



**RE.  
CAP**

**Reinforcing CAP**

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## i. Glossary

### Co-production

The term co-production was used in this context to refer to the working together of stakeholders from different sectors and regions across the EU in achieving a shared goal - to develop and pilot test a platform for the delivery of public services that will enable the improved implementation of the CAP, targeting Paying Agencies, agricultural consultants and farmers. This multidisciplinary team was made up of Partners on the project, some of whom were also end-users, and a range of other stakeholders.

### Partners

These included those individuals from the organisations that were formal participants in the RECAP project. Individuals from each organisation comprised the project team, committed resources and delivered on project work packages where appropriate. Within this context, all the participants are listed below in Table 1.

**Table 1: LIST OF PARTICIPANTS**

#	Participant Legal Name	Country
1	DRAXIS ENVIRONMENTAL S.A.	Greece
2	INSTITUTO NAVARRO DE TECNOLOGIAS E INFRAESTRUCTURAS AGROALIMENTARIAS SA	Spain
3	ORGANISMOS PLIROMON KE ELEGHOU KINOTIKON ENISHYSEON PROSANATOLISMOU KEEGGYISEON	Greece
4	NACIONALINĖ MOKĖJIMO AGENTŪRA PRIE ŽEMĖS ŪKIO MINISTERIJOS	Lithuania
5	VIESOJI ISTSIGA LIETUVOS ZEMES UKIO KONSULTAVIMO TARNYBA	Lithuania
6	STRUTT & PARKER	United Kingdom
7	INSENS DOO NOVI SAD	Serbia
8	UNIVERSITY OF READING	United Kingdom
9	NATIONAL OBSERVATORY OF ATHENS	Greece
10	INICIATIVAS INNOVADORAD SAL	Spain
11	ETAM ANONYMH ETAIREIA SYMBOYLEYTIKON KAI MELEHTHIKON YPIRESION	Greece
12	CREVIS SPRL	Belgium

The contributions from the partners varied depending on their areas of specialist expertise and knowledge, although their overall goal was shared between all Participants. Partners covered a range of roles including farm advisors, agricultural consultants, Paying Agency inspectors, academic researchers, software developers and remote sensing experts.

Due to the European nature of the RECAP project, the Participants were drawn from five regions, with representation of different types of partners from across the five regions.

### End-users

The end-users were defined as the individuals or groups that would be the main people interested in using the platform to facilitate their role. Within the context of this report, end-users were identified in D2.2 and included; farmers, land owners and agricultural consultants (submitting Basic Payment Scheme claims, recording of information to demonstrate adherence to cross compliance conditions and Greening Measures), and Paying Agency staff and inspectors (administration of remote inspections and On The Spot Checks). Representation was sought from each of these end-user types to support the development of the RECAP platform. The involvement of each of the end-users differed depending on their area of expertise, knowledge, experience and accessibility. While some of the RECAP partners also represented end-users of the platform, many additional end-users were consulted at strategic points during the project's lifetime.

### Developers

The developers were staff of DRAXIS, an ICT company specialising in environmental consultation services. They were responsible for creating and editing the RECAP platform and were tasked with incorporating the user-need suggestions that were identified through co-production activities with end-users. They facilitated feedback through multiple media including face-to-face meetings, webinars, Skype discussions, emails and the **Taiga** application.

### Taiga

Taiga is a freely available, agile project management application that can manage and document the interactions between software developers and **testers** for their innovative software packages. Taiga was used in this project to collect information and data on enrichment suggestions, questions and bugs regarding the RECAP platform. This information was then used for further analysis into the understanding needs and issues raised through **Tickets**, and in exploring social networking patterns within the development process.

### Testers

The online version of the RECAP platform was accessible to partners who were given the responsibility as testers, to test the platform to identify any issues and bugs found during data inputting. These could be rated in terms of severity and priority and sent to the developers to be considered. Some of the testers went on to train other end-users on how to use the platform, including farmers during the farmer piloting phase of the RECAP project.

### Tickets




When testers submitted their bugs, enrichment suggestions or questions onto Taiga, this was done in the form of raising a ticket. Each ticket would be given a unique ticket number and, when completed or rejected, the ticket would be closed. Testers used tickets in different ways, with some submitting a single point/comment/question to each ticket, while others submitted multiple points/comments/questions to Taiga within one ticket.

# 1. Executive Summary

## Introduction

1. The overall objective of the RECAP project was to develop and pilot test a platform for the delivery of public services that will enable the improved implementation of the Common Agricultural Policy (CAP). RECAP integrates open and user-generated data into added value services, co-designed, and co-created by public authorities, farmers, and agricultural consultants.
2. The RECAP project was focused on supporting the administration of the Basic Payment Scheme (BPS). Following the 2013 CAP reform EU farmers were able to apply for direct payments through the Basic Payment Scheme. 'Cross compliance' and 'Greening measures' are two mechanisms that are linked to these payments to ensure more environmentally-friendly farming. The RECAP project was focused on developing a software platform to assist in the implementation and monitoring of these schemes.
3. RECAP was developed using a co-production approach with the end-users as active stakeholders in the development process. This report details the participatory methodological framework that was used to support the development of the public service.

## Methods

4. During early investigational work on user requirements, it was established that one platform alone would not be capable of executing all the needs and functions identified. This was largely due to subsidiarity in the way the Basic Payment Scheme is administered in each region leading to variation in the requirements that claimants have to meet and different processes for inspection amongst Paying Agencies and other competent authorities.
5. It was therefore considered to be easier to create multiple platforms, one for each of the five regions represented amongst the project participants, rather than one that would need to be dismantled and rebuilt to fit the requirements of the five regions each with their own specific functions and languages for their user group and different work flow needs.
6. Relevant partners and stakeholders were identified early within the project's development, with the key end-users being identified as part of Deliverable 2.2. This report also identified that different regions and end-users have different needs of the platform. Therefore, each end-user and each country were expected to interact with the platform in a unique way. As a result, representation from all types of end-users and all five regions involved in the project was required to ensure that the different versions of the platform were fit for purpose.
7. Various co-production activities were used throughout the project lifetime. These included a number of activities to define the scope and functionality of the platform:
  -  Consultation with farmers, agricultural consultants and Paying Agencies concerning their user requirements of the platform
  -  Consultations between Paying Agencies and remote sensing experts regarding opportunities for use of satellite imagery for remote inspection
  -  Consultations with software developers external to the project team regarding API and SDK requirements

8. Development of the platform involved various iterative stages, with feedback collected in various ways at key stages in the development process (month 11, month 17) and during the piloting phase (months 26-28). In addition, an online platform, Taiga, was employed to manage interactions between developers and end users throughout the platform development process.
9. Towards the end of the project, after the piloting phase, feedback was gathered from project partners and end-users of the platform who had been involved in the development process, regarding the value of co-production as a process and how the strengths and weaknesses of the methods used.

## ***Key findings and conclusions***

10. The co-production of RECAP as a public service tool to support the completion of cross-compliance applications and to demonstrate farmers have met EU CAP regulations, has been successful in not only developing an effective and accurate platform, but one that is user-friendly and efficient for its end-users.
11. This success has been due to a multi-disciplinary and multi-regional team demonstrating commitment and the capacity to collaborate in new ways with other stakeholders and with end-users to achieve this shared objective through an iterative process of co-production.
12. The early work to identify end-users and their specific end-user needs enabled the project team to ensure key stakeholders and the RECAP end-users were involved in its development. This ensured legitimacy and value in the project for many regions.
13. This early work also quickly identified that there was a need for customisation at both a regional level and within the profile of different user groups to ensure that efficient platforms were built. It also highlighted the importance of developing the platform that was fully informed through the process of co-production.
14. To ensure as many user requirements were incorporated as possible, opportunities for co-production occurred throughout the project's lifespan and the pilot evaluation and feedback process has identified areas for future development of the concept. By using a wide variety of co-production and participatory methods, realistic expectations from those involved in the process were met.
15. Through evaluation, it was reported that not all the co-production and involvement methods were suitable or effective for everyone. Feedback on co-production was captured and this information can be adapted and applied to future projects utilising co-production.
16. Four key lessons learnt were:
  - The importance of having members from all end-user types – including technical staff - consulted within the development process, and not relying solely on recommendations made on behalf of another end-user. This would avoid important features or key priorities and concerns being missed.
  - The importance for co-production plans to be considered as early as possible as well as being agile and able to evolve to suit those involved through the project lifetime as there is a danger in under-estimating how long co-production activities can take to design and carry out.
  - The importance of well timing major co-production and project activities, as this can have an impact on recruitment, level of engagement, and capacity to deliver on time and to quality for all stakeholders and end-users.
17. Not all co-production methods are suitable or effective for all groups; therefore it is more appropriate to employ a range of participatory methods to ensure engagement and to gather high quality feedback from everyone.
  - The importance of providing feedback to all those who participate in the co-production process to enable them to feel that their input was recognised and valued.

