan.

• To continue to meet as a discussion group sharing experiences and acquiring additional knowledge to reduce the cost of heifer rearing and ensure targets are met.

Group members listed the benefits associated with contract rearing from their perspective:

• A means of increasing stocking rate with immediate effect, making better use of available land and buildings without the requirement to invest in stock.

• Allows for a clear direction in farm planning as the risk associated with market and price fluctuations is eliminated with an agreed contract price per day.

• Docile animals to work with and facilitate an extension of days spent at grass.

• It is good for cash flow as the rearer gets paid on a monthly basis by direct debit.

• Clear guidelines are outlined regarding target weights and pregnancy rates which keeps the rearer focused on the job in hand.

• A means of building a long-term trustworthy relationship with the dairy farmer with each farmer focused on how the relationship will benefit both.

• Contract rearing has substantially increased the profitability of farms involved either as a sole enterprise or in combination with an existing enterprise on the farm.

• An immediate source of income which facilitates the development of the existing farm infrastructure where future direction and plans can be based.

• Gross margins for the contract rearing enterprise ranged from €743/ha-€1,394/ha and were influenced heavily by stocking rate and the time period the heifers spent on the farm annually.

Group members named some negatives and associated risks:

• It takes time to build trust and form a working relationship with the dairy farmer - the first bump on the road and how it is dealt with is vital.

• Heifers arriving on the rearer's farm under target weight for age was one of the main problems. These animals will be the ones that the rearer will continually struggle with to meet the targets and the ones that will reduce farm profitability. Dairy farmers need to ensure that all heifers sent out for rearing are on target.

• Heifers arriving on the farm sick will also have a huge effect on their potential to reach targets. The dairy farmer and rearer need to draw up a health plan with a veterinary surgeon to manage the health status of the animals leaving both farms.

• The initial contract is difficult to get up and running with some dairy farmers pulling out at the last minute and leaving the rearer without stock.

• The contract rearer needs to be technically efficient, an excellent grassland manager and aware of the benefits of reaching target weights

• There is a cost associated with changing the annual herd test date to earlier in the year to allow enough time for retesting stock in the case of a TB outbreak. The rearer should liaise with his local DVO prior to entering into an agreement.

• There is a disease risk when stocks are taken onto the farm especially where there are existing animals on the farm.

There are many articles in papers and on the web about contract rearing. Group members have posted a lot on Twitter and on Facebook. Many videos can be found on YouTube, too.

7. The AHA-Erlebnis: feedback on the gained insights

1. The importance of the context for advisory processes
A long-term relationship between advisory services represented by Teagasc and farmers. These linkages were developed in the process. It is a very important factor facilitating trust and personal relationships between farmers and advisors. It takes many years to build the trust.

Discussion groups are very important part of the development of the farms. The Irish group system is very effective, and it has been strongly developing during last years.
Teagasc has very large network:

- several discussion groups, knowledge transfer
- co-operation with rearers

International knowledge transfer is all the time getting more and more important part of the discussion group system. It´s also a good way to develop discussion group system itself, when the facilitators make co-operation with other countries farmers and facilitators. It didn't become clear that this group has contacts internationally, feeding other discussion groups with their knowledge. However, there is a potential as the Polish attendees were very eager to learn more about contract rearing group experiences.

2. Different drivers to start contract rearing
The discussion group consists of farmers who seem to have different angles to start contract rearing. Whatever the angles are, this doesn't intervene with the discussion group meetings and their outcome for the different farmers.

3. Social bonding
In developing trust amongst discussion group members, social bonding seems to play a role. Social bonding strengthens the relation between the farmers and has a positive effect on the exchange of information.

4. Competition
Farmers seem to compete amongst each other. That became clear when discussing the importance of setting performance targets for the rearing. Setting targets and presenting the farms' results on reaching the targets seem to trigger farmers to perform better (you don't want to be the farmer that ...).

5. Role of the advisor free actor
Tom Coll mentioned several times during the preparation for the Mid-term conference, that he learnt a lot by the peer review and analyses. He realised how important his role is in facilitating the network. He did that by using his gut feeling, overcome several bottlenecks, mediated between farmers. The methodology of i2connect helped him realize how important warm processes are and what he can do about it.

8. Lessons learnt

The Peer Review activities, carried out in combination with farmers and agricultural advisors, helped to gain valuable experience and knowledge from representatives of the best practical cases of interactive innovation. The peer review is an efficient method. It enabled a good exchange between the peers and the project. The participation of the peers in several projects made it possible to make comparisons between the projects and to draw lessons for one's own project.

It is a pity that we were not able to conduct the interviews face-to-face, as we probably lost quite a bit of important information or at least genuine contact with the people we were talking to. Consequently, results and understanding of the project are maybe distorted. Unfortunately, peer review panel coordinator Kati Kastinen changed to another organisation at the beginning of January. This caused challenges to continue the process in ProAgria because there was a lack of human resources.

The importance of the involvement of an advisor in a peer review panel is particularly shown here, as they can best assess the role of agricultural advisors within the practical case due to their personal experiences.

Interactive innovation from this group seems to be characterised by:

- An advisor who seems to be able to get along with all farmers and hence creates a ‘relaxed’ atmosphere which is explicitly combined with business like behaviour as setting targets and presenting the results on reaching those targets in which a certain level of competition between farmers can also exist
- Farmers who can predominantly learn from each other without additional external, scientifically based information
- Contract rearing can be characterised as a kind of radical innovation in the sense that the farm's primary process changes completely and that the relationship with the customer is vulnerable (raising somebody else’s herd). Possibly this radical character of the innovation creates a bond between the members of the discussion group as they talk about all aspects of their farm business.

Appendix: Preliminary Information Meeting

Friday, 11 December 2020

Case Study: Contract rearing group Co. Leitrim - Ireland

Attendees:

Name	Role
Tom Coll	Contact point/facilitator for Ireland Case
Kati Kastinen	Peer Review Panel Co-Ordinator
Katarzyna Ambryszewska	Advisor
Samuli Kallio	Farmer
Geoffrey Hagelaar	Observer
Anu Ellä	Observer
Terhi Taulavuori	Observer
Jane Kavanagh	Observer
Janus Dabrowski	Observer (GOSC)
Wojciech Styburski	Observer

Pre-Reading

- Information Sheet
- Background information on the case study

Agenda

Time (GMT)	Item	Responsible
9.00am	Welcome and Introduction • Outline roles and responsibilities in the peer review • Outline format for the meeting and objectives	KK and All
9.15am	Overview of Ireland Case	TC
10.30am	Conduct preliminary interview	KA and SK
10.50am	Discuss and agree dates for field review in January	All

Participants: Terhi Taulavuori (Panel coordinator ProAgria), farmer Samuli Kallio, Advisors Katarzyna Ambryszewska and Karolina Swistak, facilitator Tom Coll, farmer John O'Connel, Donal Patton (field trials), James Keane (TEAGASC), vet/Farmer John Quinn , farmer Kieran Henry, farmer Neill Boland, observers Geoffrey Hagelaar, Jane Kavanagh, Krzystof Mazure, Anu Ellä, Wojciech Stuburski, Janusz Dabrowski

Recording of field peer review: i2connect _ Virtual Field Visit of Leitrim case-20210111_130336-Kokouksen tallenne

Field Peer Review Report

II. Centre for Knowledge Accumulation, Transfer, Development of Agricultural Technologies and their Demonstration "Gate of Innovations", Lithuania

Shay Phelan

Teagasc Oak Park Carlow, Ireland

With contributions from

Martin Bourke

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1. Introduction

The field review was conducted between March 22nd-23rd 2023. It consisted of visiting the offices of the Lithuanian Agricultural Advisory Service (LAAS), Akademija, where we were met by the team who organised and co-ordinated the project. The review started, on the morning of day 1, with a formal presentation about the project while also giving some background information about the advisory service in Lithuania. One of the projects co-ordinators, with contributions and presentations from the different actors involved in the project, chaired the meeting.

Our reviewers then were invited to ask relevant questions about the project which allowed for discussion and further explanation about the project. This peer-to-peer exchange gave us a better understanding of the project and provided a useful session where we were able to compare the Irish advisory system and the Lithuanian equivalent. This in turn gave the review team a better understanding about the aims and goals of the project.

The co-ordinator invited different speakers to discuss their roles in the project form setting out the objectives, planning, implementation and the outcomes. At each stage, we were invited to ask questions to give us a better understanding of the roles of each of the individuals in ensuring the project delivered on the tasks that were planned.

In the afternoon of day 1, we were then given a demonstration of two of the technologies that were designed as part of the project. These were used to interact with farmers to both provide training on precision equipment and to provide critical on the spot information on items such as forage quality and animal health. These tools were designed in such a way, that they could be both used, in the Centre of Precision Farming and Competencies pavilion in Akademija, or be brought out on to farm or demonstration events.

On day 2 of the review, we were brought to demonstration farm, which was used to demonstrate many of the technologies that were developed as part of the project. We were given a full tour of the farm and again we were given presentations from the different people involved in the projects, which also gave us an insight into their roles in imbedding the practices that were being promoted in the project. Again we found this peer-to-peer exchange very useful in giving us a clear understanding in how the project achieved its objectives validating the technologies being used and in promoting change at farm level.

2. Factsheet of the case

The project was designed to promote and demonstrate precision technologies that could be used on farm to benefit famers. The technologies were available to all types of agriculture including crop production, livestock, organic, forestry, horticulture etc.

The key issues that the project focussed on were:

- Designing precision tools for different agricultural sectors
- Designing a portal for collection of the different research innovation research which also compiles data and publicises the data. (TITRIS)
- Creating a Centre of Precision Farming services and Competencies, which consisted of laboratory services and also a pavilion of used for demonstration purposes.
- Providing mobile training tools and services which could be used to train users on precision farming and simulate full scale precision farming.
- Implementation of the precision technologies on demonstration farms to provide real life experiences of the technologies for visitors at various events

The main partners in the project were LAAS, Innovation Support Service, local universities, farmers, researchers, demonstration farms and the technology providers.

The project was focussed on precision technology in agriculture is relatively new to many farmers, so the aim of the project was to give famers a platform where they could learn about the different technologies that are available now. Many farmers are now being introduced to various technologies, which can sometimes be overwhelming and difficult to understand. There are many of different systems are being sold in the marketplace at the moment so the project was designed to give farmers access to more information, be able to interact with some of the technologies and finally to see it in action on demonstration farms. Once the farmers become more familiar with the different technologies, they can then make a decision as to which might suit their own farms or not.

The project decided to design a Centre of Precision Farming Services and Competencies, which would assist farmers in learning about precision technology and also provide key information such as soil analysis, somatic cell counts, animal health, reducing greenhouse gases etc. Within the centre was a laboratory, which could be used by farmers to carry out the various tests, LAAS also provide technical advice through the advisory service. An Innovation Support Service (ISS) team of advisors was set up to back up for the project and the advisory service to give the project partners and farmers support on the different innovations. The ISS was developed to optimize human resources and time costs in implementing the innovation projects.

A learning pavilion was also built this building is used for demonstration of innovative agricultural technologies and machinery and can provide practical training to farmers while giving them exposure to some of the machinery, technology and display screens. This is used as hands on approach to training where farmers can practice using the equipment and consequently become familiar with the uses of the technology and how they themselves can actually use it.

The project also designed mobile learning equipment which can be used in different sites at various different types of events again with the aim of giving farmers hands on exposure to the technology.

The Gate to Innovations project is a comprehensive resource which farmers can use to source information on precision technology including research information, get advice from LAAS on the technologies, receive training on how to use it and finally see it in action on the demonstration farms. The demonstration farm that we visited were part of the local university and also provided training to students on the precision tools that they were using e.g. precision guidance systems.

The project was able to design innovative tools such as the GPS trailer to help to educate, demonstrate and train farmers how to use a system. On the trailer for example a farmer could be trained how to set up the system to apply fertiliser to a crop using GPS guidance and application maps. The initiative is able to provide all the necessary information from the TITRIS online information system (https://titris.lzukt.lt/en), in which researchers can upload relevant information on different research topics, this system can also help to provide advice to farmers e.g. product recommendations for different crops.

3. The initiation period

The initial idea of the project came from LAAS who identified the role that precision technology is going to play in agriculture in the future. They also identified knowledge gaps that would need to be addressed in order to provide the necessary information and training that farmers would require to be able to use this technology. As LAAS are an advisory organisation they identified that partners would be needed in order to carry out the project so other organisations were invited to become involved such as the local university, the ministry of agriculture Technology companies, farmers and researchers.

A feasibility study of the project was completed which gave the developers of the project the necessary knowledge to proceed with the project and it also identified partners that would be needed in the project and the roles that they would need to play. A project team of 13 researchers from 3 institutions, 8 experimental farms and 21 specialists were put together to carry out the project. This feasibility study, which extended to approximately 700 pages, endeavoured to cover all aspects of the project from initial concept through to the planning and implementation phases of the project. It identified the key actors, knowledge deficits etc. and areas that could be acted upon in the project.

This feasibility study then was used to develop the project proposal, which extended to approximately 1,200 pages, which in turn outlined the different steps that the project would go through from the initial idea to final implementation of the ideas in the project. The outcomes were shown to us on the visit including the GPS demonstration trailer, the TITRIS information platform etc.

The TITRIS system and the demonstration units were very useful in overcoming many obstacles in the innovation gates as they provided the much of the necessary information that farmers would need to implement some of the technology being demonstrated. This system is an open repository for information and over time will be built into an all-encompassing information hub. The TITRIS system is also a system that can be used for continuous training advisors, farmers or other industry partners.

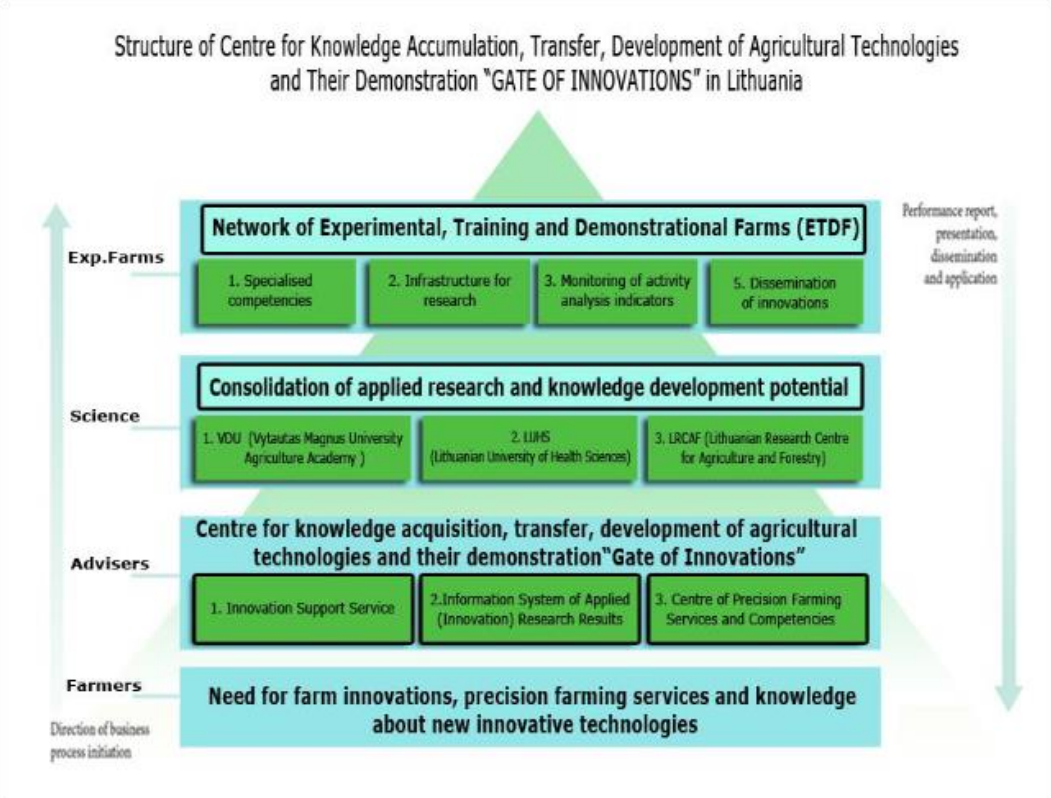
The demonstration tools are very useful or people who are hands on and like to see the tools in action. These tools I found to be very intuitive and accessible to farmers of all ages or abilities. The fact that farmers could see, for example, how a GPS enabled fertiliser spreader could be set up to apply various rates of fertiliser from the screen provided seemed to be an excellent tool. It was a very visual and practical aid that, practically, any farmer could get used to very quickly.