## 2. Introduction

### 2.1 Scope of the project

The overall objective of the RECAP project was to develop and pilot test a platform for the delivery of public services that will enable the improved implementation of the Common Agricultural Policy (CAP). RECAP integrates open and user-generated data into added value services, co-designed, and co-created by public authorities, farmers, and agricultural consultants.

The RECAP project was focused on supporting the administration of the Basic Payment Scheme (BPS). Following the 2013 CAP reform EU farmers were able to apply for direct payments through the Basic Payment Scheme to act as a safety net in the form of a basic income support. 'Cross compliance' and 'Greening measures' are two mechanisms that are linked to these payments to ensure more environmentally-friendly farming approaches and deliver continued food security and safety in Europe. The RECAP project was focused on developing a software platform to assist in the implementation and monitoring of these schemes. There are three main ways that the scheme is monitored; administrative checks of paperwork, visual on-the-spot-checks (OTSC) and Control with Remote Sensing (CwRS).

The RECAP platform aims to support all of these by:

*Developing a public service for the improved implementation of the Common Agricultural Policy (CAP) through the combination of open data and user-generated data. RECAP will: (i) improve public services through a more collaborative co-created model, which promotes the active participation of farmers in the design and delivery of the public services, and allows efficient processes; (ii) offer personalised services to farmers for complying with the environmental standards of the Cross-Compliance Scheme; and (iii) provide to agricultural consultants the opportunity to develop added value services which make use of open and user-generated data.*

### 2.2 Co-production of services

RECAP was developed using a co-production approach with the end-users as active stakeholders in the development process. This report details the participatory methodological framework that was used to support the development of the public service.

#### 2.2.1 Co-production in rural policy development and implementation

There is increasing emphasis on involving stakeholders within the creation of new rural policies and rural development as part of the regulatory framework for European rural development policy 2014-2020. Stakeholders within this context are defined as "individuals or organisations who have a stake in a matter by being either involved in or influenced by it" (ENRD, 2015). Member States and Managing Authorities have a legally binding obligation to strengthen stakeholder involvement in policy formulation and in all phases of the implementation process (ENRD, 2015). Enhancing Participation is also the first objective in the Strategic Framework of the EU Rural Networks (ENRD, 2015).

There are clear benefits in involving stakeholders in rural policy formulation and implementation reform. These include increased effectiveness of implementation due to shared ownership of EU policies, increased knowledge, insight and experience when designing and implementing strategies, and greater transparency in



the process. This cooperation is a two-way process, with stakeholders expecting to witness tangible results which better fit their needs.

The Strategic Framework of the EU Rural Networks highlights a need for promoting the speed and extent to which findings from research are translated into agricultural practice, and that research agendas are based on the actual needs of the farmer to a greater extent. Neither of these enhancements can be done effectively unless relevant stakeholders work together.

Involving stakeholders in research into the design or implementation of public service delivery processes also offers many benefits including more effective and efficient outcomes, greater satisfaction with end products and more transparency through stakeholder involvement (Voorberg *et al.*, 2015). The involvement of stakeholders early in the process enables their needs, priorities and concerns to be identified and addressed, and any barriers, issues or inaccuracies to be identified and either mitigated or avoided.

One form of involving stakeholders within project development is to involve them through co-production.

### 2.2.2 Co-production as a process

Co-production can be defined as; “the provision of services through regular, long-term relationships between professionalized service providers (in any sector) and service users or other members of the community, where all parties make substantial resource contributions” (Bovaird, 2007). There are various other definitions but there are a number of distinctive characteristics of co-production on which all definitions converge (Löffler, 2009):

- In the frame of co-production, users act as active stakeholders rather than passive consumers
- The relationship between public producers and service users is a collaborative one
- The main objective of co-production is the delivery of outcomes rather than the production of services
- It is believed that co-production may be either substitutive or additive. Where co-production is substitutive, local government inputs are replaced by inputs from users, resulting in cost savings to the public sector and lower staffing. In case co-production is additive, it adds more user inputs to professional inputs or inserts professional support to previous individual self-help or community self-organizing.





There is also a normative element to co-production, establishing key principles around equality, diversity, access and reciprocity. Specifically, Horne and Shirley (2009) proposed that effective co-production is based on four values:

- “everyone has something to contribute”
- “reciprocity is important”
- “social relationships matter”
- “social contributions are encouraged rather than financial contributions”

A co-production approach has been utilised in the delivery of public services using both individual (Pestoff, 2006) and third sector (Brandsen & Pestoff, 2006) participants; to the extent that it is a normal part of software development to have workflow plans that include end-users (Etgar, 2008). Co-production is characterised by long-term collaborations where all partners make substantial contributions (Bovaird, 2007). It has been recommended as a strategy for public policy by the OECD (OECD, 2011) and as the literature in this area advances, more defined strategies are being developed for how to incorporate different types of user groups in the co-production process (Osborne *et al.*, 2016).



End-users are particularly important in the co-production process and are considered co-designers of public service delivery (Voorberg *et al.*, 2015). End-users are doing more than merely participating; they are not just passive recipients of the end product, they are deciding how services are designed and delivered (Voorberg *et al.*, 2015). Also called co-creation, this approach has active involvement of the end-users in the production process and therefore is more specific than the broad idea of participation (Brandsen & Pestoff, 2006; Verschuere, Brandsen & Pestoff, 2012) or stakeholder engagement. A recent systematic review (Voorberg *et al.*, 2015) found that public sector projects have utilized co-creation to achieve four key objectives:

-  To increase effectiveness
-  To increase efficiency
-  To increase customer satisfaction
-  To increase citizen involvement

In the systematic review by Voorberg and his co-workers of 122 articles on co-production and co-creation in public sector projects, only one was related to farmers or agriculture. Recently uses of co-production in agriculture has focused primarily on the co-production of knowledge (e.g. Coolsaet, 2016; Sherren & Darnhofer, 2018) rather than the co-production of goods and services.

Therefore, this project developed a novel framework of participatory activities that would engage end-users as co-producers in the agile software development process.

### 2.2.3 Agile software design

Rather than following a traditional 'waterfall model' for software development (Royce, 1970) that involves application development in phases with checkpoint and deliverable documents at each checkpoint, an agile methodology was chosen for the development of RECAP. The agile methodology (Beck *et al.*, 2001) proposes alternatives to traditional system development. Agile approaches are typically used to help businesses respond to unpredictability. It promotes adaptive planning, evolutionary development and delivery, a time-boxed iterative approach, and encourages rapid and flexible response to change. One of the most widely used system development frameworks, based on the agile methodology, is the 'Scrum' framework (Schwaber & Beedle, 2002).