All the partners who took part in the project, that we met, were very open-minded people and were not afraid to try new ideas. These were very evident characteristics in all of the people we met, they were also technically competent in their own areas of expertise. Where expertise or extra resources were needed, there seemed to be no issue in recruiting new staff to assist the programme. We met a number of new energetic staff who were working in the different areas of the project on our visit.

There were a number of pain or pinch points in the development of the project particularly when it came to funding the different tools and resources. However, the necessary funding was forthcoming and the project goals appeared mostly to have been met. Developing the TITRIS system would have required the assistance of outside agencies to develop the online platform, while the system is simple to use, no doubt there was a lot of planning in the background to develop the type of system envisaged.

Crucial to the success of the project was developing a defined structure to the project in which all the different actors and their roles would have been discussed, planned and defined before the project got off the ground. This structure was pivotal to the success of the project (See diagram) as it gave clear guidance to the flow of information within the project while also setting out targets that would need to be met for the success of the project. All partners in the project, including farmers, advisors, researchers and the experimental farms had their own defined roles which were integrated into the project. It is obvious that without the participation of any one of the partners involved that this project would not have been as successful as it turned out to be.

Figure 1. Structure of the project



Inspiration

Initially a meeting was called for the potential partners to discuss the project which the idea of the Gates of Innovation was discussed, this meeting led to the collection of the information about different innovations at national from various different events. This helped the organisers to come up with suggested ideas as to what the project might contain and also what types of projects could potentially work on the basis of needs and previous experience.

After a number of discussions among the partners the finalised ideas were agreed. Outside partners who would be needed to assist in the project were then contacted to assess who would be available and suitable to work on the project. This was necessary as some of the innovations were tools or services that were needed were not provided by the partners e.g. precision farming equipment. Many of these partners would also be able to provide training and updating on the parts of the project in which they would be involved.

4. Planning and development

Once the three main activities were decided upon then plans were put in place to achieve the main outcomes. The planned activities were;

1. Innovation support service – 1 specialist was recruited and any activities related to AKIS was co-ordinated by this specialist
2. System for Applied Innovation Research Results (TITRIS) – Platform for collating data on innovation projects being implemented and their results were to be stored on the system. New information would be constantly added to the database, as it would become available. The system would be available in Lithuanian and English.
3. Centre for Precision Farming Services and Competencies – this centre would be a hub for training and analysis for farmers and consisted of three main areas;

d. Laboratory – for testing soils, organic manures and water

e. Innovation Pavilion – centre for companies to demonstrate equipment and provide training for this equipment

f. Simulation display of precision farming – mobile tool which could be used to demonstrate how to use some precision application tools to farmers.

Following on from this experimental farms were then identified to put in practice different innovations which could be tried and tested on site. These farms would then be used for demonstrations for the general public.

The details of the different five experimental farms were as follows:

Institution	Equipment
Dotnuva Experimental Farm	A dispenser of liquid and viscous feed for automatic milking.
Seduva Experimental Farm	1. A set of smart scales with the function to store data in a computer. 2. An automatic disinfectant stall with a bath. 3. An automatic bonitization machine for sheep. 4. A mobile set for sheep hoof care with function to rotate.
Silute Experimental Farm	Vertically towed forage crusher/mixer/dispenser with a weighing system
Upyte Experimental Farm	1. A somatic cell counter. 2. A herd management system. 3. A feed management system.
Aleksandras Stulginskis University	1. An automatic driving system for a tractor. 2. An automatic system for management of sections of a sprayer.

Innovation Support Service

The Innovation Support service was responsible for the running and development of the project and consisted of four staff - Head of Innovation Support service, two project management specialists and an interpreter. Specialists form other departments were also used when needed.
Their main roles were:

- collect and store information;
- organize various activities;
- initiate writing of proposals and take part in implementation of projects;

- administer projects;
- find human resources needed for implementation of projects;
- co-ordinate dissemination of the results of innovation projects implemented;
- co-ordinate collaboration among institutions.

The staff recruited we found to be motivated by educating the general public and by improving their knowledge of the different aspects of the project. They all seemed to be well trained in their areas of expertise and were very open to discussion and questions.

TITRIS

The TITRIS system (https://titris.lzukt.lt/en), which was co-ordinated and run by staff from the Innovation Support Service, is used to collect publicize and compile data on applied innovation research and innovations in the sector of agriculture in Lithuanian and English. The objective of the system was to collect non-commercial scientific research and practical innovations that have or might have influence on sustainable agricultural production.

The system is free to access and provides information on a wide range of topics from within the project but could also be used as an extension service in future. On accessing the website it seems to be very intuitive and simple to navigate with brief summaries of the different topics. The system was planned to be as user friendly as possible.

Centre of precision Farming Services

On visiting the centre of precision farming services we were provided with a tour of the facilities including the laboratory, the pavilion and we also had a demonstration of the mobile precision training simulator. Again, the staff we encountered were very open in their discussions and seemed to be well versed in their own areas of expertise. It was obvious that there was significant funding needed to develop the centre and while funding would have been one of the main pinch points in the project, the project seemed to be well funded judging by the cost of some of the equipment.

Picture 1. Mobile training unit in the pavilion

This mobile training tool received an innovation award in “Inno panorama 2019” in September 2019.

Experimental farms

Recruiting and using experimental farms were key to test out the technologies and demonstrating the tools involved. They were also used to commercially on the farm that we visited. We visited the Aleksandras Stulginskis University, which was a mixed dairy and arable farm. They were using precision steering and GPS enabled sprayers which are designed to cut down on waste by applying inputs more accurately. The systems used were retro fitted onto existing machinery and were supplied by an outside partner to the project. This farm was an important resource to assist in the knowledge extension part of the project. Typically, farmers like to be able to see and witness systems in operation live in the field. The staff on the day were able to explain the tools used and were very informative about how they used the systems to maximise their performance, especially on the organic part of the farm.

These farms were recruited based on their suitability to be able to use the technologies that were being promoted by the project. Also, we found that the staff on this particular farm were fully engaged in the project and were keen to be involved. They were very knowledgeable in the area that they were involved and there was constant contact between staff from the ISS and the farm staff. This seemed to ensure a relatively good working relationship between all those involved in the project. This was also the case with new staff who were recruited after the project had started, they also were very knowledgeable and enthusiastic about the role of the technology on the farm. Indeed, all staff were

very generous with their time in the day which indicated that they were keen to pass on the learnings form the farm to any visitors to the site.

Picture 2. Visit to meet the staff experimental farm

5. Implementation and Dissemination

Once the various aspects were decided upon and the planned infrastructure were put in place then the demonstration phase of the project begun. All of the actors were made clear of their roles and were supported by the Innovation Support Service (ISS).

The ISS helped to organise many demonstration events as part of the projects at the different centres and on the experimental farms. The pavilion was a key resource where many demonstrations could be held at different times during the year which was especially useful during the winter months. It was used by different companies to demonstrate various different precision tools and equipment, including the mobile training unit.

Picture 3. An indoor training session in the pavilion

These demonstrations were aimed at farmer users of the technologies and who were invited to attend each of the different training sessions. Where outside expertise was needed, external experts would be invited to assist in providing the training.

The acquisition of the mobile training unit was another important part of the project which allowed trainers to go off site to various shows or exhibitions. The unit could then be set up to show farmers the capabilities of the precision application equipment, how it needed to be set up and then it could simulate how the system would work in the field. The unit is set up in such a way so that the trainers could give a PowerPoint presentation, for example, at the start of the training using the on-board computer screen and then on the other side of the unit they could physically set up the Trimble unit to simulate fertiliser application. The unit also allowed farmers to be trained on the use of the different menus behind the different screens on the Trimble unit.

Other mobile units, for example, the mobile laboratory could also bet set up to demonstrate its capabilities and run live tests which could give back results on forage analysis within a few minutes. While this unit was a working laboratory, it was also a very useful training tool to show farmers the value in testing soils, forage, bloods, water, pregnancy scanning, etc. This information could then be used, by the farmer, to make decisions on input requirements for animals or crops.

These mobile labs were an important advisory tool and were in everyday use by the advisory service. They were hired out to farmers or groups of farmers to carry out the necessary analysis on their own farms, where they could then get rapid feedback of the results without the need for the samples to be

sent off to a central laboratory. According to the operators we met on the day, there was a very large demand from farmers, particularly livestock farmers, for the use of these labs.

Figure 4. Mobile laboratory

There were two mobile labs working for the advisory service at the time of our visit and one of the main issues with these labs was they were very busy at certain times of the year so it was difficult at those time to get access to one of the units for training purposes.

The experimental farms were set up to firstly “road test” the different technologies and then to disseminate the information gathered on the farms. These were a very important aspect of the project as they gave testimony to the usage of the different tools that were being promoted, throughout the project. Again on the day we visited there was a lot of discussion on the role of the precision tools had on the farm and how they were used to drill crops and to apply inputs such as fertilisers and plant protection products to the crops. All of the farm workers were trained in the use of the GPS steering and the GPS enables input systems so they provided a true reflection on how the systems worked on the farm and any issues that they would have had during the project.

The farms were also used as sites for farm demonstrations, both to the public and in the case where we visited the local agricultural university students. A number of farm walks were carried out on each the farms at different times of the year to demonstrate various issues or technologies.

6. The AHA-Erlebnis: feedback on the gained insights

Overall, we found that this was a very interesting project involving many different actors form different agencies. We found that there was a clear focus from the beginning about the type of project that it was designed to be and there were clear goals and targets set out at the start.

At a glance some of the key successes of the project were the installation of the different the centres and training aids and how these were used. However, the overall success of the project can be attributed to the teamwork by the key individuals and the leadership of the members of the Innovation Support Service. These specialists were key in supporting all of the different actors in the project and ensuring that all goals and targets were met. Setting up the Innovation Support Service was also critical to the success of the project because there were so many different agencies involved with different expertise in many areas that it would have been very easy for the project to become disjointed. The ISS were able to keep a clear focus on the outcomes that were needed rather than the individual tasks that each actor was involved in.

The main barrier in the project was trying to get all the different agencies aligned to the same outcome from the project. Some had expertise in a certain area for example research but would have very little expertise in extension methods and vice versa. Given that the project had a significant element of training and knowledge transfer involved, this could potentially have been a major impediment to the success of the project. Also the fact that many of the actors would not have worked previously together on the project would have been a significant hurdle that the project had to overcome, which may not have been the case if the project was carried out by members of one organisation.

Again, apart from the different technologies that were used in the project, one of the key outcomes was the process by which the different agencies were able to come together to design, plan and carry out a project. This project is a template in how this can be achieved. By setting up an internal unit i.e. the Innovation Support Service this unit ensured the success of the project.

7. Lessons learnt

There are a number of lessons that can be learnt by this project especially in regard to how to organise various different actors form different organisation to come together and implement a project. Some of the key lessons that this project displayed are;

- Have clear goals and objectives from the start
- Where there are different agencies involved set up a working group who are responsible for the running of the project
- Innovation can come from the top down not always from the bottom up
- The use of external expertise is very important where needed
- Identify the key people in the different areas
- Each actor must be clear in the respective roles
- Good knowledge transfer tools play an important part in knowledge exchange.

The process of a field review or peer to peer review as a process to learn about innovation is very useful tool in idea exchange. We certainly were very impressed with the knowledge of the participants in their areas and also the methods used in knowledge transfer. We found that the process was a very useful tool where we could compare how similar projects are carried out by our organisation and how it was carried in this example. There are certainly learnings that we got form the members of this project and hopefully they will in return have received many learning s for our experiences.

Field Peer Review Report

III. Salad Potato Project, Ireland

Main author

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With contributions from

Rasa Kuperskyte
Rokas Antanynas

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1. Introduction

The Lithuanian project Innovation Gates was selected as a successful case of interactive innovation to be reviewed by peers during the 2nd round of the i2connect field peer reviews.

On 28th of November and 12th of December 2022, online training sessions took place on how to prepare for the field peer review of the case and what methodology and guidelines have to be used. After the training sessions, our Lithuanian case was paired with the Irish case Salad Potato project.

An online meeting of the Lithuanian team, consisting of the Lithuanian case coordinator, Lithuanian advisor in the case, and representative of the training farm in the case, was conducted on 16th of December 2022 to discuss the aim of the review, the guidelines and methodology.

The coordinator of the Irish case Shay Phelan and the coordinator of the Lithuanian case Lina Zukauskiene arranged the first online meeting on 7th of February 2023. During the meeting they introduced themselves, provided more details about the cases, discussed potential dates for the face-to-face field peer reviews, details of logistics. During the planning process of the peer review visit to Ireland, case coordinators conducted several online meetings, phone calls, exchanging of emails to discuss and arrange organizational details, logistics, agenda, and other related questions of the visit.

In the beginning of March 2023, the Lithuanian representative of the farm informed that he could not travel for the peer review to Ireland. Other farmer of the case was mobilised to participate in the peer review visit to Ireland.

The face-to-face field peer review of the Irish case was conducted on 7th and 8th of March 2023 with the visit of the Lithuanian team to Teagasc Enniscorthy Local Advisory Office for presentations and interviews, to Slaney farm for the field visit, and to Teagasc Crops Research Centre in Oak Park for a tour of their research facility and a case feedback session.

The aim of this field peer review was to assess:

- Roles and functions of advisors in supporting interactive innovation process.
- Effectiveness of advisory, that is how this support helped the process to move to the next phase.
- Conditions, both internal (advisor's characteristics) and external (environment), that enabled the advisors to play support functions.

The methodology used for the field peer review consisted of **the spiral of innovation** to analyse phases of the innovation process, **interviews following the Q&A flowchart, a field visit, and a reflection session**. The spiral of innovation was a helpful tool for conducting the analyses of areas of interaction between actors and functions played to support these interactions within each phase of the innovation process, analysing enabling conditions to move to the next phase of the process. The Q&A flowchart was a structured guided way to get information about roles, functions, skills of the actors, internal and external environment of the project, etc. The field visit enabled us to get information and insights about the innovation itself and better understanding of the role of the farmer in the innovation process. The reflection session enabled the exchange of ideas between peers and to clarify some aspects of the project.

Participants of the field peer review visit:

- Lina Zukauskiene, Lithuanian case coordinator, Chief Project Management Specialist, Acting Head of Innovation Support Service (Lithuanian Agricultural Advisory Service (LAAS)).
- Rasa Kuperskyte, advisor in the Lithuanian case, Business Economics Advisor (LAAS).
- Rokas Antanynas, one of the farmers in the Lithuanian case, Crop Production Advisor (LAAS).
- Shay Phelan, Irish case coordinator, Crops and Potato Specialist (Teagasc).
- Michaell Hennessy, Irish case lead, Head of Crops Knowledge Transfer Department (Teagasc).
- John Pettit, advisor in the Irish case, Business & Technology Advisor – Tillage (Teagasc).
- Ed Tobin, farm's representative in the Irish case, Operation Manager (Slaney Farms).
- Lorcan Bourke, partner in the Irish case, Fresh Produce & Potato Manager (Bord Bia).
- Jane Kavanagh, facilitator, Head of Research Operations (Teagasc).

Agenda of the field peer review visit:

7 March 2023	8 March 2023
9.45 Transfer from Riverside hotel to Teagasc offices Enniscorthy. 10.00 - 10.15 Greeting and introduction. 10.15 - 10.35 Michael Hennessy – outline of role of Teagasc. 10.35 - 11.00 John Pettit – Role of Teagasc advisor. 11.00 - 11.15 Tea/Coffee Break. 11.15 - 11.30 Lorcan Bourke Bord Bia – Role of Bord Bia 11.30 - 12.00 Shay Phelan – Potato sector in Ireland. 12.00 - 12.30 Shay Phelan – salad potato project details. 12.30 - 12.45 Review/Questions. 12.45 - 13.45 Lunch. 14.00 - 16.00 Farm visit to host farm of the project. Farm insights to include: Farm overview before the project Reason to become involved Trials conducted Outcomes to the farm business 16.00 Leave farm and return to hotel. 19.00 - 21.00 Dinner.	9.30 Depart Hotel for visit to Teagasc Oak Park. 10.30 Tea/Coffee followed by discussion from previous day. 11.00 - 13.00 Tour of research facility in Oak Park. 13.00 - 14.00 Lunch Canteen Oak Park. 14.00 - 16.00 Feedback session and workshop. 16.00 - 17.00 Depart Oak Park and return to hotel.

2. Factsheet of the case

The **changing consumption trends of potatoes** and **reducing area under potato production lead to the development of this Irish case**. In 2015, there were following concerns in the Irish potato market:

- Drop in consumption of fresh ware potatoes (across all main crop varieties).
- 'Rooster' potato variety dominant, but in oversupply to market needs.
- Increase consumption in salad ('baby') potatoes (estimated 10% fresh market share).

- Market segment diversification needed.

Market diversification options looked at use of existing machinery and building infrastructure, as well as at salad potatoes. While the market segment of traditional ware potatoes declined, **salad potatoes were growing consumer segment** (growing approximately 7-10% per year) in Ireland. Consumers saw salad potatoes as more convenient because they cook faster and do not require the same cleaning. Also, promotion of salad potatoes in recipes used by certain diet companies meant they are becoming more popular.

In 2015, the imports of salad potatoes to Ireland were estimated at 20,000 tonnes per year. About 10 Irish growers supplied approximately 15% to this market each year, that is about 3000 tonnes. These figures allowed to make assumptions, that there was a huge scope to increase the volume of home-produced salad potatoes to the domestic market. **Increasing the area of salad potatoes could thereby displace imported salad potatoes** and also help potato growers **diversify existing ware production into a premium market**.

Despite all of these opportunities, coping with an expansion of salad potato would be challenging. The production of salad potatoes requires considerable **skills and a change of practice of farming** if changing from traditional ware potato production. Grower diversification into salad production cannot be taken likely as the supply chain (from seed supply, agronomy, to final sale) need to be secure. Potato farmers required the knowledge and support to enable them to make the necessary changes. The initiative and actions were needed, because providing growers with the necessary skills and technical solutions would enable them to **develop their potato farms or enterprises sustainably in the future**.

Understanding importance of the opportunities and need of new solutions, a joint industry initiative has emerged. An initial working group led by **Teagasc,** involving the **Irish Farmers' Association (IFA)** and the **Irish Food Board (Bord Bia)** was set up and agreed on developing the salad potato programme.

The overall aim of the programme was to **increase the level of skills and knowledge** to existing potato growers about growing of salad potatoes and **increase the quantity of salad potatoes grown in Ireland**.

Two main issues were identified:

- Solving **technical problems** of farmers in salad potato production.
- **Market access** issues.

The working group set following key objectives for the project:

- Improve existing growers' knowledge in all technical areas (including agronomy and storage) of salad potato production.
- Increase the tonnage of salad potatoes grown in Ireland
- Increase the number of growers supply salad potatoes.
- Grow the market for domestic grown salad potatoes to keep pace with increased production.

- Leave a legacy of information for growers to use after the programme is finished.

The initial working group agreed that in order to reach the objectives of the project **other actors need to be involved**:

- International technical expert / researcher on salad potatoes growing methodology.
- Local demo farm for technical trials and demonstrations of salad potato growing technologies for other Irish potato growers.

As international technical expert, **a researcher from Scotland's Rural College (SRUC)** was engaged. To conduct technical trials and demonstrations, **Slaney farm** from Enniscorthy was engaged.

To address the challenges, the following methodology was set up:

1. Run a Technology transfer project over the next 3 years.
2. Regularly meet existing growers through each season at critical times.
3. Develop markets and solutions to prolong window where salad potatoes are delivered.
4. Provide up to date agronomy notes for growers at each meeting, building to a substantial volume of information over the three years which can be used in the future.

Duration of the project was 3 years (2015 - 2018).

Funding sources: Teagasc grant-in-aid and Bord Bia (sponsoring the cost of the knowledge transfer (KT) element).

The main expected result of the project was **increasing the total quantity of salad potatoes grown in Ireland of 50%**. The project was successful. After the three-year programme, **production of salad potatoes was estimated to have increased by over 200%** from approximately 3,000 tonnes/per year to over 7,000 tonnes in 2018. Other project results were:

- Increase in area planted.
- Increased demand of Irish salad potatoes in the market.
- Irish salad potatoes production – in all major outlets.
- Some equipment grants aided.
- Opportunities for further growth.

3. The initiation period

Initial idea

The background for arising of initial idea was a concerning situation in potato market in Ireland: changing consumption trends of potatoes and reducing area under potatoes.

The initial idea that **expanding of domestic growing of salad potatoes** could be **uses for market diversification,** came from the industry. The initiator was Michaell Hennessy, Head of Crops Knowledge Transfer Department of Teagasc (Agriculture Development and Food Authority). This implies that Salad Potato project is not a bottom-up initiative, **this is a top-down initiative**.

In this phase of the project, Mr. Hennessy had both **the knowledge and competencies** to come up with the initial idea and to carry out the initial need's assessment, because of his **professional experience, personal skills**, such as capacity to provide insights, to have a broader view of situation, identification of opportunities, barriers, and risks, understanding need of new solutions.

Regarding the enabling environment of the idea, it needs to be mentioned that **Teagasc has many years of expertise in the potato field**: breeding, research, advisory. Teagasc carries out a Breeding Programme and breeds varieties for home market and export since 1962. Varieties bred by Teagasc are being grown in Europe, North Africa, Middle East, Australia, and Brazil.

Another enabling factor for the idea was that Teagasc closely **collaborates with a diverse range of agri-food sector stakeholders**, including farmers, farmers' organizations, government departments, agencies, enterprises, institutes, etc. Teagasc collaborates with Irish Potato Marketing (IPM), as well. The broad network of partners provides access to newest actual information and data needed for various initiatives, helps to keep knowledge up to date.

Furthermore the work of Mr. Hennessy in the department, can also be seen as an enabling factor. His work focuses not only on transfer of sustainable science-based advice to maximise farmer profits, but also on working with wider industry, providing information/catalysis for change, and **developing joint industry initiatives**. It can be concluded that the idea derives of to the work of the whole department.

During the field peer review visit, at first Mr. Hennessy stated that the initial idea came from both industry, and farmers, but later, the discussions and clarifying questions it was agreed that this is an industry initiative.

The idea had a broad scope, intended to have an impact on the entire potato growers' sector and potato market. Therefore it is understandable that the idea was initiated by experts with specialised knowledge, expertise, and skills.

It can be stated that **in this phase the support functions was working sufficiently**, as they played attention for assessing the needs and skills, the identification of opportunities, barriers, and risks for new solutions.

Inspiration

For further developing of the initial idea, more colleagues from Teagasc were involved. Also, the need of other actors **with more specific knowledge** of the potato market and potato growers' needs emerged.

The identification of possible actors was quite easy, because of Teagasc close collaboration with a wide range of various agri-food sector stakeholders and being familiar with their activities.

There were two organizations selected: Board Bia (Irish Food Board) and IFA (the Irish Farmers' Association). After the initial contact, discussions and sharing of ideas were organized. The project idea was relevant to the aims of these organizations, so as a result, **working group was created**. This group consisted of:

- **Teagasc** as the lead – Michaell Hennessy.
- **Bord Bia** (Irish Food Board) - Lorcan Bourke
- **IFA** (the Irish Farmers' Association) – Patrick Farrell.

The support functions in this phase was played to a good extent, because Mr. Hennessey had **good interpersonal skills** needed for creating and leading the group:

- Proactiveness
- Leadership
- Communication skills
- Facilitation skills
- Coordination skills

It can be stated that organizations of the initiative working group formed the immediate circle and the result of this phase was **an agreement on developing a salad potato programme**.

The overall aim of the programme was agreed: to **increase the level of skills and knowledge** to existing potato growers about growing of salad potatoes and **increase the quantity of salad potatoes grown in Ireland**.

Also, two main issues were identified:

- Solving **technical problems** of farmers in salad potato production.
- **Market access** issues.

The **success moments** in this phase were the agreement of the idea, good communication between partners.

The main **pain moment** was how to deal with the fact that growing salad potatoes is an "all or nothing scenario".

4. Planning and development

Planning

The lead of the planning phase was Mr. Hennessy. Although Teagasc was the leading partner, other actors were also actively involved in the planning.

During this phase, the working group formulated more **detailed objectives for the project**:

- Improve existing growers' knowledge in all technical areas (including agronomy and storage) of salad potato production.
- Increase the tonnage of salad potatoes grown in Ireland

- Increase the number of growers supply salad potatoes.
- Grow the market for domestic grown salad potatoes to keep pace with increased production.
- Leave a legacy of information for growers to use after the programme is finished.

There were **expertise issues identified**:

- Lack of technical growing expertise in Ireland.
- Many 'theories' about growing salad potatoes.

After discussion, the working group agreed that to reach the objectives of the project and to deal with the issues identified, some **other actors need to be involved**:

- **International technical expert** / researcher on salad potatoes growing methodology.
- **Local demo farm** for technical trials and demonstrations of salad potato growing technologies for other Irish potato growers.

As international technical expert, **a researcher Dr. Stuart Wale from Scotland's Rural College (SRUC)** was engaged (Dr Stuart Wale).

As a local demo farm, **Slaney Farms** from Enniscorthy was engaged (operation manager Ed Tobin).

During this phase, **methodology how to conduct the project** was set up:

1. Run a Technology transfer project over the next 3 years.
2. Regularly meet existing growers through each season at critical times.
3. Develop markets and solutions to prolong window where salad potatoes are delivered.
4. Provide up to date agronomy notes for growers at each meeting, building to a substantial volume of information over the three years which can be used in the future.

In this phase also the **funding sources were identified:** Teagasc grant-in-aid and sponsoring the cost of the knowledge transfer (KT) element by Board Bia.

Development

During this phase, the tasks of the project were assigned according to the methodology developed in the planning phase. The tasks were distributed according to the actors' knowledge, experience, and skills.
The coordinator of working group at this phase was Mr. Hennessy, as well. The project had just started, so it didn't take much effort to energize the interest and the involvement of the key actors.

The agronomy advisor John Pettit was assigned tasks of advising farmers on agronomic issues of salad potato production, such as:

- Crop nutrition
- Planting densities
- Disease control
- Crop irrigation
- Crop desiccation

It was a good interaction between Mr. Pettit and Mr. Tobin, Operational Manager at Slaneys Farms, because they had known each other for several years and the trust relationship was already created.

The task assigned for Bord Bia was to establish the full market size opportunity and provide insights and statistics for the potential of Irish grown salad potato.

It can be stated that **support functions in this phase was played to a good extent**, because Mr. Hennessy was coordinating activities of working group, and Mr. Pettit was assigned to provide agronomic advice.

The **success moments** in the planning and development were clear objectives, successful selection of additional partners, consistency in planning process.

The **pain moment** in the planning and development was identifying solutions how to break down the negative perception among farmers that it is not possible to innovate in salad potato farming.

5. Implementation

Realisation

During the realisation phase, the task according to methodology were performed. The main tasks were:

- conducting of technical and agronomical trials at Slaney farm (planting, irrigation, fertilization, storage).
- investigating opportunities in marketing.

The main **success moment** was Mr. Tobin's active involvement in trials.

The **pain moment** was how to attract more potato growers to demonstration events.

Dissemination

The dissemination of the outcomes of the project activities were well organized, using websites, social media, conferences.

Also, there were 3 – 4 workshops organized per year to present the results of demonstration trials. These workshops were organized on the demonstrations site at Slaney Farms.

The agronomy advisor Mr. Pettit also actively contributed to the dissemination, because he had a lot of previous experience in dissemination of knowledge.

Embedding

Because of well-organized communication ad dissemination, also because of a successful choice of demo site for trails (recognized farmer), quite a lot of farmers embedded project results. A good embedding has enabled the project to achieve and exceed its planned results.

After the three-year programme, production of salad potatoes was estimated to have increased by over 200% (compared to the planned 50%) from approximately 3,000 tonnes/per year to over 7,000 tonnes in 2018. Other project results were:

- Increase in area planted.
- Increased demand of Irish salad potatoes in the market.
- Irish salad potatoes production – in all major outlets.
- Some equipment grants aided.
- Opportunities for further growth.

6. The AHA-Erlebnis: feedback on the gained insights

The main success factors

- Choosing the **right demo farm** was a big part of the project's success. Slaney Farms is well known and recognized farm among potato growers' community. This farm could be called a kind of '**potato farming influencer**'. Slaney Farms provided a hub for meetings and co-designing solutions to technical issues encountered by growers. This farm provided a link to demonstrating best practice and acceptability of the concept to other farmers. This helped attract more farmers to the demonstrations.
- Well organized regular communication and dissemination of the outcomes. There were **sessions of workshop at demonstration site** at Slaney Farms organized, **covering all areas of production** (planting, irrigation, machinery used, storage, etc).
- Good **interaction between project partners,** agreement on project aims, clear roles, good **distribution of knowledge and skills**.

Main barriers to overcome

- **Lack of technical growing expertise** in Ireland and many 'theories' about growing salad potatoes. To overcome this barrier international technical expert was engaged.
- **Technical and agronomical issues** by farmers of salad potato production (planting, irrigation, storage, etc). Trails were conducting at the Slaney Farms. All potato growers were welcomed to the demonstration meetings.
- **Market specifications for salad potatoes** (tuber size 25-45 mm). At Slaney farms were trials of selections best varieties which correspond markets specifications best.

The outcomes of the case

The project was very successful. After the three-year programme, production of salad potatoes was estimated to have increased by over 200% (compared to the planned 50%) from approximately 3,000 tonnes/per year to over 7,000 tonnes in 2018. Other project results were:

- Increase in area planted.
- Increased demand of Irish salad potatoes in the market.
- Irish salad potatoes production – in all major outlets.
- Some equipment grants aided.
- Opportunities for further growth.

7. Lessons learnt

What did we learn from field review as a process to learn about interactive innovation?

- **Experience of implementing of innovation** project in one country **can often only be applied to a small extent in another country**. The enabling environment, conditions to implement innovation projects depends on country legislation, funding calls, type of advisory system, etc.
- Having a **highly motivated individual(s)** is crucial to the success of the project.
- Existing **collaboration networks** makes it easier to find the right partners for new initiatives and projects.
- There was some confusion: if the **project started with not a bottom-up approach** but the farmer joined in later phase and actively contributed to the creation of the innovation, shared knowledge, and responsibility, **it is not clear if could such an innovation process be considered an interactive innovation process**.
- Advisors are in the best position in the innovation process for the **role the innovation broker**: they maintain close relationship with farmers, have technical knowledge and skills, but supporting of the interactive innovations **requires a lot of soft skills**, for example, conflict solving, coordination, facilitation, leadership, etc. They also have many other work engagements. There are not many such individual in advisory systems. This could be the reason why **there are not so many advisors - innovation brokers**.

What did we learn from the case to enhance interactive innovation?

- The **methodology of the field peer review is complex** to follow, requiring a lot of time resources, especially for those peers who are not involved in i2connect project and have not come across the concept of interactive innovation. One of the peers said that he would not have taken part in the visit if he had known how difficult and time consuming it would be. There are a lot of very detailed questions in the methodology, some of which are not very clear and some of which could not be answered by the participants. The **suggestion is to try to simplify the current methodology** (Q&A flowchart). On the other hand, the methodology was a **good guidance allowing to go systematically through the innovation process**.

- **Face-to-face peer review has many advantages over online meetings**. It was very useful for farmers and advisors practically to see how innovation processes are implemented in other country. But it was quite **difficult to focus on the process of innovation rather than the innovation itself**, especially for advisors and farmers. It was the content of the innovation that interested them most.
- In East European countries, the **language barrier** is one of the biggest issues in getting the full benefit of such exchanges of experience. In Lithuanian advisors and farmers hardly speak English. The suggestion is to provide funding for professional interpretation.
- The selected Lithuanian project was finished almost 5 years ago, so it was **difficult to form the peer review panel**: many people who were involved in the project changed their working positions and didn't want to participate. They also stated that quite many things have been forgotten.

Field Peer Review Report

IV. Precision agriculture in citrus irrigation and fertilisation "GoCitrics", Spain

Main author

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With contributions from

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Iratxe Díez Delgado (peer coordinator from MAPA)
Gil María Campos Alabau (advisor/innovation broker and OG coordinator of project GoCitrics)
Vicent Jesús Ribera Barelles (producer of citrics and avocados from agri-cooperative ASAJA)

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1. Introduction

After the 2nd round of peer consultation on the 12th December 2022, where we got the basic information about how to prepare the Field peer review case and gather the information, we were paired with the Spanish practical case "GoCitrics" about smart agriculture in citrus irrigation and fertilization. We were paired with them because we expressed the preference to review their case, as our farmer was very much interested in precision agriculture.