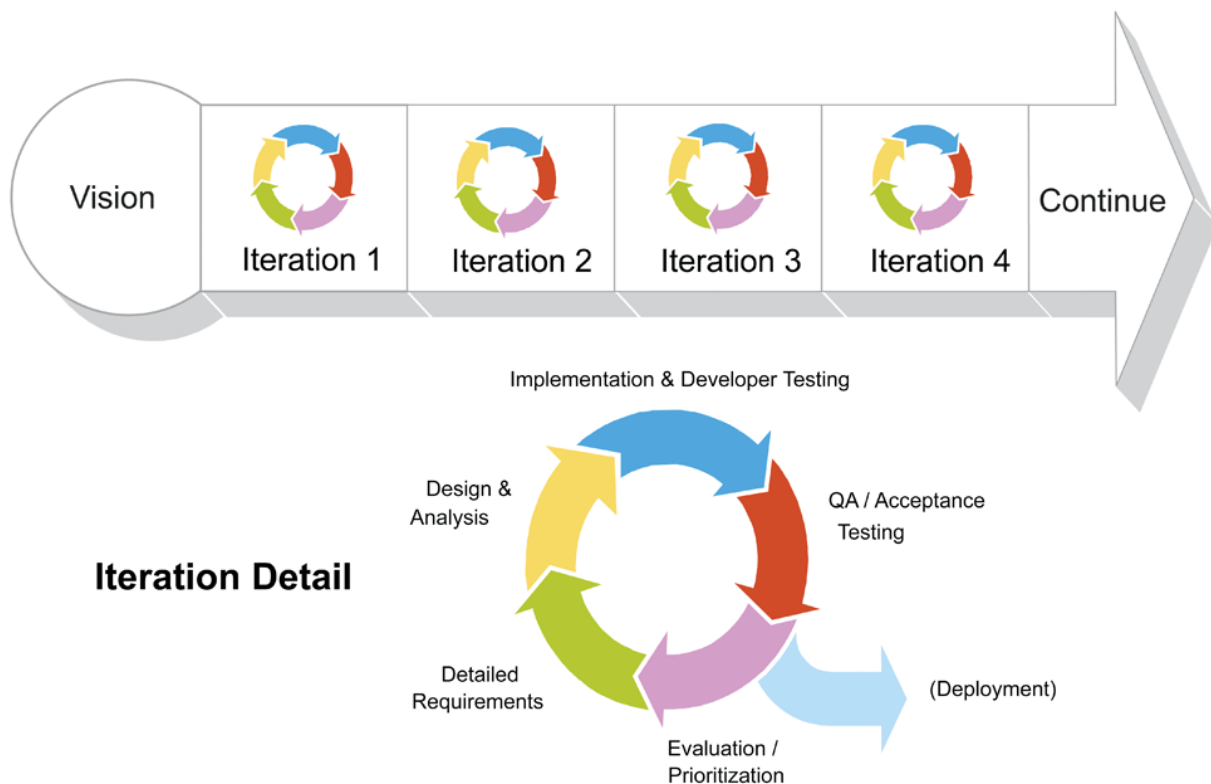
### 2.2.4 The Scrum framework

Scrum is a management framework for incremental product development using one or more cross-functional, self-organising teams (Schwaber & Beedle, 2002). It provides a structure of roles, meetings, rules, and artifacts. Teams are responsible for creating and adapting their processes within this framework. Scrum uses fixed-length iterations, called 'sprints', which are typically between two weeks and 30 days long. Scrum teams attempt to build a potentially shippable (properly tested) product increment every iteration. The greatest potential benefit of Scrum is for complex work involving knowledge creation and collaboration, such as new product development. It is particularly effective in situations where there is likely to be temporal changes in user requirements or unpredictable challenges in the development of the product.

The stages are:

- 🌱 Detailed requirements: at this stage, the detailed system requirements are defined
- 🌱 Design and analysis: based on the previous stage, the design and analysis of the system are performed
- 🌱 Implementation and developer testing: system development and testing in accordance with the above design and analysis
- 🌱 QA / Acceptance testing: quality assurance and acceptance tests are performed
- 🌱 Deployment: deployment of the system
- 🌱 Evaluation / Prioritization: evaluation of the system

Figure 1 shows a graphical representation of this process.



**Figure 1: The Scrum development framework, showing the incorporation of development activities into each iteration, adapting to feedback at intervals in the development process (source: James & Walter 2018).**

### 2.2.5 Co-production of the RECAP platform

The existing process for monitoring whether Basic Payment Scheme claimants have met the cross-compliance conditions and greening measures has a high resource and cost burden associated with it. There are administrative costs for Paying Agencies associated with on-farm inspections and difficulties in disseminating changes to requirements. For farmers; they are tasked with familiarising themselves with the relevant conditions and regulations applicable to their specific geographical location and farming system, while being aware of any potential breaches in the requirements of the scheme. At the same time agricultural consultants are looking for opportunities to improve the advice and services they can provide for their customers. The RECAP solution was to provide a public Software as a Service system to improve this situation.






It was important to identify appropriate stakeholders to include in the development process for the RECAP platform to ensure multiple perspectives and expertise are incorporated, while not being led by bias and personal agendas (OECD 2011). Involving end-users early in the process was critical for the development of a platform that would be fit for purpose and for evaluating whether the product offers a better solution than those currently available (Osborne *et al.*, 2016).

One of the largest challenges for co-production is enabling the different stakeholders to work together by bridging the gaps between them and finding a common way of working, irrespective of roles, principles and interests. Therefore, a variety of methods was used and evaluated to ensure the approach works best for stakeholders to exchange ideas and comments.

Within the context of this report, co-production was regarded as the process of involving and engaging with a variety of representative stakeholders in agile ways during platform development, up until completion of piloting sessions with end-users.

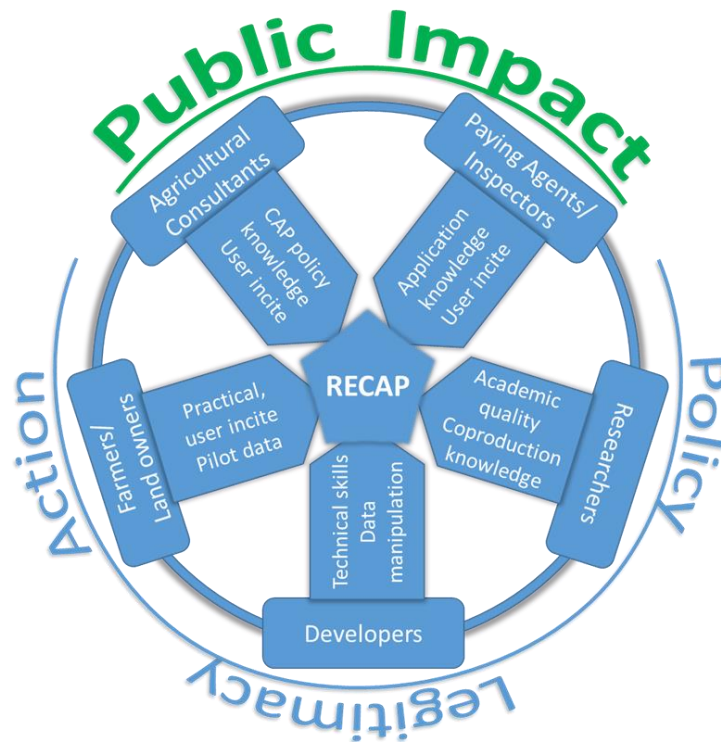
## 2.2.6 End-user groups

Stakeholders of the RECAP project were identified as Paying Agencies/ Inspectors, farmers/ land owners, Agricultural consultants, researchers, developers and project managers. Within these, three groups were identified as key end-users (Deliverable 2.2);

-  Paying Agencies (PA)
-  Agricultural Consultants (AC)
-  Farmers (F)

Through co-production, each stakeholder had the opportunity to add value to the development of the platform, with significant emphasis on input from the end-users (see **Figure 2** below).

The main RECAP team included representation from two key end-user groups, Paying Agencies and Agricultural Consultants and spanned across the five regions. They were treated as equal partners on the project, contributing efforts and expertise. It was expected that Paying Agency contribution towards developing the platform would be to ensure the platform was suitable for their role as inspectors, as well as to ensure the administrative information included was relevant and correct. Agricultural consultants were expected to contribute more practical advice and offer both a social and knowledge bridge between farmers and the RECAP team. Their role frequently involved them taking a farmer's perspective towards the platform. Whilst they also facilitated the farmer involvement in the project, they also needed to protect their clients from unnecessary complexities and menial requirements of the project. This led to the farmers' contributions mainly being focused at strategic points within the development process, and through more formal and purposeful activities to reserve their efforts and interests and reduce the risk of survey fatigue.



**Figure 2: Key stakeholders and their contributions towards the development of the RECAP platform**

### 2.3 Aims of co-production

This report outlines the framework of how stakeholders (end-users) were involved in the co-production of the web-based platform aimed at providing a service to enhance the administration of the CAP, in particular with respect to enhancing compliance and reducing inspection costs associated with the cross compliance and greening measures in the Basic Payment Scheme.

In collaboration with key stakeholders and end-users, the co-production approach was used to support and maximise the delivery of the key aims of the RECAP project which were:

- To use co-production to support the development of a generic RECAP platform
- To customise RECAP for regional requirements

This report details the framework for the participatory co-production approach that was undertaken to provide an improved public service for cross compliance monitoring - the RECAP platform.

## 3. Methodology

### 3.1 Customising RECAP

The initial plan was to build one platform that could be translated into each language of the five regions represented amongst the participants and therefore customised for regional use. Often developers develop one platform, and then modify this accordingly. During early investigational work on user stories/ workflows, it was established that one platform alone would not be capable of executing all the needs and functions identified. This was largely due to subsidiarity in the way the Basic Payment Scheme is administered in each region leading to variation in the requirements that claimants have to meet and different processes for inspection amongst Paying Agencies and other competent authorities. It was therefore considered to be easier to create multiple platforms, rather than one that would need to be dismantled and rebuilt to fit the requirements of the five regions each with their own specific functions and languages for their user group and different work flow needs.

To capture the differences in the regional, user type and functional requirements, a range of methods of communication with the developers were established as appropriate. These included: emails, reports, individual and group Skype meetings, face-to-face small workflow or large consortium meetings, organised interviews and workshops, or through submitting tickets through Taiga. All these methods can be used to exemplify how different users and stakeholders contributed towards the co-production of the RECAP platform.

### 3.2 Engagement of stakeholders in the co-production process

The early identification that the customising of the platform would require more work than just translating one platform into other languages meant that five platforms needed be developed concurrently and the project timeline was adjusted to allow sufficient time for this to be done.

Relevant partners and stakeholders were identified early within the project's development, with the key end-users being identified as part of Deliverable 2.2. This report also identified that different regions and end-users have different needs of the platform. Therefore, each end-user and each country were expected to interact with the platform in a unique way. As a result, representation from all types of end-users and all five regions involved in the project was required to ensure that the different versions of the platform were fit for purpose. The numbers of those involved at different stages in the co-production process are detailed in Figure 3.

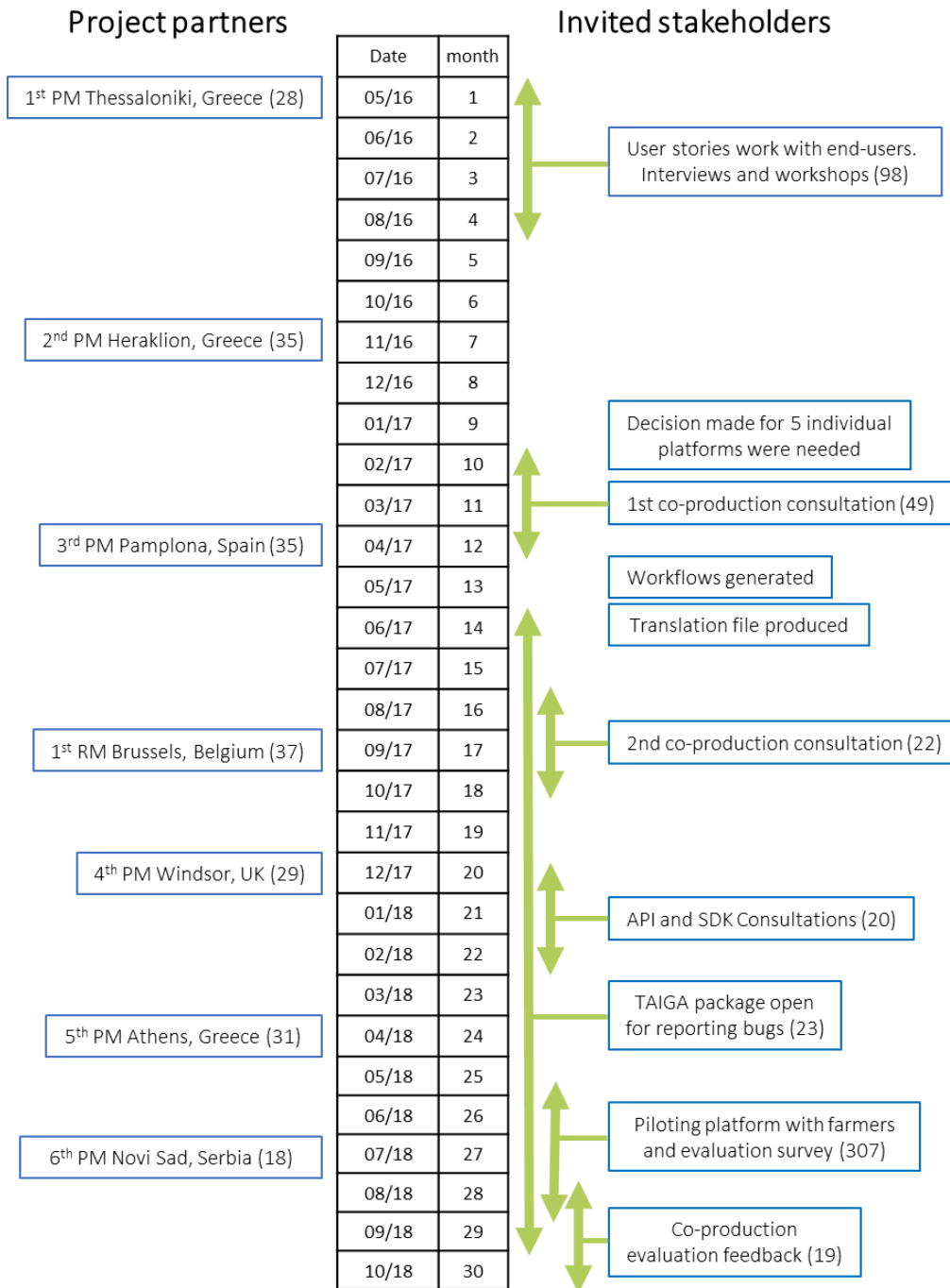
For Paying Agencies and Agricultural Consultants as end-users, representation came through Participant organisations. Duties and responsibilities were assigned to members within the team according to availability and expertise. Farmers were also identified as end-users for the platform, but due to their existing business commitments to their farms, few individual farmers maintained continuous involvement throughout the project. To account for this and not to lose farmer perspective within the project, a variety of formal and informal methods to capture input were utilised for all types of end-users. This also gave other Paying Agencies and Agricultural Consultants, who were not partners in the project, the opportunity to support the development of the package at strategic intervals. Most farmers supporting the project were only approached once during one of many significant points within the development process. This decision was taken in order to prevent farmers getting fatigued or disinterested by the longevity of the project and reserve their efforts for more relevant development stages. As there were no incentives for the farmer to be involved, this form of limited requests for help seemed appropriate. A few farmers who displayed a willingness to be involved were invited to participate in multiple stages of the platform development, and although they held no

responsibilities within the project itself, they provided consistent and progressive feedback and incite as farmer representation throughout the platform's development.

### **3.3 *Timeline of co-production activities***

Various co-production activities were used throughout the project lifetime. A timeline for major involvement activities is outlined below (Figure 3).