The preliminary information meeting took place on Zoom on Thursday 29th December 2022, where Iratxe Díez Delgado and Saša Plestenjak, the case coordinators of both practical cases, discussed when the two field peer review case studies should happen in Slovenia and Spain, who the peers should be and all the logistics around it. There were couple of emails forwarded to the task leaders at WUR to keep them updated about the progress of the preparation of the field peer review. The case coordinators exchanged some crucial preliminary documents about both cases, such as "Initial Information" and "Outline for the preliminary interview", both available on Meteodocs, so that we could get acquainted with the cases to be reviewed.

The field peer review case study happened face-to-face at Politechnical Universiti of Valencia, and a field visit to irrigation community at the north of Valencia province, from 2nd to 3rd March 2023, although some interviews were conducted online as some stakeholders are not from Valencia region. In addition, here is attached the agenda that was followed.

Agenda:

2 March 2023	3 March 2023
9:30 -09:40 Context: Introducing the UPV and EIAMN (Juan Manzano-UPV)	9:00- 10:00 Interview with producers and private business, researchers, university members (Juan Manzano-ETSIAMN, UPV-University member; Alberto de Pascual-DIMAV/grupo Buitrago-private business)
9:40 -10:00 Context of AKIS and OG in Spain (Iratxe Díez- MAPA)	10:00- 10:30 Coffe break
10:00-11:00 Project presentation and energy timeline of the project (Gil Maria Campos)	10:30-11:30 Reflection meeting (final conclusions, remarks and discussion)
11:00- 11:30 Coffee break	11:30- 13:30 Field visit
11:30-12:30 Interview with advisor (Gil Maria Campos)	

2 March 2023	3 March 2023
12:30- 13:30 Interview with producers and private business, and researchers: (Luis Bonet- IVIA-researcher, Carlos Ferraz-HEMAV-private business, Vicent Ribera -producer)	
13:30- 15:00 Lunch	13:30- 15:00 Lunch & Farewell at field
10:00-11:00 Project presentation and energy timeline of the project - continued (Gil Maria Campos)	Return to hotel
20:00 Dinner	

We followed methodology and guidelines developed within the i2connect project for the field peer review. The outline for preliminary interview, spiral of innovation, the energy timeline with the crucial moments in the process, question flow & checklist, feedback session and field visit were used.
Based on the spiral, the i2connect framework of analysis was focused on three main issues:

- The contribution of advisors in supporting individuals or groups involved in interactive innovation.
- The effectiveness of advisory service in innovation, which is how this support helps the process to move to the next phase.
- The conditions, both internal (advisor's characteristics) and external (environment), that enable the specific actor(s) to play support functions.

The field peer review process provided an inventory of practices that defined an enabling environment for interactive innovation processes, providing a framework for analysing the roles of various actors and policy stakeholders. The peer review methodology is designed to accurately assess the advising practices within the interactive innovation cases under review. This includes the information about roles and functions, skills and competences, key actors' reflexive evaluations, peer observations and other evidence. There was no observer designated for this field peer review case.

The challenge addressed was the development of precision citriculture through the implementation of efficient water and fertilisation management. Given the problem, which affects multiple actors, from farmers to society in general, the challenge was addressed and solved through the multi-approach, considering different innovative technological tools in order to adapt as much as possible to the needs of the sector.

Participants:

- Saša Plestenjak, case coordinator from Chamber of Agriculture and Forestry of Slovenia
- Katja Jakljevič, Slovenian advisor from Chamber of Agriculture and Forestry of Slovenia, Institute Novo mesto
- Alojz Ferlan, Slovenian farmer from Slovenian innovation case
- Vicent Ribera Barelles, Spanish producer of citrics and avocadoes

- Gil Maria Campos Alabau, Spanish advisor, innovation agent, facilitator and project manager from Arakua.
- Iratxe Diez Delgado, case coordinator from the Spanish Ministry of Agriculture, Fisheries and Food (MAPA)

2. Factsheet of the case

In Spain, the main regions of citrus crop production are the regions of Valencia and Andalusia. The Valencian Community represents 54% of the national citrus crop production, followed by Andalusia with 31%. Both regions are specially threatened by climate change and other environmental impacts, which will affect water availability in quantity and in quality. At the same time, citrus crop production demands a relevant amount of water; therefore, it is imperative to have an efficient use of water. In addition, nowadays due to the economic and political situation the costs of fertilizers are skyrocketing.

Prior to the application of the innovation there were several systems to make recommendations on irrigation and fertilization, most of them derive from the IVIA studies in the 80s and 90s, in which based on destructive analysis of plant material, a forecast of variation in fertilization was made. Also, the water balance, supported since the end of the 90s and the beginning of 21st century in the agroclimatological stations of the SIAR Network, and from the beginning of the 90s, capacitance type humidity probes began to be used.

The climatological stations supported by the government, which measured temperature, evapotranspiration and the amount of rainfall, gave the government all the data to make the assessments of amount of water they recommend using daily. They gave to the producers the Excel spreadsheet where they recommended how many hours they could irrigate per week. They have installations of drip-in irrigation systems with two pipelines (on each side of the tree) with one meter of separation and 3 m between the trees, the holes in the drip-in irrigation are every 3,6m, so that means the flow of water for each tree is 21,6l/h. The common irrigation society law let them have 1000l/h per plot, at the same time the government told them that they need to use around 4000-5000 m^3 water per year. Traditionally the irrigation went through the channels which brought water from the rivers but in this project the water comes through pumps from around 100m below the ground. The water is transferred to the little house, where it is filtered, they add the fertilizers, and then the clear water with fertilizers goes to the fields. In this process, the uniformity is very important because each plot needs to get the same amount of fertilizer. Each plot is equipped with a flowmeter that says how much water the producer uses per month and based on that data they pay to society for the water and fertilizer they used. In Valencia region the society decides when the producers are allowed to irrigate. This is the system in this social communities where the average size of the plot usually is one third of a hectare.

Terrestrial and aerial sensing used in the project helped to use the water resources more efficiently and precise as the citrus crops are irrigated according to needs, that means according to what data the farmers get from the plots to their information management system. With this system now, they irrigate whole year round, and do not use more water as before, when they did not irrigate in the wintertime (using the irrigation channels).

On the other hand and in relation to being able to apply what the recommendations indicated, in community irrigation a basic and general action is carried out, which each owner completes individually. At a social level, many irrigation companies, still at this time, do not make the

recommendation based on the above. Although the companies chosen in the project have carried out a process of modernization of their facilities and used drip irrigation. Finally, even if the recommendations are made properly, most facilities do not allow irrigation or differentiated fertilization.

Figure 1: A map of Spain with its regions. In red there are circled areas where the project took place.

The project has sought to develop three innovation pilots in three provinces of Spain, specifically in Castellón, Málaga and Valencia. In the Valencian Community, the focus has been placed on small irrigation companies, in which smallholdings stand out, in order to be able to work on standard plots. In Malaga, work has been done on large citrus farms with various production systems.

The initiative was to develop smart agriculture for citrus crops by improving the irrigation and fertilization systems, which has been achieved through the adoption of more efficient water and fertilization management, improving the quality and production of the citrus crops, and addressing the real situation of the plant, including data capture by land and aerial sensors RPAS (Remotely Piloted Aircraft Systems/drones and satellite imaging) and transferring the techniques developed in the research. It includes the adoption of new techniques and knowledge related to agronomical design, irrigation, fertilization planning and management, as well as other cultural practices.

The goals are: to adequate the communitarian and plot infrastructures to be prepared to the usage of smart agriculture; to increase water and nutrient efficiency to increase citrus crop quality and quantity; to improve crop efficiency in the plots to get the maximum benefit from the technology and to consolidate an innovation community related to smart agriculture, especially in citrus production.

The main goal is to demonstrate the correlation between the optical data and the field experience in irrigation and fertilization as well as to create a citrus management platform, where it would be possible to find new knowledge and skills related to planning and managing irrigation and fertilization.

The expected outcomes of this innovation are:

- Development of a profitable technology for the farmers.
- Improvement of the quality and quantity of their production.
- Reduction of the usage of water and fertilizers.
- Big economic (input cost efficiency, profitability, competitiveness), environmental (less water consumption, groundwater & soil preservation), social (new business models, employment, thriving sector) and technical (development & use of technology) impact.

In this initiative was participating operational group from:

- Agriculture professional organization Asaja – AVA (Agrarian Association of Young Farmers – Valencian Association of Farmers) and Agrarian Association of Young Farmers Asaja-Málaga;
- Advisor, innovation agent and project manager Gil Maria Campos Alabau from Arakua;
- Research, innovation & university sector with Luis Bonet from IVIA (Valencian Institute of Agrarian Research); CEBAS-CSIC (Center for Edaphology and Applied Biology of Segura), Juan Manzano from UPV (Polytechnic University of Valencia);
- Private sector with Ignacio Puech Suanzes, Hemav Technology Ltd., Dimagro – Agrochemical and Agricultural machinery distributor Ltd. (is a part of Grupo Buitrago).

Why did they decide to undertake the digital transformation project?

At an economic level, it was necessary in citrus farming to adjust costs and with the same amount of inputs or less, obtain a greater amount in higher quality production. At an environmental level, it was necessary to be able to demonstrate the proper use of inputs. Currently, new varieties of fruit require more fertilizer input than what is indicated by the legislation, and if the technology is used properly, it can be demonstrated that this is done without producing leaching to the aquifers.

On a social level, there was a great opportunity to develop new business areas in the countryside, to generate new jobs and it was also observed that the more technical it was, there was a greater entry of women and young people into the field. At a technical level, the development of this technology in Spain was essential, and to be able to compete adequately with third countries, as well as take advantage of the existing knowledge and knowledge generated in Spanish R+D+i centers. The technologies applied are the most developed up to this date for precision agriculture in irrigation and fertilization.

3. The initiation period

Initial idea

We are talking about the project that is oriented to improve the remote sensing or smart agriculture that is related to irrigation and fertilization. From the technical side the initial operational group wanted to discover how they can assess the real situation of the crops by using new technologies. From the social side, from the beginning they wanted to know how to make it feasible for the crop producers. At the same time, the innovation has potentially a very important environmental impact, if they discover how to produce more efficiently, they are going to use more properly the water and fertilizers. It doesn't mean that they are going to use less, but use them whenever they are needed and this way they are not going to affect the environment badly.

The initial idea for the initiative arose in a UPV meeting room on a meeting between two researchers, one of them from the UPV (Juan Manzano) and another from the IVIA (Luis Bonet), and the innovation agent/advisor/project manager Gil María Campos Alabau, thinking about how to make an impact in real land plots. These people had a lot of knowledge and know-how on precise irrigation and fertilization, and they had their own networks they could contact and spread the information. Innovation agent and project manager Gil María is a very likable, sensible, charming and good-natured person with a gift for people, who attracted to his auspices people that think likewise and could as well persuade the citric producers (since he is one as well) to collaborate in the project.
They liked the idea, so that they wanted to obtain funding for the innovation, but soon they discovered that people do not know how to differentiate between innovation and research. A lot of people who work in research centres think they are doing innovation, but they are doing research, and some of them like Luis and Juan are doing innovation, which included generating impact on farm level. Secondly, they had to choose the site where they could begin to work, and for them it was important to start to work on small plots of land. Historically they had big irrigation channels from the 13th century, which controlled 30000 Ha. 95% of land is not irrigated by big channels, but by small irrigation societies. These irrigation societies normally have 74 Ha - 300 Ha and were created around 100 years ago by people who wanted to invest in irrigation. Juan who is a researcher at UPV studied how all the irrigation societies function, discovered that the most important leverage point was social.

Inspiration

They soon went to talk with farming association AVA – Asaja, which found the initiative very interesting. Then they went to talk with farmer's association Asaja – Malaga, which are independent, but under the same farmer's association in Spain.

Challenges in the initiation period:

- Searching for suitable partners
- Different farming structures (Málaga vs. Valencia), which they found good to compare.
- To persuade the producers to join the project as they were accustomed to the irrigation from before (flooding the plots).
- How these things could work in different environments. In Málaga they have farmers with big plots of lands and they control the whole irrigation system, but in Valencia region they have

big control of water and the law comes from the Ministry of environment that controls the water confederation.

4. Planning and development

Planning

In the phase of planning were involved project manager/innovation agent Gil Maria Campos Alabau, two researchers, one from the UPV (Juan Manzano) and another from the IVIA (Luis Juannes), AVA-Asaja, Grupo Buitrago, Ignacio Puech, Hemav and IFAPA (Agricultural and Fisheries Research and Training Institute). IVIA had a great connection with CSIC and Ignacio Puech. UPV had great relationship with AVA-Asaja. AVA had a relationship with Asaja – Málaga and they had a relationship with IFAPA, the project manager had a relationship with Hemav which had a relationship with Grupo Buitrago. it was the first time they saw a call for innovation projects oriented not to writing papers or individual subsidies. They were really looking for people who were oriented in doing something meaningful for the farmers and creating an impact in farming, like Juan from UPV, Luis from IVIA or Diego from CSIC and other people who were enthusiasts.

Planning was a tricky part for them as usually they would go to solutions but here they had to go one step back, and think about what were the needs of the sector. They thought about what was needed to be done in the citrus crop production, although they didn't still know what technology they would use. They had two meetings, one in Valencia and the other in Málaga.

They were working during three months identifying the real problems in citrus production, in setting the possible paths of work, in defining the ones that were more important, and finally in defining a feasibility of the project. The project manager then started to write the proposal for the project, and on the second meeting in Valencia at AVA headquarters he presented the project and they discussed it, then they improved it and adapted it for the next call to be submitted.

There was an opportunity to hear all the voices and have time to think about the project. Not only on the meetings and workshops, but between each workshop the partners had the opportunity to read and make the opinion to the proposal. In this part of the process there were some good and some bad things. The project manager said that, when you do a collective work it is great when the people collaborate and cooperate and if there is no trust in innovation process it could be good or bad. It could be good because it makes people review everything that is written. If there is a high level of trust it is great because that lets the innovation work but maybe the people do not work on the paper as they should work, and later when the paper is submitted and approved, they would prefer to change some things. That's why it's important to have enough time to let the people be involved since the beginning of the project. In the case of project manager he asked many times to the actors about their opinion and if they agreed with the project and wanted them to write back to him by e-mail. It occurred that when the project was already approved that some actors wanted to slightly change the project. He said that when you get in the project management role you have to be certain about your actions, as you have to sign the project and although you have some flexibility in the project, if you are flexible only with some actors, you could be producing some disagreements with the rest of the actors, so it is important that every single change needs to be approved by all the actors.

So they identified the technologies that were involved and implemented:

- Terrestrial sensorization (capacitance type humidity probes; IVIA robot with multispectral, hyperspectral and RGB image capture)
- Aerial sensorization (Multispectral cameras located on satellite Sentinel II, with 20 pixel resolution; multispectral cameras located in U.A.V. (drones) with 3 cm resolution)
- Other technologies (Layers (AI) information management platform, irrimax life; destructive analysis of leaves in various periods of the year; pressure chamber; agroclimatological stations)

Since they wanted to work in remote sensing, they decided to talk to companies that began to work in that area. They talked to Juan from Hemav technologies who is now responsible of artificial intelligence assessment and data analytics, then with the people who work with drones and another one that works with sensors on the fields. At that time a research centre IVIA (Valencian Institute for agricultural research) was very much involved in the project and there was as well another research institute from Andalusia which was only participating at the beginning (IFAPA – Agricultural and Fisheries Research and Training Institute), but at the end didn't join them, maybe due to the COVID and as well due to the change in their inner structure.
When they talked to different stakeholders, they asked themselves what they could do and what the biggest problems they have are. From that on, they began to divide that big problem, divide the tasks and analyse during six months on how to proceed with the project. They got support from the government for that and finally they defined the project working in Valencia region and in Andalusia.

On the field visit we looked into two irrigation societies in the border of Valencian and Castellon province were farmers have different drip-in irrigation systems and the main questions were, how to work in a place with many producers, how to improve the management in water and fertilizers with all these social complexity. In area near Málaga the plots are much bigger and one plot there can be of the size or bigger of the whole irrigation society area of Valencian province that they worked on. In Valencian province was the problem of how to get to the people, although they saw the people get very quickly balanced and involved in the project, but in big plots as the ones in Malaga, the problem of this innovation is that the farmer decided by its own if he wanted to be involved in this kind of innovation project or not. The president of the irrigation society of the south region in province of Valencia wanted to cooperate in the project but at last, when the project began, they withdrew from the project. This happened although the members of the irrigation society of the south region were younger farmers than the ones from the northern irrigation society, but looked like they were not interested in changing their way of irrigation.

One of the most important research centers, which collaborates in different parts of Spain and got involved in the project, was CSIC. CSIC Murcia was also collaborating with them. There were agents from four different regions collaborating: from Catalonia, Valencia, Murcia and Andalusia, but working in two regions: Valencia and Andalusia.