**Figure 3: Timeline with key co-production events between partners and stakeholders**



**Table 2: Opportunities for use of remotely sensed data for monitoring of compliance with requirements of the Basic Payment Scheme.**

Compliance Area	Specific detail	Reference	Are there problems with assessment at the moment?	Specific items that could be checked via image	Any other comments (for example - is this an area with a high administrative burden or that is often found to be a problem at inspection?)
<b>Water: Buffer Strips</b>	Location of watercourses	GAEC1	Definition of water courses	Location of watercourses included under this control	Water courses change with time (especially with climate change) and may be temporary (noted in arid areas)
<b>Water: Buffer Strips</b>	Applying fertilizers, pesticides or commercial cultivation within 2m of watercourses	GAEC1	Would be very time consuming by inspection	Cultivation within 2m of watercourses (though may be hard to distinguish from permissible green cover)	Time of year dependant - how is this assessed if cross compliance visit not at relevant point in the year?
<b>Water: Buffer Strips</b>	Maintaining green cover near watercourses	GAEC1	Would be very time consuming by inspection	Not maintaining green cover within 2m of watercourses (e.g. storing bales of dredgings). Problems may be that this is often temporary.	Time of year dependant - how is this assessed if cross compliance visit not at relevant point in the year? Possible application for geotagged photos?
<b>Water: Buffer Strips</b>	Location of field manure heaps	GAEC1	Time consuming and if heaps are temporary may not see	Field heaps within 10m of surface water or 50 m of well/borehole etc	Time of year dependant - how is this assessed if cross compliance visit not at relevant point in the year? - Summer vs. all year round inspections. What frequency would be required? Possible application for geotagged
<b>Water: Abstraction</b>	Permits required for irrigation	GAEC2		Identification of irrigated areas	
<b>Water: Groundwater</b>	Mapping of risk of groundwater contamination	GAEC3	Would be very time consuming by inspection	Direction of cultivation and other field operations with respect to slope and soil type. Mapping of proximity to watercourse, residential areas	Time of year dependant - how is this assessed if cross compliance visit not at relevant point in the year?
<b>Soil/Carbon: Soil cover</b>	Maintain soil cover (unless agronomic justification)	GAEC4	Would be very time consuming by inspection	Maintaining soil cover in winter. RS could provide early evidence of failure of autumn-sown crops	Very variable depending on crops grown. Could look at field slopes to provide risk maps? Also could look at ploughing strategies (though differences depending on region as to what is recommended/required)
<b>Soil/Carbon: Soil Erosion</b>	Limiting soil and bank erosion (cropping practices, livestock management, wind and machinery)	GAEC5	Would be very time consuming by inspection	Direction of cultivation and other field operations with respect to slope and soil type	Time of year dependant - how is this assessed if cross compliance visit not at relevant point in the year?
<b>Soil/Carbon: Soil Organic matter</b>	Crop residue burning restrictions (may not burn crop residues unless there is a plant health reason)	GAEC 6	Would be very time consuming by inspection	Evidence of crop burning should be easily visible using RS.	Time of year dependant - how is this assessed if cross compliance visit not at relevant point in the year?
<b>Soil/Carbon: Soil Organic matter</b>	Burning heather and rough grass	GAEC 6	unsure	Evidence of burning rough ground should be easily visible using RS.	Time of year dependant - how is this assessed if cross compliance visit not at relevant point in the year?
<b>Landscape Features</b>	Removal of hedgerows, stone walls, terraces	GAEC 7	Would be very time consuming by inspection	Removal of landscape features should be easily visible using RS.	Possible application for geotagged photos?
<b>Landscape Features</b>	Maintaining isolated trees	GAEC7		Changes probably visible using RS	Possible application for geotagged photos?
<b>Landscape Features</b>	Protecting scheduled ancient monuments	GAEC7			
<b>Water: Nitrates</b>	Area treated with N	SMR1		Extent of fertilized area ?	
<b>Water: Nitrates</b>	Must inform of new slurry installation construction	SMR1	can only check retroactively	Building should be visible using RS.	
<b>Biodiversity:</b>	Maintenance of semi-natural	SMR2,		Mapping of habitats using RS data	Integration with CORINE
<b>Biodiversity: Crop Diversity</b>	Diversification of crops	Greening 1	Very dependant on time of year	This is quite likely to be visible by RS, but there are some crops that may be too similar (e.g. barley and can. RS differentiate short term leys from permanent)	Already used by Pas. LAR used to detect different crops with presenter claiming 90% accuracy.
<b>Soil/Carbon: Grassland</b>	Maintenance of permanent grassland	Greening 2	Should be easy to assess	Monitoring grassland should be fairly straight forward.	
<b>Biodiversity: EBA</b>	Dedication of 5% of arable land to 'ecologically beneficial elements'	Greening 3	Time consuming. Challenges of mapping	This is quite likely to be visible by photo, but there are some may be tricky (e.g. use of legumes as an EFA)	Issues of definitions of eligible EBA land cover in different countries

### 3.3.1 Consultation with Paying Agencies on remote sensing opportunities (May 2016)

An online questionnaire was sent to the RECAP Paying Agency partners to present options for the areas of cross compliance that have potential to be remotely inspected by using remote sensing data. These were divided up into areas where it is likely Sentinel data could be used (Table 2).

### 3.3.2 Gathering RECAP user requirements from all end-user groups (May-Sept 2016)

A meeting was held with staff of the Rural Payments Agency (the English Paying Agency) to discuss the RECAP project and its aims. The discussion centred on the potential use of the RECAP platform to support their cross-compliance inspections and from this interaction the workshop methodology was developed for gathering user needs from the other countries.

The user needs of the three end-user groups were gathered using 'user stories' workshops or interviews in each partner country (full details of the methodology and results are detailed in D2.2). Framing user requirements as concrete and discrete suggestions, called "user stories" is a common technique in software design (Cohn, 2004). Table 3 shows the number of participants who took part in each consultation (in addition to the workshop facilitator).

**Table 3: End-user consultations (May-Sept 2016), showing number of participants**

Country	Paying Agency staff (workshop)	Farmers (individual interview)	Agricultural consultants (workshop)
Greece	6	15	-
Spain (Navarra)	4	14	-
Lithuania	8	15	-
UK (England)	5	13	7
Serbia (Vojvodina)	n/a	9	2
<b>TOTALS</b>	<b>23</b>	<b>66</b>	<b>9</b>

The consultation in Serbia was with end-users from the Organic Certification body because, in the absence of a Paying Agency, this is the closest equivalent to an agency that sets requirements on farmers and carries out inspections to determine compliance.

### 3.3.3 Initial feedback on RECAP farmer interface (March 2017)

A consultation on the farmers' module of the RECAP platform took place in March 2017 with 49 stakeholders; including 31 farmers. There was a lot of variation in the strategy adopted by partners to collect the feedback. Participants were shown a mock-up of the farmers' module of platform either in one-to-one meetings with project team members, or in small group meetings.

### 3.3.4 Webinar consultations (Sept 2017)

Webinars were held for each partner region in September 2017, with 22 people from the five partner regions included in the consultation (see Table 4). These webinars introduced the 'Paying Agency Administrator' and 'Paying Agency Inspector' parts of the RECAP platform. This was the first time that partners had seen these parts of the platform.

**Table 4: End-user consultations (Sept 2017), showing number of participants**

Country	Paying Agency inspectors	Other Paying Agency staff	Extension service staff	Agricultural consultants
Greece	2	1	-	-
Spain (Navarra)	-	-	3	-
Lithuania	5	2	-	-
UK (England)	-	-	-	7
Serbia (Vojvodina)	-	-	-	2
<b>TOTALS</b>	<b>7</b>	<b>3</b>	<b>3</b>	<b>9</b>

### 3.3.5 SDK and API consultations (Jan – Mar 2018)

The software development kit (SDK) and the application programming interface (API) were developed after the main platform. We led detailed interviews with three external partners who were potential users of this part of the software because they managed other farm management software applications. A summary of the detailed interviews was fed back to DRAXIS and on the basis of the pilot discussions a questionnaire was designed and released. This gained 17 responses as detailed below (Table 5).

**Table 5: SDK/API consultation participants, Jan-March 2018**

Country	Survey response	In depth interview
Greece	4	-
Spain (Navarra)	1	-
Lithuania	5	1
UK (England)	2	2
Serbia (Vojvodina)	1	-
<b>Germany</b>	4	-
<b>TOTALS</b>	<b>17</b>	<b>3</b>

### 3.3.6 Gathering project feedback using Taiga (Jun 2017 – Oct 2018)

An online management system for the developers, Taiga, was used as a single repository to capture constructive and agile feedback in the form of tickets, from testers accessing an online pilot version of the

RECAP platform. Testers included a range of stakeholders involved in the project, including, but not limited to, Paying Agency staff and Agricultural Consultants. In total there were 31 registered on the Taiga system, with 23 considered testers and 7 categorised as developers. For one their contributions towards Taiga meant they were considered both a tester and a developer.

Taiga enabled the developers to allocate and organise resources and efforts needed to address issues reported and the system enabled the testers to input comments at their leisure, and on some occasions, access rapid support from the developers. Testers could also see who was dealing with, and the progress status of each of their tickets (for example, "closed", "postponed", "open").

Testers submitted tickets under three types ("enhancement", "question", or "bug"), and rated each by priority (how urgent the ticket needed to be addressed) and severity (how important the issue/ comment was towards the mandated purpose or the outcome of the platform) See Table 6 for descriptions of the classes used for each criterion.

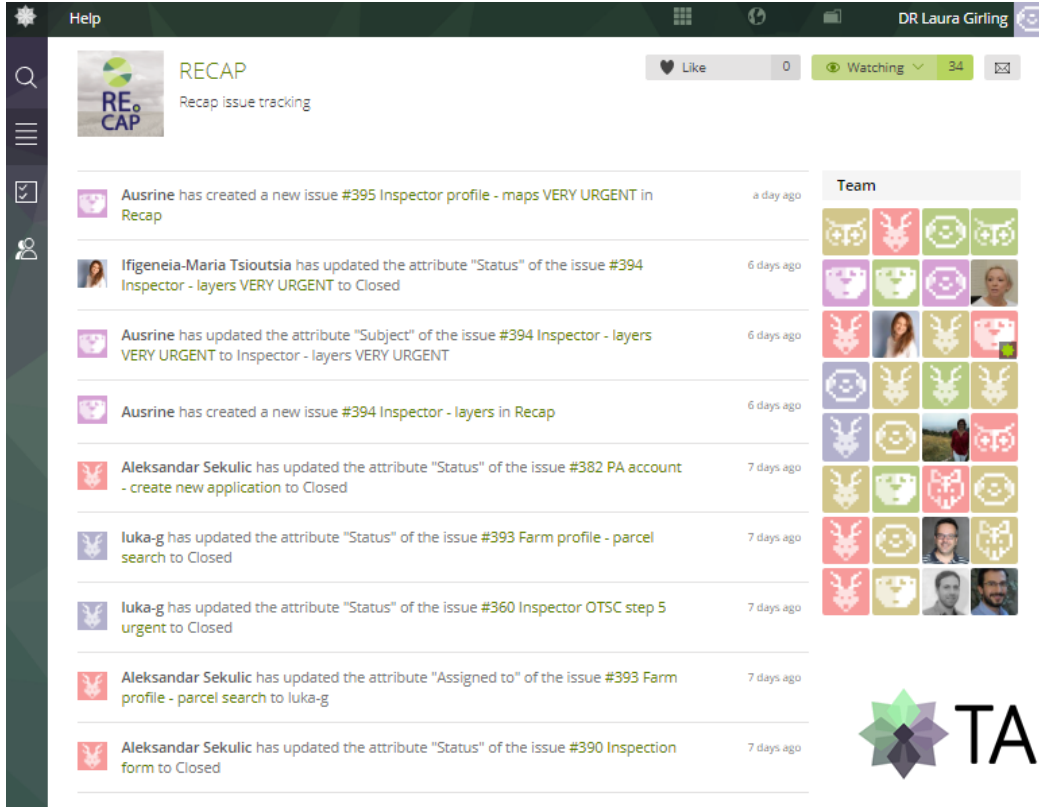
**Table 6: Descriptions of the classes used for each of the three criteria the testers assigned to their tickets**

a) Type	Description
Bug	A problem within the platform that prevent it from performing a function as expected, or that prevented the platform for providing the expected information
Enhancement	A suggestion made by tester to make the platform perform its function better than currently expected. Something additional to the existing platform
Question	Where no changes to the platform are required but further information or details are required by the user in order to use, or teach others how to use the platform


b) Priority	Description
Wish list	Does not need to be dealt with - an enhancement which would make the platform better but is not important for the platform or the user.
Minor	Could be dealt with at some point, but no urgency.
Normal	Should be dealt with, but the platform could function without it in the mean time
Important	Should be dealt with relatively soon as the platform function is impacted
Critical	Must be dealt with immediately as the platform cannot function at all until it is addressed

c) Severity	Description
Low	Not impacting on the running of the platform and would not jeopardise the outcomes achieved by the platform
Normal	Something that needs to be dealt with before the platform is complete, but not crucial to the end outcomes delivered by the platform
High	Must be dealt with otherwise the mandate of the platform will not be achieved and the outcomes not delivered

(a)




(b)



Type	Severity	Priority	Votes	Subject	Status	Modified	Assigned to
●	●	●	▲ 0	#61 Inspector-Maps	Closed	22 Dec 2017	luka-g
●	●	●	▲ 0	#62 Inspector_Send request	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#63 mobile_app-farmer-menu	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#64 mobile_app-farmer	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#65 mobile_app-farmer	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#66 mobile_app-farmer-upload photo	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#67 mobile_app-farmer	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#68 mobile_app-inspector-upload photo	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#69 Farmer UK_upload phot	Closed	01 Dec 2017	Not assig...
●	●	●	▲ 0	#70 Greece_login page (first page)	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#71 Greece_login page (first page)+ aft...	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#72 UK_Farmer_Step2_Import from ex...	Closed	31 Jan 2018	Aleksand...
●	●	●	▲ 0	#73 UK_Farmer_Field data sheet	Closed	31 Jan 2018	Nebojsa ...
●	●	●	▲ 0	#74 UK_Farmer_Maps_Search	Closed	22 Dec 2017	luka-g
●	●	●	▲ 0	#75 UK_Farmer_Maps	Closed	22 Dec 2017	Aleksand...
●	●	●	▲ 0	#76 Farmer_Upload photos	Closed	31 Jan 2018	Nebojsa ...
●	●	●	▲ 0	#77 Registration type	Closed	31 Jan 2018	Aleksand...

**Figure 4: Two screen shots of the Taiga management system with a) real time timeline of issues reported and updates b) Case with associated information including category and severity and priority ranking displayed.**

Each ticket was read to identify and isolate any individual points that may have been raised in the same ticket and then grouped into one of 12 categories (Table 7).

**Table 7: Category themes identified from the Taiga tickets submitted to the developers**

Category	Description	Justification
Function not working/absent	When a function crucial for the platform to perform the task, it has been designed for is not working or is absent.	Enable the platform to be usable.
Category absent/incorrect	When a category required for BPS monitoring/ regulation is absent or incorrect on the platform	Ensure correct and complete information to be submitted on the claim.
Data/ value/ scale incorrect	Incorrect values/ scales/ units required to complete returns more accurately	Both for accuracy and to comply with requirements, but also for user friendly purposes
User log on/ profile issues	(When user cannot log on) linked to issues with user's permissions or differences between profiles	Enable completion of the RECAP form, respect user privacy and data protection where appropriate- more trusted
Translation issues	When words or phrases had not been translated from English into another language within the project	Requirement to enable non- English speakers to use and understand the platform
Terminology issues	When incorrect words or phrases used, or there is a more appropriate way of describing or labelling features	Make more user friendly and accurate
Visual presentation	Where the view of information is restricted, unsuitable, difficult to see or not used in an appropriate way	Make more user friendly, usable, and efficient
Unnecessary stages/ functions	Not needed as part of the compliance process or has no positive benefit	Make platform more efficient and simplify/ user friendly
Additional stages/ functions	Not required within the platform, but which would add value or improve functionality or positive benefit	To improve user experience, quality/ quantity of data, or alternative process to a previously unnecessary stage that was removed
Technical support	Question regarding how the platform works, algorithms contained, or how to perform a task.	As part assessing its usability within the online pilot stages, and to ensure function is correct and accurate for compliance
Other suggestions	Any of function, category or idea that was suggested in order to improve the platform but not directly required as part of the platform brief	To make platform more effective and useful for end-users
Other	Anything not included in above- for example ticket created in error	

Conversations between developers and testers could occur and were documented using the “comments” facility within the system. This facility enabled further details to be given, better clarity to be obtained, discussions on compromises made and solutions tested and reviewed.