In Valencia region, the producers can irrigate when the society tell them to irrigate, which is normally every three weeks. Until the 1990s, the producers irrigated with flooding their crops with water, which came through the small channels, but at the end of 80s beginning of the 90s, the irrigation changed to drip- in irrigation system. It was a big revolution as the producers could apply fertilizers into the water and as well the drip-in irrigation system was important for the management of the water. From the

beginning of the 90s to the beginning of 21st century there was big investment coming from the regional government and the Ministry of agriculture. From the 80s there was around 30% land irrigated and now it arose to 50% land irrigated. Drip in irrigation system let them have irrigation on the lands where before it was impossible.

There were made many assessments by different organizations, which would tell you how to irrigate, as well they began to put the agro climatological stations in all regions which would assist and recommend how to irrigate. They as well started to implement the land sensors, which would tell the user how much water the plant would need. Ten years ago they began to discover, they could work with more optical technology, that means that with some cameras they could capture what was going on in the air. From the year 2014 there were launched couple of satellites and since they were in the middle of the new technology they didn't want that the farmers would be far away from that technology. With the drip in irrigation system and the land sensors the use of water dropped by 20 to 40%. But the aim was not to reduce the amount of water used, but to produce a better quality produce at the right moment.

Development

To make this project work, there were several paths they tried to go through, but they got a great push when they saw that there was and EIP-Agri initiative funded by the European Union. In the terms of application and selection for the procurement of the funding, they followed the rules established by the Spanish government (Ministry of Agriculture, Fisheries and Food – MAPA). The project was designed and written by a project manager, who was the one of helping the process go through. This project was supported by MAPA and EU, from which they got 414,786 EUR of investment. 80% of that investment came from EU funds.
In the first attempt they failed to secure the financing as they tried to get the funds at once with the previous call.
The project was approved in March 2019, but from November 2018 they were almost certain they will get the subsidy for the project applied, because they were on the 18th position. They started to work on the project in January, in the phase that didn't need any investment, only their time. When the COVID 19 arrived, some people were reluctant to begin to work, but those were more on the political positions. The political organizations thought that the government would move the budget to the following year, so to convince them to move forward with the project was not easy. To the project manager it was clear that he had to secure the budget approved or he would lose it. They had to be imaginative to change some parts of the project, that in this really social project they could not do in specific way. The majority of the partners really worked on the project since that moment and that helped the rest of the group to move forward. It was like the net system that pushed each other to move forward.

For the project manager was easy to write the project and to follow the structure but what was hard in this case was for people to understand that they needed the step back to make a bigger reflection what they are going to do. For technical people that was a waste of time, but for the project manager was really important, because he has got a lot of information and also the compromise of the people. When you go step by step you are getting into technical results, but also you start to build the

engagement among the people as the people start to work together for the first time. For the project manager were not so important the results of each workshop, but the creation of the habits of beginning to work together. The first results had to be delivered in June 2020, because of the pandemic the government decided to postpone the delivery of the first part until September. The stakeholders realised that they have to make the project possible and that the public administration is going to help them to do some changes. In project manager's mind it was very clear it was the time to follow the path and he as well said it was good that he was involved in the project as an independent agent, as if he was working in one of the organizations this project might not go forward. But because he was independent, he had the power to continue working.

Carlos Ferraz who was working on this project in combination of remote sensing, conservation and agronomy science, data processing from drones said there were some challenges they had to overcome; some actions they were pursuing, they were trying to impair the water needs through drone and satellite recognition, this required the involvement of different stakeholders and experts to get this information. They were all going towards the same aim and they were all winning. The technology was already there, ready to get used and all the partners were aligned and ready to contribute with their knowledge. The results kept the people motivated. They did not face any difficulties/barriers in terms of knowledge and regarding the relationships with the stakeholders of operational group. Everything went on smoothly. He even said that he would be happy to work again with the project manager Gil Maria in his future projects. The alignment in economic and environmental knowledge side was the key for having everyone on the project and they were eager to work together in this project.

The remote sensing company was created as a start-up about ten years ago and they got the funding form one of the biggest companies in Spain to support them. There were some enthusiasts from telecommunication engineering, who decided to build the drones, at the same time there were some people who were more interested in creating platforms, and artificial intelligence, and then there were others who entered by agriculture. Each one of them had a different entry point on how to solve the problem. One of the interesting points of this group was that they had monthly gatherings at the same table and at the beginning, the people were really reluctant to such gatherings. But soon the start-up company realized they need to cooperate with farmers in order to be able to earn some money. If they would not take care of the farmers they would not make any money. The people who created the drones had to go to the field to see they were doing something meaningful. Advisor's leadership role was to make a conversation happen, more than to arrive to the technical solution.

Talking about social aspects of agricultural innovation, coming from different backgrounds (telecommunication engineer talking to a researcher on the field or farmer) the conversations are hard, as people do not understand each other as they talk in "different" languages. The main point was, their mind-set was different and so they needed the project manager Gil Maria as an "interpreter" who would make them, to be able to move forward. The researchers had to explain to the farmers all important features about the technology to improve the watering, fertilization and finally the production. And if the communication among them didn't work, they would not like their technology. At the same time, they spoke to the farmers saying to them they will need to use the new technology

and to listen to the researchers, as if they wouldn't use it, they would not want to hear their complaints.
At first the producers' association was sceptical about the project and they thought the researchers want to sell them a technology and take advantage of them, afterwards 95% of the people who were involved in the conversation were really aligned in the project. The main concern was how to get all the people align as they all had a different mindset. Finally, they all got emotionally involved in the project and said that they will all work systemically together. In the complex structure like this one, with partners with different mindset, it is very important to take care of all of them, to listen to all their needs. To have an independent project manager helped to do so.
At the same time, it was a very tough moment with the pandemic starting to spread, so the compromise of the different partners was very important. The trust between the partners was created and energized through listening and respect, taking care of everyone's needs and desires, knowing that to get the money back they have to accomplish with all the steps of the project.

The **methods used for joint learning** and reflection were:

- Continuous and individual conversations of each agent with the project manager.
- Conversation and decision making among each of the partners while working together on each task: preparation, execution, assessment and beginning again.
- Conversation among all the partners to take care of the project.

The **knowledge needed** in this phase was:

- Technical and telecommunication engineering, remote sensing
- Data analysis and interpretation
- Agronomy and environmental science
- Economy science

The **skills and competences** that were needed in this phase were:

- Facilitation skills,
  Motivation abilities,
- Coordination and communication,
- Compliance to milestones

After clearing all the differences and starting to speak the same "language" all the stakeholders assumed their tasks and got aware of their roles and functions.

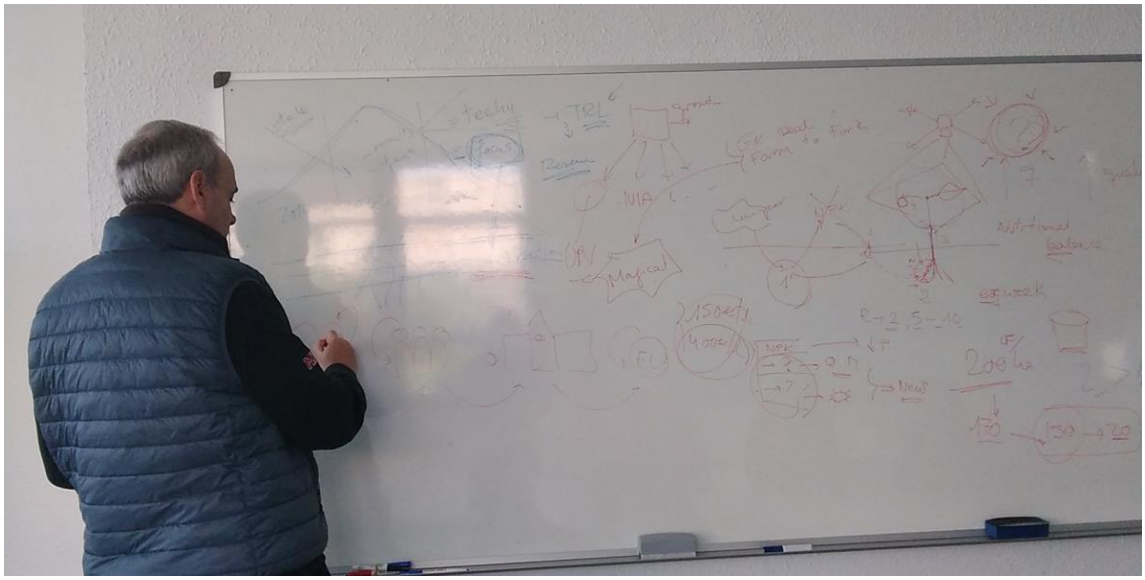

Figure 2: Innovation agent/project manager Gil Maria Campos sketching the future of agricultural innovation projects.

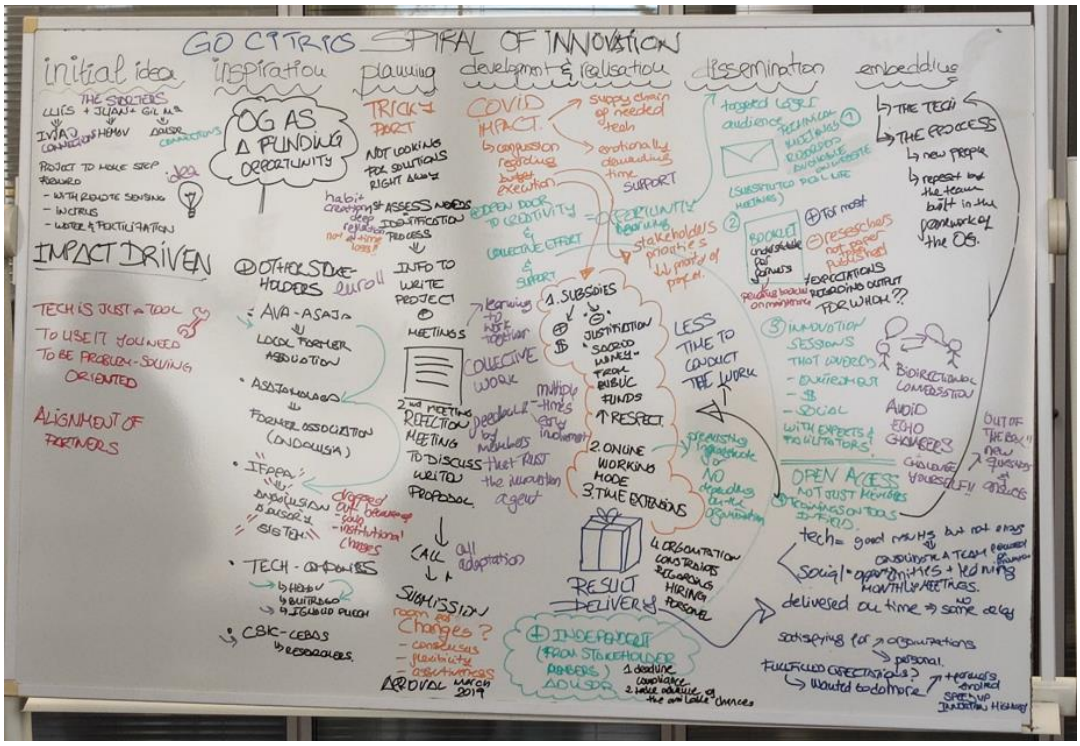

Figure 3: Spiral of innovation with its steps in innovation process for the GoCitrics success case.

5. Implementation

Realisation

The fundamental barrier in the Implementation phase has been and is social. In one irrigation company the collaboration has been complete, in another it has been limited, and in the plots of Malaga it has been variable depending on the owner. The technique is the same, but the confidence in it varies due to emotional and cultural issues.

On a technical level, the biggest difficulty is the current state of the art of technology. Aerial sensing is currently adequate to be able to detect uniformity problems on the plot, and from there, combining disciplines, discover the reason and then act on the problem. Terrestrial humidity sensors give very good results and their technology is highly contrasted.

Challenges during realisation:

- need of computer, electronic, telecommunication knowledge and skills required to involve some new actors to fully develop the innovation,
- partners experimented conflict and disagreements, as it was hard to begin with the project due to COVID 19 restrictions. They got the solution by talking and having a clear leadership from the independent project manager and the collaboration of the research centres.
- there were problems with supply chain due to COVID 19 and the sensors did not come in time from Australia.
- in case of sensing for irrigation and fertilization recommendations, the technology is currently unfinished, and requires more time to be implemented. It is mostly based on AI, and requires more field work.
- there was the need to make people feel peaceful and calm despite the problems they had, and to be focused on the positive side: The situation with COVID was very severe in Spain and there was a total lockdown, so people were insecure how to go on with their businesses, so the project manager/innovation agent is a very down to earth man and knew they need to work on the fields to proceed with the project. This way farmers got distracted and didn't think so much about their problems, they got connected with the advisor/project manager and opened up to him.

At economic level, the technology itself is not expensive, but it is expensive to put it in the hands of suitable professionals. This will give a good return in the medium term, but currently and especially in the current crisis in citrus, it is difficult for farmers to accept such an input.

As they did not expect the pandemic to occur, the main problem was identified during the realisation period, not the design phase. Due to many restrictions, they could not meet in person to continue working. There were as well couple of minor problems, which were solved by taking care of the actors who were involved in the project. At this point it was very important to have clear roles and responsibilities and the chain of decisions defined. At the same time, it was important to give recognition (trust) to the project manager to let him do his work.

The activities that were developed in the realization period were:

1. Adaptation of the facilities of the irrigation society to be able to apply irrigation and fertilization in a differentiated way and with maximum efficiency.
2. Provide terrestrial sensing to the installation.
3. Provide aerial sensing to the facility.
4. Integrate data from plots in an information management system.
5. Advise farmers continuously according to irrigation, fertilization and tillage.
6. Review the results and disseminate them.

Figure 4: Capacitance probes, type Enviroscan Sentek, 3 levels of sensing at 20, 50 and 75 cm.

On the figures above you can see a box which is a data connector, and a top part of the prop which has 3-4 places with sensors. This props are form Australia where the scarcity of water is higher and as the project manager said the best farmers are from the places where you have less water, because they need to figure out how to come to the water resources and how to use them in a smart way. The components of the land sensing are data loggers that collect the data, solar panels, a phone cart and a prop that has 3-4 sensors. Usually, the roots of the orange tree are about 50 cm deep, so the info on the sensors tell to the farmers if the trees are irrigated well. Depending on amount of water there is in the air, the sensor will give a different sign, it is an electrical thing. Electricity is transmitted in a different way on the air and on the water. Capacitance is different if there is water in the soil or not. There are sensors at different levels at 30 cm, 50 cm and 75 cm which send the information about water saturation on each level, and if the water saturates soil at 75 cm deep, then the system reports

that it would be necessary to close the watering. There is as well another technology that is aerial sensing; satellites and drones as well get the info from the air.

There was needed some implementation and implantation time for:

1. Audit of the facilities and improvement of the same took six months.
2. Implementation of terrestrial sensing took about two months.
3. Implementation of aerial sensing took six months, if we include the generation of the parcel database with the necessary information from the farmers.
4. Development of new work habits in irrigation companies took one year for the first implementation, and another year for the iteration.
5. Obtaining results: from the first year uniformity problems can be corrected, and see the results in the use of irrigation. To be able to compare vintages, a minimum of a two-year historical series is required.

One of the results of their operational group was, that they published two booklets about how to enter in smart agriculture in citrus crops. It was hard to write these books although 90% of the people in the operational group were motivated, some of them who were research oriented said that their outcomes were not robust. The project manager said that they may not be robust related to writing an article, but they were very robust having an impact on farmer. For him the most important thing was to begin the conversation. Another outcome of this project is, that when the project manager Gil Maria talked to Juan and Luis in 2016 asking themselves what they could do regarding digitalization of agriculture, now it happened that Luis is leading some projects related to remote sensing, another department of the Valencian institute of research are as well leading other projects related to remote sensing, and Gil Maria himself is involved in research related with remote sensing. All this coming from those conversations.
From the innovation point of view, they got more than expected, because all this troubles created more opportunities for learning. From the technical side the biggest challenge came when some people had the mindset of writing papers instead of having the mindset of creating the value for the farmers and society.

Dissemination

In the phase of dissemination were involved all the actors from the previous phase. The chain connection among regulators and other stakeholders in the region was an innovation agent/project manager, as he was the one who mostly could hear out the problems of the farmers and tried to help them. The farmers are working together, they got the knowledge they needed from the advisor, the researchers, IT and sensing specialists. The farmers are in contact with the advisor/project manager who is in contact with the regional government.