Social networking patterns were explored using the iGraph package in R (Csardy, 2006). The network of connections made through each issue raised was coded into a data frame. The data were coded by the originator and respondent to each interaction, with the type of contact recorded. Data were visualised using a social network diagram.

**Table 8: Degree of connectedness in the communication network on Taiga.**

User	Team	Degree
AK	Development team	211
LG	Development team	37
GT	Development team	70
IA	Development team	5
NS	Development team	48
IT	Development team	113
ML	Development team	13
AU	Lithuanian pilot team	59
AS	Lithuanian pilot team	10
MB	Serbian pilot team	9
VM	Serbian pilot team	5
KJ	UK pilot team	1
EH	UK pilot team	29

### 3.3.7 Focused Workflows (Jan-May 2018)

Due to limitations of effective communication between developers and other stakeholders using Taiga and email contact alone, two workflow meetings were held; one for the Greek platform, and the other for the UK platform. Within these meetings, issues with the platform were identified and prioritised to ensure the platforms were fit for purpose. For those issues considered a high priority, solutions or work arounds were discussed and later incorporated into the platform.

### 3.3.8 Pilot evaluation responses (Sept 2018)

As part of WP4, the RECAP platform was pilot tested by farmers and Paying Agency inspectors. Alongside this, a face-to-face evaluation was completed. This was either done through an online Google form, or collected by the partner demonstrating the platform to the farmer/ PA inspector. In some cases, the evaluation was completed after the demonstrator had left, after the tester had had time to test the platform by themselves. This data was then centrally collected for analysis for work package (D4.4 Final Evaluation Report, WP4), and the results shared with the co-production team for analysis of specific questions relating to evaluation of the co-production process.

### 3.3.9 *Qualitative semi-structured interviews (Sept 2018)*

Partners and strategic end-users who engaged in more than one element of co-production were invited to undertake a semi-structured evaluation interview to help evaluate co-production within RECAP. These were conducted either by email, telephone or face-to-face meetings and completed by either the University of Reading team or by project partners themselves. Interviewees were asked about:

- their motivations for participating in the RECAP project;
- whether they could see evidence of their input in the pilot platform;
- any realised benefits to themselves or their organisations;
- whether they would do co-production differently

The RECAP developers were asked questions to evaluate their experience of working with the products of co-production and to evaluate the usefulness of the co-production engagement they had with stakeholders. Some of their comments are discussed within multiple sections below.

## 4. Results and Discussion

### 4.1 Customising the RECAP platform

As planned, information on customising the platform to fit the needs of the regions and different end-users was collected and used to modify the RECAP platform accordingly. Table 9 below outlines some of the customising that was required during the project lifetime. This feedback was gathered at different times during the co-production rounds, but is summarized here to explain the customization process.

Due to early changes to the original plan of developing one platform, to that of five individual platforms with a shared purpose, the development process was more complex and time demanding than previously predicted. In addition, due to the development of separate platforms, the communication process between the regions and the developers varied as each region became more focused on achieving their own specific requirements within their platform. Some countries had closer working relations with the developers and had a greater level and more varied user representation. Some partners required for a greater technological readiness level to facilitate incorporation into their organisation's administrative processes. This variation in requirements and working practices may have potentially creating some imbalance in the final functionality of the five platforms.

**Table 9: Examples of customisation required between the regional platforms and between and within the different user types**

Customisation	Examples
Different regions	Platforms required translation into regional languages.
	Some phrases and sentences needed to be modified according to regional preferences.
	Adaptions to the overall purpose of the platform. For example, Serbia requiring use of the platform for organic certification.
	Platform functions to take account of regional farming systems, such as larger farm sizes, multiple parcels, field splitting etc.
	Inputs modified to account for regional differences in application of cross compliance rules. For example, the level of detail for data, or correct units, or emphasis on certain functions considered more important in select regions.
	Addition of regional specific remote data, and therefore different GIS layers to be added to each specific platform.
	Different regions employed different levels of input from the end-users, resulting in different user needs for the same user type across different regions.
Different end-user types	Different roles for each end-user required varying permissions, access, information and functions to be available or restricted where appropriate.
	User types with different responsibilities, whereby they can perform their entire process successfully, without needing access to other profiles
	Modification in descriptions of scheme requirements to better suit the audience, e.g. differences in level of detail between farmers and Paying Agency modules.

Different end-user functions	Ability for end-users to input data directly from the field, requiring an app version suitable for uploading information using a mobile phone.
	Some areas have poor internet connection, so an offline app version was required, with automatic upload when internet connection was possible.
	The app was developed for Android phones, there is now a requirement for the app to be modified for Apple phones too.

## 4.2 Results from the consultation with Paying Agencies on remote sensing opportunities

The full report on the quantitative responses from the Paying Agency on whether or not they use RS data for monitoring each area were summarised in D2.2. The PA user requirements were extracted from the qualitative responses and incorporated into the list of users' needs.

## 4.3 Summary of user requirements and implementation in the RECAP platform

A table summarizing the priority given to each user requirement by the different groups of users was created (Deliverable 2.2, shown in Table 10). A qualitative scale of high (H), medium (M), and low (L) is used. These scores were decided based on the overall data collected from all the end-users in the group. Using the interviews and workshops; a list of 55 user requirements were identified and categorised into five topics; 1) *General system requirements* 2) *BPS eligibility and application*, 3) *Farmer record keeping* 4) *Inspection process*, 5) *Farmer education and information*.

Collectively, the end-users considered the main priorities to be related to the platform's BPS eligibility and application functions. As this is the key purpose for the creation of the platform, this result was expected. Farmers considered the *general system requirements* an equally high priority, relating to making the platform user friendly and functional. Farmers were able to identify elements that the platform needed in order to make their jobs in completing the online documentation easier. For example, identifying issues linked with poor internet connectivity; offline systems needed to be considered to enable farmers to collect data from anywhere on the farm, not just the farm office where the internet connection was good. This would simplify and speed up the process of adding, for example, photos to the platform, enabling a farmer to do it immediately, rather than waiting until they had an internet connection.

The *inspection process* appears to mainly be a priority for the Paying Agencies and is likely to be linked to the Paying Agency's role in administering inspections, and therefore needing to be fit for purpose, whilst the farmers and agricultural consultants have less of a role during this process. *Farmer education and information* was generally scored the lowest in terms of priority for users, and maybe seen as a more of a bonus benefit, rather than a core function and therefore was not a priority concern during the development of the platform. See Figure 5 for a breakdown by user.