The relevant information was shared with actors outside the partnership. There were different types of dissemination made:

- Two booklets. One related to irrigation infrastructures maintenance and another one related to smart agriculture.

- Dissemination among the agriculture citrus sector and professionals was mainly made online and that way they could even arrive to more people, they as well made some recordings from the fields.
- Workshops (innovation sessions) with people involved in social, environmental and economic areas, but not involved in citrus production. This helped to get a very practical insight where to get new ideas and questions uncovered during the project.
- Training for the farmers involved in the project about the usage of the tools and how to let them enter in their own farm to get the data in a weekly basis (captured by satellite) and in monthly basis (captured by drones).
- Social media: Gocítrics (@Gocitrics) / Twitter

The key actors were engaged in dissemination activities as they participated in the workshops and dissemination sessions. The research centres and companies participated in writing of the booklets.

Embedding

From the interviews we found out that the researchers and the innovation agent had to teach the farmers about the fertilization and sensing to the level that they do not need their help any more. The farmers are now self-sufficient experts who know how to deal with the equipment and the results and can use them on their own. Once the project was ending, they made the training for the rest of the people that were interested in this technology to know the tools.

The most important results of this innovation project have been the ones oriented to see the different opportunities and weaknesses of the Smart Agriculture for people who did not face them before. The project has helped the partners to begin other projects based on personal learning of this process. The information is especially used outside the partnership for those, learning what could be the useful paths needed to launch new smart agriculture projects. At the same time, to make people aware of the power of this technology. The innovation case connected with a wider circle of users during the workshops in the dissemination phase.

We all agreed that long-run sustainability of the project is guaranteed through social infrastructures (networks, communities, etc.), there will as well be an environmental need (climate change, lack of water, droughts) where farmers will grasp that it is necessary to change the method of watering the crops and they will opt for more sustainable option, which will even improve in future. The innovation is very relevant for the local community and the citrus and avocado production, as in Valencia region there is more than 50% of Spanish citrus production which means the consumption of water is high as well, though in Andalusia region where the citrus production is around 30%, scarcity of water is even greater but there the plots are much bigger.

6. The AHA-Erlebnis: feedback on the gained insights

The main success factors were:

- The project was successful at a second round call and got the funding from the EU and as well from the Ministry of Agriculture (MAPA) of Spain
- the bond and collaboration among research institutions, independent proactive project manager/innovation agent and private sector as they address real climate problems (high water and fertilizer consumption in agriculture and overall scarcity of water in Spain) and the adaptation to new technologies, awareness and recognition of need to overcome that problems going towards more green solutions.
- project manager has technical, innovative soft skills, he was able to communicate with all the actors involved in the project, build trust among them, facilitate the good conversation and spirit, engage the partners and lead the procedures of the project from the beginning to the end, complying to administrative chores and compromises of the funded project.
- clearly delineating goals and tasks allowed for clear roles and expectations of the partners, so it resulted in highly engaged partners that increased project efficiency and in minimal disagreements among them.

The main barriers:

- The coincidence with the COVID-19 pandemic has greatly limited the implementation of the project, and its impact on the direct relationship with farmers. Therefore, many results could not be calculated during the execution of the project.
- Lack of interest in the innovation by farmers; some farmers that have been farmers for a long time, were reserved about new technologies and since they were experts managing the water irrigating the old way (irrigated with precision) didn't want the advice from the researchers and didn't want to adopt the new technologies. They didn't see the benefits of new technologies although the measurements clearly showed there were problems on their installations.
- There could be a possibility of application or introduction of microorganisms into the soil simultaneously with the irrigation and fertilization although they don't know what the outcomes of this would be. There still have to be made some experiments to see the benefits of such applications.

Case outcomes:

- **On a social level**, much has been learnt in detecting and seeing how to solve the main barriers to the adoption of this technology by the typical irrigator. At the same time, a working group has been created among various agents that are motivated to work together and to promote precision agriculture, not only in citriculture, but also in other crops such as avocado or rice. Knowledge of Precision Agriculture has also increased, including the publication of a Manual with the current state of the art of this technology in citriculture, and with a Maintenance

Manual for irrigation networks, in order to adapt them to take advantage of the benefits of this technology.

- **At the environmental level -** having the exact data, there has been greater control of the use of water and nutrients, and therefore a better water footprint per kg of citrus produced is estimated. Although this does not really mean a direct reduction in water consumption.
- **At an economic level -** the improvement of the facilities in one of the irrigation companies, through the installation of a new pumping group, frequency inverter, and new sectorization produces an economic impact in the reduction of its energy cost. They also hope that the adjustment of the use of water and nutrients will have a positive impact on the harvest, as well as on the cost of production. The evaluation is missing and will be done in the coming years.
- **At a technical level -** irrigation recommendation technology has continued to be developed, and some of this knowledge has been adopted by irrigation society engineers.

Figure 5: Reflection meeting

7. Lessons learnt

The application of quality capacitance probes, such as Sentek's Enviroscan, used in the project has been highly proven and its use in the field of citrus growing is accelerating.
In relation to aerial sensing, much remains to be done, especially in nutrition.
In the case of production prediction, it is a technology that has advanced a lot in rice, and in sugar cane and sugar beets.
In relation to the improvement of the facilities and their provision with competent technicians, their effectiveness has been demonstrated, but the necessary investments are not being made.

There were some obstacles regarding pandemic, which did not let them work directly with main groups of farmers during the realization of the project. The drivers that were pushing the project on was the will of the main partners in the project to go forward as well as to accomplish with what was decided and to follow public administration's tight rules. The independent advisor/project manager/innovation agent played a crucial part all along the innovation process, he was a huge driving force from the beginning to the end of the project.

From the point of view of the farmers, they should continue to take advantage of the technology, and see how it is already installed without the continuous support of all the institutions of the project.
From the point of view of the technicians, they should continue developing the intuitions generated during the execution of the project.
From a results standpoint, it's necessary to follow up to see how this technology continues to be leveraged.
From the point of view of the agrarian organizations, it's necessary to transfer the benefits of this process to all the associates.

Currently, the project technicians intend to continue advancing in adjusting the technology for irrigation and fertilization. In the case of irrigation, it is fully developed in the use of capacitance probes.
In the case of nutrition, they are in an incipient situation.
In relation to the maintenance of most of the irrigation societies, much remains to be automated.

Digitization is a reality that is accelerating in the field. There are more and more investment funds entering the Spanish agricultural market seeing that there are many inefficiencies that can be corrected with the application of new technologies. This is going to have a major impact in the next five years.
At the Spanish level, they are very well positioned to generate the appropriate technology, but it requires teamwork, knowing how to meet social and environmental needs, as well as technical ones.

It is very important to take care of the leadership process, as well as have people involved not only technically in the project, but also emotionally with the impact that they wanted to produce. At the same time, this makes possible to open the network to other people who share this scope of the project.

Some people that work in innovation say that sometimes you get many ideas when you challenge your ideas with people who don't really understand what you're working on, because they are going to make questions that you have never heard before. When you discover you could have different approaches (not the ones you have been taught), when you let yourself be out of control zone, something new appears and opens new conversations. This way you build new "highway" then you begin to create a new impact, although you're not aware of it. It's like a paradox, this part of the project was a successful because they didn't control that outcome, but at the same time if you don't control the outcome you don't get rewarded at the end. The project manager realized that he would like to do more in this project, to consolidate the "highway" and continuously work in this kind of style. He would have loved that the administration discovers more people in the projects that have this mindset of creating big innovation community in Spain.

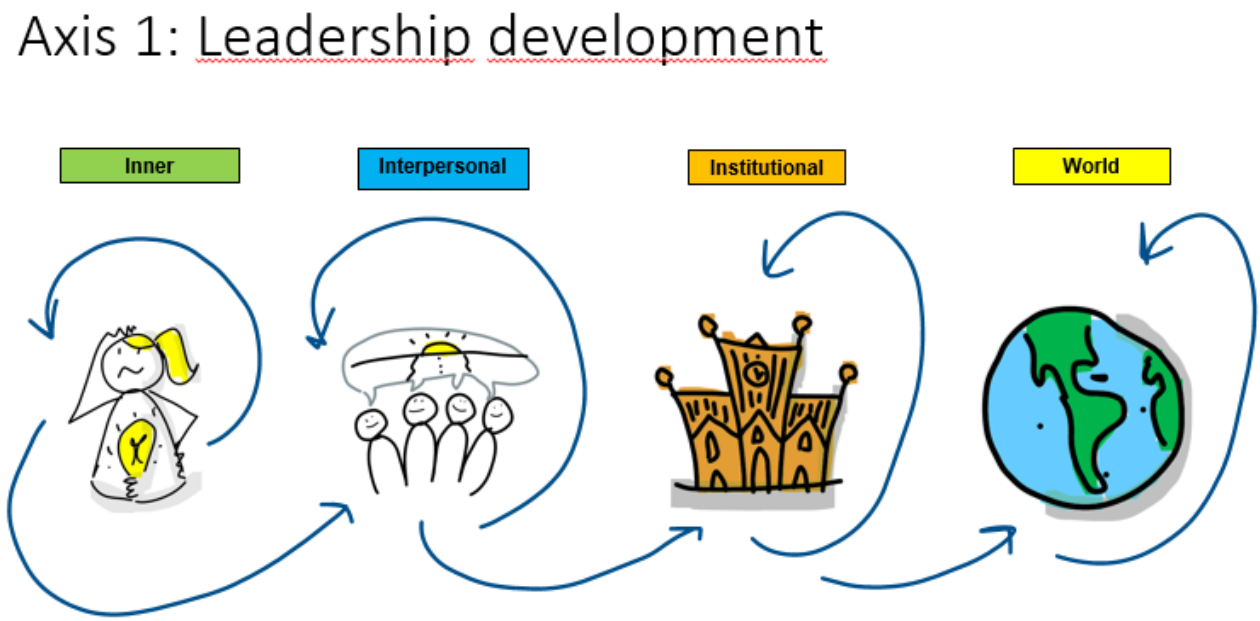

Figure 6: Leadership development as described by the project manager/innovation agent

What we learnt from the case to enhance interactive innovation is that the mentality or mindset of the individuals need to be shifted to the proactive mode, from where this would become a community point of view and then it would be expanded to a national level and from there to the more global impact.

Figures 7 and 8: Field visit to the north of Valencia province, where we saw the installations of the pumps and where the fertilizers are incorporated to the water irrigation system, as well we saw the fields where the terrestrial sensing was implemented.

8. Additional insights from case coordinator

In this section, additional insights from case coordinator Iratxe Díez Delgado is given on the case to provide a more complete set of best practices and learning moments.

Best practice/learning moment	Description	Stage in spiral of innovation	Stakeholders involved
Connecting actors with different backgrounds (“languages”)	Enabling effective communication and understanding among actors with different languages as “telecommunication engineering” (drone company), “administration” (funding body), “scientific” (researchers) and “farmer” (citrus producers). Effective connection was possible “translating” the communication style and vocabulary of each actor.	Development	Researchers, tech companies, farmers, advisor

Best practice/learning moment	Description	Stage in spiral of innovation	Stakeholders involved
Elicit conversation and build trust among actors	The operational group had a great diversity of actors: farmers, researchers, tech companies, advisor. In groups with such a complex structure is important to balance the different interests and perspectives. Having an independent advisor & project manager looking on everybody bests interests is perceived as an unbiased and reliable partner that can mediate if conflicts arise and build trust among partners.	Inspiration Planning Development Realization	All actors. The most remarkable example is tech company and farmers: farmers were sceptical about the technology as they thought it was something to be sold to them to take advantage of them. With the advisor facilitating the conversation, farmers quickly realized that technology was a useful tool and tech providers understood better farmer's needs.
Overcoming COVID-19 related challenges	Limitations on face-to-face interaction and direct work. Misconceptions about funding (some partners thought that due to the exceptional situation the funding body would put the projects on hold and that the milestones would be paused or delayed in time). Communication and leadership by the advisor & project manager cleared these misconceptions, maintained partners engaged and coordinated efforts so tasks were completed safely and on time.	Development	Farmers, researchers, tech companies, advisor, funding body.

Field Peer Review Report

V. Controlled feeding of corn silage in cattle feed rations, Slovenia

Main author

Iratxe Díez Delgado (MAPA)

With contributions from

Vicent Ribera Barelles

Gil Maria Campos Alabau

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1. Introduction

After attending the training sessions, the Spanish success case ("OG CITRICS: Smart Agriculture in citrus irrigation and fertilization") was paired with the Slovenian success case ("Pilot project: Controlled feeding of corn silage in cattle feed rations").

The case coordinators of both cases (Saša Plestenjak and Iratxe Diez) set up a preliminary meeting on 29th December 2022 were potential dates and logistics were discussed and agreed. An email with this information was forwarded to task leaders that were kept updated timely with the progress of the process.

Success cases exchanged via email the documents with the preliminary information following the "Initial information" and "Outline for the preliminary interview" templates (available on Meteodocs).

A meeting between the Spanish case coordinator and Spanish advisor and farmer was set up the 3rd of February to communicate, discuss and solve questions about the expectations of this field visit, the aim, and the methodology to follow (making special emphasis on the Spiral of Innovation and Question flowchart).

The field peer-review was conducted on 16th and 17th of February 2023 and implemented face-to-face with the visit of the Spanish team to the Slovenian Chamber of Agriculture for interviews, reflection meeting and to Mr. Ferlan's farm for the field visit.

The aim of this peer review dynamic was to:

- Assess the roles and function of advisors in supporting innovation processes.
- Assess de effectiveness of this support and the enabling environment.
- The contribution of advisors in supporting actors in interactive innovation.
- The effectiveness of advisory in supporting interactive innovation.
- The conditions that enable the advisors to play support functions.

The methodology used for the field peer review was spiral of innovation completion, interviews to follow the Q&A flowchart, the reflection meeting, and the field visit..

- The spiral of innovation enables us to understand the different phases of a particular project and to characterize the moments that energized and/or the network, the breakthrough moments, and insights during the project.
- The Q&A flowchart and methodology is a structured way to gain insight on roles, functions, skills, and competencies; and to gather key actor´s reflexive evaluations, peer observations and other evidence.
- The field visit enables to have a less theoretic, more practical perspective on the innovation itself, the interactive innovation process and on the human factor involved.
- The reflection meeting allows the exchange of ideas between peers and to clarify aspects.

By using it systematically for peer evaluation on several projects, the i2connect project aims to learn how interactive innovation happens and to extract key lessons to use this knowledge in training programs for advisors.

Agenda:

TIME	ACTIVITY
13:45 – 14:00	Arrival and welcome
14:00 - 14:30	Presentation of EIP-AGRI by Anton Jagodic and by the Ministry of agriculture (Boštjan Bidovec)
14:30 - 15:30	Active role, innovative approach, role of advisory service (presentation of Andrej Kastelic)
15:30 - 16:00	Coffee break with pastries
16:00 - 17:30	Workshop with Jana Žiberna, Time for interviews
19:00 - 21:00	Dinner in Slovenian restaurant Vodnikov hram

1st day: 16.2.2023

2nd day: 17.2.2023

TIME	ACTIVITY
8:30 – 9:00	Coffee, tea and pastries
9:00 – 9:30	Farmer comes to CAFS and presents his farm and the innovative case study
9:30 – 12:00	We transfer to the farmer's farm and have a look into the innovation
12:15 – 13:30	Interviews at CAFS
13:30 - 14:30	Lunch
14:30 - 16:30	Evaluation & solving open questions

Participants:

- Saša Plestenjak, Slovenian case coordinator from the Slovenian Chamber of Agriculture and Forestry).
- Andrej, Slovenian advisor in the success case (Slovenian Chamber of Agriculture and Forestry-Institute- Novo mesto)
- Arloj Ferlan, Slovenian farmer in the success case.
- Vicent Ribera Barelles, Spanish farmer.
- Gil Maria Campos Alabau, Spanish advisor.
- Iratxe Diez Delgado, Spanish case coordinator from the Spanish Ministry of Agriculture, Fisheries and Food.

2. Factsheet of the case

Controlled feeding of corn silage in cattle feed rations is an initiative to optimize corn silage feeding in milk cows.

This is a **pilot project under the European Innovation Partnership- AGRI sub-measure 16.2** - Support for pilot projects and for the development of new products, practices, processes, and technologies in Slovenia, funded through the Ministry of Agriculture of Slovenia.

This project located nearby Ljubljana received funding (74.200 euros) to develop a practical and innovative solution that addresses the optimization of corn silage feeding in milk cows.

This pilot project brings together:

- Farmers: Mr. and Mrs. Ferlan (innovators, Ferlan farm) and Ludvik Trebše (tester, Trebše farm).
- Researchers from the Agricultural Institute of Slovenia: Tomaž Žnidaršič and Jože Verbič conducted feed analyses and provided expertise in this field.
- Members of the Biotechnical Faculty of the University of Ljubljana: Andrej Lavrenčič, Marko Kodra, and Mojca Koman Rajšp developed, calculated, and evaluated feed rations.
- The Chamber of Agriculture and Forestry of Slovenia as supporting organization:
    - MsC. Andrej Kastelic as the advisor, innovation broker as well as project leader and coordinator, contact person with funding body. Works in one of the Agricultural and Forestry Institutes of CAFS: Novo mesto.
    - Monika Selan provided technical support with reporting and administrative issues.
    - Vladimir Sotošek and Andrej Golob were in charge of dissemination.
    - Saša Plastenjak and Igor Hrovatič supported international aspects.
- Market actors: suppliers of computers and electronic components (MAK ELEKTRONIK) and technical shops.
- Civil society: Sevnica cattle breeding association and Farmers weekly newspaper (Marinka Marinčič) contributed to dissemination.
- Administrative bodies: Ministry of Agriculture that provide financial support.

Controlled feeding of corn silage in the cattle focuses on many key issues:

- **Input optimization**: feed is one of the mains costs of livestock production. Particularly, the optimization of corn silage in ration is especially important when own production of corn at the farm is low (years with less favourable weather conditions, corn produced on hill areas or under ecological schemes…).
- **Health and production** related to feeding: when given fodder on a feeding table weak cows are pushed away by stronger cows This causes that approximately 1/3 of the animals are underfed and other 1/3 is overfed. Both groups have lower milk production, reproductive problems, and other health issues (some overweight cows die at the start of next milking period because of ketosis).

- The amount of **manual work** on the farm.

The case addresses farm sustainability in its economic, social, and environmental point of view by developing an innovative solution. This is important as most Slovenian milking farms are small, familiar holdings and farming is a second job for farmers (they have main jobs besides farming, part farm operators). In the herds belonging to these farms there are cows in all stages of lactation (dry cows are usually separated) and therefore have different feed needs. Also, these farms have small areas of field where some of the corn administered is produced and the yields can vary or be low as mentioned before.

In this context, the improvement in health and production and the increase in work efficiency achieved by feed ration optimization are key to farming economics and to the maintenance of these holdings. Also, due to the characteristics of farm holdings (small, secondary job), innovation implementation is not very common. Therefore, this project represents an opportunity to make a case for innovation in farms.

The approach to address the need in feed ration optimization in milking cows to increase production, health, and efficiency in the farm was the **creation of an automatic feeding device**. This device provides individualized amount of corn silage to adjust ration to the needs of each animal (depending on milking yield, cow condition and corn silage availability, etc).

Brief note on the innovation
Cows are equipped with electronic collars; these collars are read by sensors placed in the entry to individual feeders. When the sensors recognize the animal the access to individual cubicles is granted and the entry for other cows is blocked. Once in, after the read, the computer where the individually tailored rations are programmed gives input of the exact amount of canola meal and corn silage required for the particular cow to the device. Ad libitum access to grass silage. The automatic feeding device prepares the ration and deploys it into the feeder. See “Device 1” and “Device2” videos.

The expected outcomes of this innovation are:

- Higher and better-quality production.
- Better health and improved animal welfare (less stress).
- Improved profitability: optimization avoids expenses or inputs (corn, supplements, vet costs due to health conditions, costs due to loss of reproductive cycles etc.).
- Improved working conditions on the farm by reducing the amount of manual work (not many groups of cows and/or feed mixes, automated feeding, no mix trailer needed).

- Lower greenhouse gas emissions and water consumption per liter of milk as optional feeding maize silage has better efficiency.

The novelties and innovations of this project are:

- Development and fabrication of an automatic feeding device that individually delivers the optimal ration.
- Farmer as the innovator (generates innovative idea that addresses his needs and is proactive to materialize it), truly a bottom -up innovation process.

More details in “Pilot project presentation by Andrej Kastelic” video.

3. The initiation period

Initial idea

The initial idea comes from the farmer, Mr. Alojz Ferlan. He is a very innovative and proactive farmer.

He had issues with corn silage production due to hot weather, it became quite variable and risky. He wanted to get the maximum milk production out of his corn silage.
He was invited to a conference in Austria about fertilizers the key idea in one of the talks was “more fertilizer does not mean more production”. He made a parallelism with animal feed and asked himself: does more food means better production (quantity & quality) and health?
Also, he noticed in his herd that, by feeding a mix ration, neither the full potential of it could be exploited nor optimal care could be provided due to the variability in individual nutrient and energy requirements.

Mr. Ferlan has a broad knowledge on nutrient and energy needs during the different phases of lactation, on associated health and reproductive issues and he faces the variability of maize production in his own lands. He is also very skilled in technology as well as in mechanical and electrical components.

He made the needs assessment (need for adjusting rations individually) and came up with the concept and technical solution (designing and creating an automatic feeding device) right from the beginning.

He already researched about the topic, attended several conferences (an AHA moment was a conference in Austria were an American attendee presented a topic on the excess of minerals in soil), undertook soil analysis and experimented with different nutrients/fertilizers in his land to find the best combination.

Mr. Ferlan idea was a mature idea that needed support.

Inspiration

Mr. Ferlan, by self-initiative, attended **meetings on EIP presentations** by Slovenian Ministry of Agriculture in 2017. Is not common that farmers attended to these meetings. These meetings enabled him to share and discuss his vision and to **actively make connections and search for partners and support**.

In these meetings, he contacted the advisor, **MsC. Andrej Kastelic**, who he knew previously. This pre-existing trust was a key fact to ask him for leading the project. Andrej realize this could be a project submitted to the EIP pilot project calls.

MSc. Andrej Kastelic is an experienced advisor working for the **Chamber of Agriculture and Forestry of Slovenia** (CAFS), more specifically he is the leader of Animal Department of the Novo mesto Institute. This institution promotes agriculture, forestry and fisheries protecting and representing its members 'interests (compulsory membership, 109,664members) and provides them free technical aid in several topics.
Regarding innovation it acts as a connector and support institution by finding, identifying, and contacting potential partners who can contribute to the development of an innovative solution. CAFS also guides and assists in the establishment of partnerships and the preparation and implementation of an EIP project.

Experts from Agricultural Institute of Slovenia and the Biotechnical Faculty of the University of Ljubljana were also involved, they were key for idea validation.

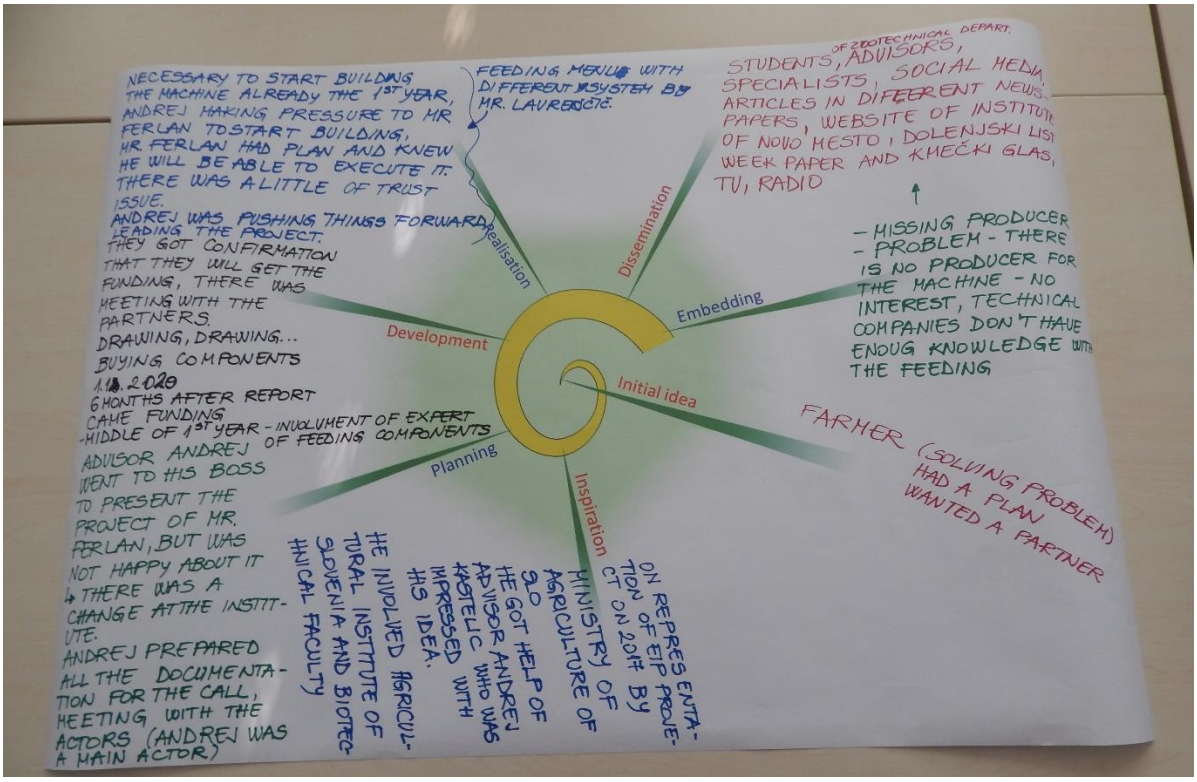
The EIP meetings organized by the Slovenian Ministry of Agriculture, CAFS support and MSc. Kastelic gave the push that made the idea progress from initiation to further development (making the technical solution real by enabling cooperation).

Challenges in the initiation period:

- searching for partners.
- validating the idea by experts (proof of concept).
- finding a potential funding mechanism and the suitability to apply to EIP funds.
- the advisor had to secure his boss's permission to lead this project.
- the farmer had to prove the advisor that he was able to build this device. Trust goes both ways.

AHA moments in the initiation period:

- most partners were on EIP presentations and the opportunity to cooperate was clear.
- the advisor was willing to lead the project and has the professional and technical skills needed to lead an EIP project, to act as an innovation broker and as a facilitator.
- the idea was confirmed by different institutions (Agricultural Institute of Slovenia and Biotechnical Faculty of the University of Ljubljana) and the project was deemed as technically sound.
- the project was suitable to apply to EIP funding due to its innovative nature. This funding mechanism was chosen as it covers the main expenditures of the project (material costs and working hour costs).
- the farmer is knowledgeable and even has few registered innovations.



Spiral of innovation of the success case "Controlled feeding of corn silage in cattle feed rations"

4. Planning and development

Planning

The advisor had to secure his boss's permission to lead this project. There was a potential friction within the advisory system in jumping into a project due to the institution Statutes (they had to be changed to comply to the call requisites). This was a pressing issue that needed to be solved before preparing the project. Finally, he got permission from his boss and institution. In fact, three applications were submitted.

Common views regarding the aims of the project, the main goals to achieve and the roles and functions of the partners were established. This allowed to have the pillars for writing a proposal to submit to the EIP call. Since the source of funding was identified in the previous phase and the partners attended the EIP presentations they were all on the same page regarding the rules that would influence this cooperation project and the general process. Inspiration and planning were quite entwined (funding identification, some of the planning and some of the partner set up was already done in the inspiration phase).

The **main technical objectives** of the project were set up by Mr. Alojz Ferlan with cooperation of the rest of the partners that contributed adding specific details and with some remarks. Moreover, some objectives were mandatory by tender for being eligible to receive the funds.

With this information the project leader made the final list with project outputs, deadlines and milestones that would integrate the proposal and be used by the funding body to monitor the project. He asked for specific details by email or phone to fine-tune the proposal. When proposal was ready for submission, he sent it to the partners for confirmation and for supervision of the more technical details.

Compliance to eligibility conditions of fund shaped **cooperation network** (e.g., need to enrol a farmer to test the innovation). The roles and functions of project members were clearly defined based on their skills and areas of expertise:

- Mr. Alojz Ferlan had to develop and build the device with support of other partners (brainstorming, asking, researching, talking, and drawing).
- Dr. Tomaž Žnidaršič and Dr. Jože Verbič (Agricultural Institute of Slovenia) had to perform feed analysis and provide expertise in this area.
- Andrej Lavrenčič, Marko Kodra, and Mojca Koman Rajšp (University of Ljubljana) had to plan feed rations and provide expertise in this field.
- Ludvik Trebše (farm Trebše) was the farmer responsible for testing the device on feeding bulls.
- MsC. Andrej Kastelic had to learn about the funding, write the proposal and try to secure the funds.

<u>Challenges in planning:</u>

- the advisor had to secure his boss permission to lead this project.
- the tight deadline between receiving the green light from CAFS and the call deadline led to 12 days of intensive paperwork to complete all required documents.
- preparing the proposal, it was the first time applying to an EIP tender.
- competitive process. Getting the funds is not easy due to the application, selection, and evaluation procedures but the network and proposal were competitive enough to be submitted and have fair chances of success.

<u>Success moments during planning:</u>

- advisor was granted permission to support the innovation project. Advisor asked for permission and was persuasive about the need of taking part in this project and also the institution was willing to change their Statutes to do so.
- clear objectives and structure of the network were agreed on as the partners have met before.

Development

Funding was granted in January 2019, a total of 74.200 euros were allocated to this project. Money was not received straightaway though. The other two unrelated proposals were rejected.

Communication and interaction between partners were done by a meeting once the funding was granted and then the working group was coordinated by mail and individually by phone calls and visits. This approach ensured everyone was updated. The communication among partners was structured and centralized by the project leader and coordinator Andrej Kastelic.

The tasks were assigned so all **stakeholders were aware of their roles and functions**. The clear layout smoothed the cooperation process by managing expectations about objectives and results to be achieved, about specific tasks and about deadlines to comply.

All **partners were aligned** and contributed with their knowledge. They chose to cooperate and work together in this project to generate an innovation, to develop new skills, to learn from other partners (joint learning) and, also, due to incentives related to the funding (financial, access to information, visibility, etc.).

In this phase the main goal was the **creation of an automatic feeding device** capable of adjusting the ration to the needs of each animal (depending on milking yield, cow condition and corn silage availability, etc). This was done by the innovator farmer with the support of the rest of the partners.

Visits to Mr. Ferlan were conducted regularly while he was **developing the idea and constructing the device** to provide support, give some remarks and discuss about possible functions and design. During the development and construction of the device several methods for reflection and learning were applied, in fact, brainstorming while drawing device schemes helped to learn jointly and to explore new things together. It was very important for Mr. Ferlan that someone was there to listen and support him meanwhile drafting.

As it was agreed on the group meeting that established the deadlines of the project:

- analysis of feeding components in the middle of 1st year and creation of different types of feeding menus.
- by the end of the first year a prototype the device had to be constructed.

The **knowledge needed** in this phase was:

- Technical: feeding analysis, feed ration calculations, electronics, computer, building automatic device.

- Facilitation skills: motivational abilities, time keeping, compliance to milestones, coordination, and communication.

Challenges during development:

- encouraging Mr. Ferlan to achieve the milestones on time.
- advisor nervousness to comply with deadlines and milestones to receive the funding (comply with the monitoring of funding body). Moreover, he had extra pressure for advances to be made and the project to be completed so CAFS would queue other propositions for next call and not drop the support and partnership under EIP-AGRI calls. He stated to partners that if there was no compromise (moving forward drafting to initial prototype by December 2020) he would be out of the project.
- hardly managed to submit first report.
- funding arrived 6 months after the first report was submitted. There was an issue of trust, of acquiring the components because the money was not already there.
- trust issues to make the investment.
- prototype device was not finished till end of 2020.

Success moments during development:

- funding was granted due to the effort made by the project leader, that made sure to present a proposal of high quality and that complied the requirements in time.
- having a proposal approved for funding was very important and encouraging for advisor and CAFS after all the effort to be able to be partners.
- by the end of the first year the investing finally started.
- the Slovenian EIP-call was quite flexible and allowed for readjustment, although monitoring systems were in place.

Mr. Ferlan drafting

5. Implementation

Realisation

With the hard deadline Mr. Ferlan managed to build up the device very fast. Once the **initial version of the automatic device (prototype) was built and set up on Ferlan´s farm it required some improvement and finetuning** (as Mr. and Mrs. Ferlan detected some problems in the herd)**.**

Moreover, as some technical changes had to be made **requiring electronical and technical support** these stakeholders were added to the ones present in the previous phases. This expertise was provided by specialists employed by the technical and electronic stores. Different companies and technical supply stores were screened and contacted by Mr. Ferlan to obtain information. It was necessary to negotiate with these external actors, they were involved in the project as employed by technical stores and got paid by selling the technical components.

Improvement in feeding menus was made to adapt and tailor according to silage and cow condition/ production (by animal instead of by small cow groups).

Upgrade: device and feed ration calculations were improved.

Challenges during realisation:

- need of technical, electronic, computer knowledge skills and know-how required to involve some new actors to fully develop the innovation.
- troubleshooting, some problems were identified.
- some failed bills from foundation. Own funds about 15.000€ (exact amount is not specified) due to additional costs not planned in the project: components for automat, hours of working for additional reports etc.

AHA moments during realisation:

- no conflicts occurred.
- prototype device was built.
- trust between partners rose when the first version of automat was in place, this dynamized the network.
- identified problems were solved quickly.
- Mr. Ferlan became independent, he can manage different programs to calculate rations and create individual menus.
- an improvement of cow conditions (health) was appreciated in farm Ferlan.

- established goals and milestones were achieved. The system to monitor progress was stablished by funding body.
- funding arrived (6 months later), nonetheless the overall experience with funding mechanism is positive.

Dissemination

The **device was replicated and tested in another farm (test farm of Mr. Ferlan)** as compulsory by call.

The project was actively disseminated by a variety of partners, channels, and approaches. Dissemination also targeted different types of audience: advisors, farmers, agriculture school's students, specialists…

- **Agricultural institute Novo mesto-CAFS** was actively involved in dissemination:
  - agricultural newspapers: Dolenjski list, 17.6.2021, Kmečki glas 14.7.2021, Zelena dežela, august 2021.
  - website:
    - https://www.kmetijskizavod-nm.si/projekti/eip-projekti/kontrolirano-krmljenje-koruzne-silaze-v-obrokih-govedi
    - English version: https://i2connect-h2020.eu/casestudy/controlled-feeding-of-corn-silage-in-cattle-feed-rations
  - regular post mail to 120 farms and email.
  - social media:
    - YouTube:
      - https://www.youtube.com/watch?v=JCirVzs7wS0&ab_channel=KmetijskogozdarskizavodNovomesto
    - Facebook: 28.1.2022:
      - https://www.facebook.com/groups/325714614277564/posts/2022976717884670/
      - https://www.facebook.com/groups/1306764119681868/permalink/1590150618009882/
      - https://www.facebook.com/groups/1306764119681868/permalink/1590170771341200/
      - https://www.facebook.com/groups/234069704622267/permalink/685029749526258/?notif_id=1643373275527977&notif_t=video_processed&ref=notif
    - TikTok:
      - https://www.tiktok.com/@andrejkastelic/video/7058228431237991686?is_from_webapp=1&sender_device=pc&web_id6995078728201520645
      - https://www.tiktok.com/@andrejkastelic/video/7058228049141140741?is_from_webapp=1&sender_device=pc&web_id6995078728201520645
    - Linkedin:

  - https://www.linkedin.com/posts/andrej-kastelic-5317a0157_v-triletnem-pilotnem-projektu-kontrolirano-activity-6892803816467570689-QhLT
  - Instagram:
  - https://www.instagram.com/p/CZRhNjolugr/
- seminar of agricultural advisors: https://www.youtube.com/watch?v=qCvzTkEjUQI&ab_channel=KmetijskogozdarskazbornicaSlovenije
- brochures.
- booklet.
- poster of project results displayed in the institute hall.
- preparing events on farm Trebše.

Other partner institutions also supported the dissemination of this new practice:

- The **University of Ljubljana** organized agriculture students visit to farm Ferlan.
- **Agricultural institute of Slovenia** delivered one presentation.
- The feeding automat is working at **farm Ferlan**, and it is available to see.

According to the partners the effort towards project visibility could make that the information and solution developed by the project facilitates that the automatic device is seen by everyone and elicits conversation. Spreading out the innovation to as many farmers as possible so they can implement it.

Challenges during dissemination:

- no remarkable challenges were identified.

AHA moments during dissemination:

- having a communication department within CAFS and involvement of farmer´s journal (partner).

Embedding

Innovator farmer said during the field visit that sometimes his colleagues do not perceive this as a need or are skeptical about the device or do not realize the improvement it makes (discussion can be seen on “Interview in field” video).

Advisor states that companies don’t believe that producing the automatic feeding device is profitable. He also stated that for embedding this innovation in Slovenia it should come from a foreign country (as an innovation used in, for example, Austria) and be taught in technical schools. He estimates uptake by local farmers requires a span of 10 years. He is positive that farmers will demand this product in the future, especially the younger generations and the ones that already own some technology as milking robot (prioritize them as target).

Producers of agricultural machines visited Ferlan and Trebše farms, but **the device is not being produced for sale therefore is not available for purchase and uptake by farmers is not possible. The**

long run sustainability of the project is compromised. Is important to influence producers of new technologies, to network and negotiate with them to scale up device production.

The intellectual property is not registered yet.

Potential changes in the socio-economic/farming system due to the results of the project:

- No influence on legislation or policy instruments.
- Impact on educational issues and knowledge infrastructure: paradigm shift, farm as an innovation example for students and agricultural equipment producers.
- Big potential for local farming system.

No opposition to the device is expected, maybe feed distributors because more efficient using of corn silage leads to less purchase of corn silage from feed companies.

Challenges during embedding:

- producing the device for sale is the main bottleneck currently.
- expanding the innovation.

AHA moments during embedding:

- impacts over educational and knowledge systems, over local farming system…etc.

6. The AHA-Erlebnis: feedback on the gained insights

Main success factors

- The **initial idea comes from field**: it addresses a real farm need and there is already a strong motivation as there is awareness and recognition of this need (although there is skepticism in some farmers).
- Idea brought by a self-sufficient, proactive **innovator farmer**. Farmer was directly involved in the solution development with the aid and assistance of scientific and technical knowledge.
- **Bottom-up process**.
- **Enabling environment**, the key networks that enabled this project are:
    - Ministry of Agriculture of Slovenia: dynamizing opportunities available through EIP-AGRI and acting as funding body, this provided most of the contacts that the initiator needed to develop the idea and the money needed for the investment and services needed to create the technical solution.
    - CAFS: provides technical and structured agricultural advisory service and support, long-term relation advisor-farmer. The advisor was, as stated below, one of the main drivers. He led the project and made sure the initiator complete and complied with the proposal presented to the funding body and maintained him motivated to do so. He performed the same skills tpwards the rest of the members of the project.

  - The expertise provided by research and academia network were key for supporting the conceptual design of the initiator regarding feed requirements (initial boost) and to provide the data of feed to make the calculations (project development).
  - Electronic and technical devices support was essential for overcoming the challenges during the construction of the devide part of the solution (project development).
- The **main drivers** were the interest of Mr. Ferlan (farmer) to build the automat and the motivation of MsC. Andrej Kastelic (advisor) to lead the project to complete it.
- Project had a **simple cooperation structure** due to the small number of participating farmers (2, one had the leading opinion, and the other was the tester).
  - Regarding this we, as peer reviewers, are curious on: How project would have worked if multiple farmers were involved (different values, objective, mission and/or vision)? Which tools are needed to balance the acceptance of roles, ideas, approaches of several farmers? How different but equal weight voices would have been balanced in decision-making?
- **Advisor has technical, project management and soft skills**. Able to communicate, to build trust facilitate, keep partners engaged and to comply to the administrative chores and compromises of a funded project.
- **Clear layout of goals and tasks allowed for clear expectations & roles of the partners.** This results in highly committed partners that increase project efficiency project and in minimal conflicts or disagreements among them.
- **Ability to secure the funding, and flexibility of the funding mechanism**.

Main barriers

How to keep moving and spread the technical & the social innovation. Important to find out until what degree the solution is transferable to other farms.

- There is a **technical barrier as the device is not available in the market** (is not being scaled up).
  ➔ Suggestion: maybe explore the EU connections of the EIP AGRI network to link and make joint effort to scale up with other well-positioned actors to make this possible.
- Moreover, the tester farmer already has the device but is not using it, what **suggests other potential issues that condition uptake**:
  - **no interest** in innovation by farmers as farming is their second job.
    ➔ Suggestion: make the benefit of using the innovation direct and clear, motivate them.
  - **technical complexity & difficulties in use**, requires knowledge on programming, ration calculations and feed management so it can be tailored to each farm needs.
    ➔ Suggestion: train advisor and farmers, create user-friendly protocols and guidelines, mixing your farmers and experienced ones so they can have mentoring going both ways.
  - consider the **potential need for financial support when acquiring the device**. A priori, case partners believe the device is not going to be expensive but is worth to explore this issue.
    ➔ Suggestion: have in mind potential solutions as co-financing the device, have the possibility to test the device in farm prior acquiring it…

Outcomes of the success case

- **Technical innovation**: Development and fabrication of an automatic feeding device that delivers the optimal ration to each cow.

- Social innovation: **Innovation goes beyond the device, empowering farmers, and connection among AKIS actors.**
    - Farmer as the innovator, "superfarmer", generates innovative idea that addresses his needs and is proactive to materialize it. Empower less innovative farmers that need more support from advisors to uptake innovation or to develop and implement their own. Empowerment by building trust, self-confidence, and capacities (problem-solver mindset and know who and where you can find support). This is challenging as farming is per usual a second business and they already have another job to keep up with.
    - Strengthen links between actors, advisory-farmer, -research, -public administration, -civil society, -market….

Reflection meeting (see "Reflections" video)

7. Lessons learnt

Lessons from the case to enhance interactive innovation:

Each **success case is unique, and projects might have several formulas** due to each country legislation and calls, particularities of funding body (even though when they have same "root" as in measure 16 EIP-AGRI linked calls) characteristics of the advisory system and sector at least comparing both cases involved in this peer review. No silver bullet, there is need for tailoring interactive innovation to each case.

Anyhow, some common lines and lessons identified are:

- **Having "driving forces" of the project:** highly motivated and compromised individuals, not just with the innovation also with the administrative part of the project.
- **Bottom-up process** (involved farmers).
- Importance of the **connector figures**, institution wise (CAFS) and person wise (advisor). Advisory organization is proactive and enables its advisors to support these projects.
- **Advisor is essential for the interactive innovation process as it provides support to actors involved in the project**. Support offered requires a wide array of different skills from technical (professional, topic related), to "administrative" (proposal writing, knowledge on funds and application, report writing…) and "social" (trust, conflict solving, facilitation skills, connected to experts, funding bodies, public administration…). Maybe too many tasks/skills for one person. This is why an advisor belonging to a strong institution as CAFS allows for having support from other departments within the institution in administration or communication tasks as happened in this project. This enables to better balance technical skills, project management and soft skills required.
- A **clear layout of the project regarding goals, milestones, and deadlines as well as tasks and contribution of each partner** is key for effective support of interactive innovation and to move forward onto the process.
- **Funding: availability, accessible, public information about the fund characteristics and requirements, flexibility of funding mechanisms**, especially important is the **time when actual money is received** (all at once or split by periods, early or late into the project development).
- **Recognition** of the work done; innovation projects are very demanding, so acknowledgement is gratifying and motivates to pursue this path.
- **Transference of knowledge and/or technical solution** to other farms. Result expected by innovator/s (own benefit) has to be aligned with result expected from the innovation funding body (widespread innovation).

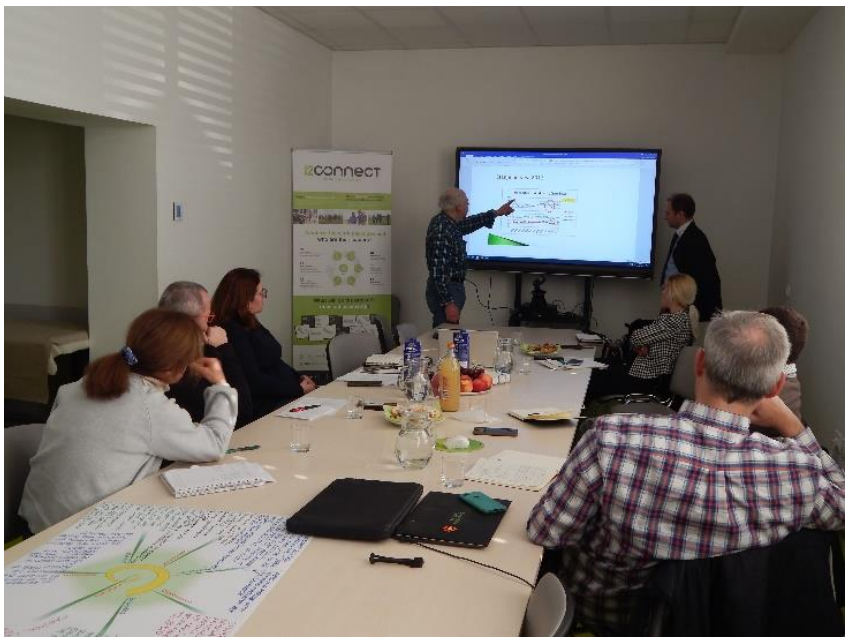
The driving forces of the project, Andrej Kastelic (left) and Alojz Ferlan(right)

<u>What we learn from field review as a process to learn about interactive innovation:</u>

- **Face to face field visit** provided a first-hand experience on the innovation process of the Slovenian success case and it energized the Spanish advisor and farmer making them realize the potential of interactive innovation.

While face to face has many advantages over online, please consider the trade-off of travel times + 2 days of meetings per visit (excluding preparation meetings and tasks).

- In this regard, please consider the burden for participants not belonging to the i2connect project (advisor and farmer). For them this exercise is very time demanding (6-7days just for both visits), prevents they from working on their business and is done without any compensation.
- The **methodology** is systematic, allows for obtaining a complete picture of the success case and it was explained thoroughly. Nonetheless it is quite complex. The question flowchart requires a lot of time to "process" it, also since the important questions should come mainly from peers (advisor, farmer) it needs to be explained to them as well. When this was done both were concerned as they perceive the Q&A slides very difficult. Consider trying to simplify the Q&A flowchart.
  On the other hand, the spiral of innovation and the energy timeline are quite intuitive and useful and were very well dynamized by our workshop leader, Jana Žiberna.
- **Language** is a huge barrier, especially for farmers, and leads to moments of isolation and some missing information. This was minimized in our case as luckily our host (Saša Plestenjak) is very fluent in Spanish and the advisor, Andrej Kastelic, was doing a great job to translate to the farmer/from him.
- From case coordinator perspective, once we received the training and preparation time was dedicated to the field visit roles and tasks were clear and thus not having an observer at the end did not have an impact. It is difficult for everyone (interviewers, interviewees) to avoid talking about content (technical, topic: precision feeding, device) and focus into the process (interactive innovation).



Interviews and field visit

8. Additional insights from case coordinator

In this section, an additional set of insights from case coordinator Saša Plestenja are added for a more complete overview of the enabling environment around the case.

The **first** most crucial AHA moment/learning moment in the Slovenian practical case was:

- The farmer got an initial idea from the precise plant fertilizing and then he wanted to transfer that idea to the precise feeding for animals.

- Bottom-up process where self-initiative and proactive farmer got an idea how to improve the health and vitality of his dairy cows, so he designed a machine for precision feeding of cattle. Farmer was directly involved in the solution development.

Stage in Spiral of innovation: it happened in the initial idea (1st stage of the spiral)
Stakeholders involved: Only the farmer Mr. Ferlan.

The **second** crucial AHA moment:

- Mr. Ferlan found a like-minded advisor Andrej Kastelic at the presentation of one EIP project by Agricultural ministry of Slovenia, with whom he connected immediately and told him about his idea which he wanted to realize. The advisor was impressed and inspired by his idea.

Stage in the spiral of innovation: 1st stage or initial idea
Stakeholders involved: the farmer and an advisor whose assistance the farmer needed to apply the EIP project (Andrej Kastelic from CAFS institute Novo mesto)

The **third** crucial AHA moment:

- The advisor was relieved after pestering the farmer for few months to stop sketching and start doing the feeding machine, as advisor was still indecisive if the project will really happen, or they will need to cancel it. First the advisor was sceptical if the farmer will be really able to create the feeding machine by himself, but because the farmer has few registered innovations, the advisor decided he will trust him. And the farmer really started to assemble the machine as soon as he got all the parts.

Stage in the spiral of innovation: in between planning and development.
Stakeholders involved: farmer, advisor, private sector (technical stores with the supplies of electronic parts for the feeding machine, computer)