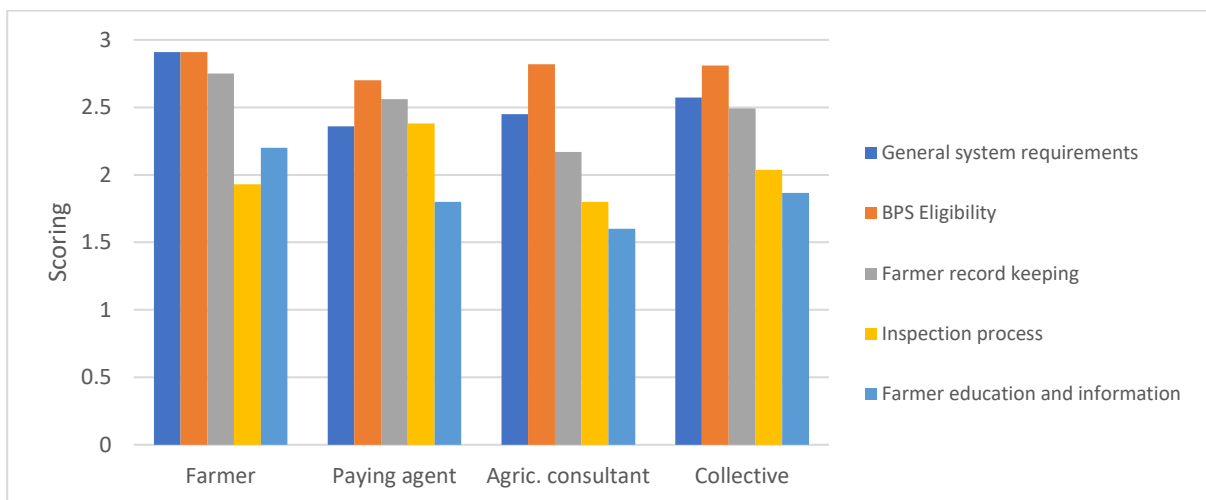
**Table 10: Summary of user needs by priority level showing which were implemented by the developers**

Ref	User requirement (see Deliverable 2.2 for further details)	Priority for PA	Priority for Farmers	Priority for AC	Delivered?	Comments
A1	Allow integration of spatially and temporally tagged/referenced data	High	High	High	Yes	Geo-tagged images and all other spatial data (including images from NOA) are shown on the map
A2	Simple navigation – especially for the ‘farmer ‘user interface	Medium	High	Medium	Yes	
A3	Allow a system of user accounts with varying privileges/access permissions	Medium	High	High	Yes	Role menu (farmer can add an additional user with specific access permissions)
A4	Ability to record an activity log to track author and date of edits	High	High	High	Yes	Log history
A5	Assurance of security of data storage	High	High	High	Yes	
A6	Records uploaded to the RECAP Platform must be acceptable for the Paying Agency	High	High	High	Yes	We used official forms from the pilots
A7	Ensure reliability and resilience – needs to cope with peak usage and be able to be accessed quickly	High	High	High	Yes	We have high performance and optimized server
A8	Accessible in areas of poor internet access – site responsive to internet connection speed	Medium	High	Medium	Yes	Mobile - offline mode
A9	Accessible in areas of poor internet access (or other interruptions) – automatic frequent saving of any activity with clear progress bars	Medium	High	Medium	Yes	Mobile - offline mode - only available for uploading of photos
A10	Accessible in areas of poor internet access – allow data intensive tasks to be scheduled	Medium	High	Medium	Yes	Mobile - offline mode - only available for uploading of photos
A11	Option to set networks used for internet access	Low	Medium	Low	No	
B1	Able to update LPIS system through the RECAP Platform	High	High	High	No	Suggest parcel (but it won't update LPIS)
B2	Ability to set a temporary (i.e. seasonal) field boundary	Medium	High	High	Yes	Subparcel mechanism
B3	Ensure area calculations add up to correct totals and use the correct degree of accuracy	High	High	High	No	New role is added and user can give to the additional user specific permissions/ The forms on the platform are based on the forms of each pilot country
B4	Able to view BPS farm history	High	High	High	Yes	BPS History
B5	Use most recent BPS application to provide farm profile data	N/A	High	High	Yes	Farm profile provides the most recent BPS application and the user is able to select a BPS application from the BPS history
B6	Able to export data from RECAP Platform to pre-populate the BPS application	Medium	High	High	Yes	Prepopulation from the previous BPS application
B7	Provide a tool for land transfers (e.g. sales, leasing arrangements)	High	High	Medium	No	
B8	Greening Calculator Part 1 to ensure compliance with greening measure regarding crop diversity as part of eligibility for basic payments	High	High	High	Yes	Greening calculator
B9	Greening Calculator Part 2 to ensure compliance with greening measure regarding Ecological Focus Areas as part of eligibility for basic payments	High	High	High	Yes	Greening calculator
B10	Ensure compliance with greening measure regarding no loss of permanent grassland as part of eligibility for basic payments	High	Medium	Medium	Yes	Greening calculator
B11	Provide transparency regarding calculation of eligible area when obscured by tree canopies	Medium	High	High	No	This cannot be solved using Sentinel data as landscape feature detection requires VHR imagery (<2 m).
C1	Allow permits to be matched to relevant Land Parcels	High	Medium	Low	Yes	Questionnaire
C2	Provide a tool to help farmers calculate values based on area	Low	High	High	Yes	Work dairy
C3	Ability to incorporate data exports from commonly used agronomy software	High	High	High	Yes	Through API
C4	View cropping history to inform general farm management/decisions	N/A	High	High	Yes	We hold history of crops but it is not visible to the users
C5	Easy uploading and tagging of photos from within app	High	High	Medium	Yes	Users can upload photos through the RECAP platform and geotagged ones through the mobile application
C6	Provide tool to inform of accidents/exceptional circumstances	Medium	High	Medium	Yes	Report problem
C7	Allow system to be used for within farm issue reporting – e.g. allow tractor driver to upload pictures of ruts/tracks/fallen trees.	N/A	Medium	Medium	Yes	My documents, report problem
C8	Provide warnings if automatic mapping calculations detect problems	High	High	High	No	GIS queries (no partner provided such info)
C9	Generate checklists of actions required, personalised to farm type	High	High	Medium	Yes	CC Rules - Checklist
C10	The RECAP platform needs to allow farmers to perform self-assessment	Medium	High	Low	Yes	Self-assessment tool
C11	Maintain crop loss records based on satellite pictures – map extent and duration of flooding	N/A	High	Medium	No	Remote sensing
C12	Enable interaction with the animal ID and movement records services through smart phone app interface	High	Medium	Medium	No	No animal inspection through remote sensing



**Table 10: (continued)**

Ref	User requirement (see Deliverable 2.2 for further details)	Priority for PA	Priority for Farmers	Priority for AC	Delivered?	Comments
D1	The inspectors need all known data to be presented and the inspection form pre-filled when preparing for an audit	High	N/A	N/A	Yes	The inspectors can see the fields that the farmers have filled in. Furthermore, they can prepare the inspection form before starting the on-the-spot inspection. On the hand, through API the user is able to connect the existing system with the RECAP platform and have all the needed information pre-populated on the required forms.
D2	RECAP needs to accommodate recording of data for three different types of cross compliance inspections	High	low	low	Yes	Done that through the forms that each pilot provided us with
D3	Allow description of location and extent of cover crops to check compliance with winter cover requirements	Medium	low	low	Yes	It will be visible on the mpa extent of the RS imafes and for which date they are
D4	Assess extent of areas affected by soil erosion	Medium	low	low	Yes	The remote sensing component produces 5 products relevant to soil erosion, with some being byproducts of others. The products are primarily based on the Revised Universal Soil Loss Equation (RUSLE) a very well-known proxy for soil erosion. Constituent factors of RUSLE such as the K-factor (soil erodibility) and C-factor (to reflect the effect of cropping and management practices on erosion rates) are also given as independent layers in parcel level. The RUSLE product and its factors are pan-European and updated every 3 years. In our case the C factor, dependent on the erodibility based on the cultivated crop type, is dynamically updated according to the crop type classification product (every year) in parcel-level, increasing significantly the resolution of the alternative semi-static pan-European product of C-factor. Additionally the RUSLE product is combined with the parcels' proximity to surface waters to produce a risk of polluted soil runoff for the Nitrate Vulnerable Zones.
D5	Tool to map areas at risk of soil erosion	low	Medium	Medium	Yes	
D6	Ensure areas sensitive to soil erosion are cultivated appropriately	low	low	low	Yes	
D7	Allow description of location and extent of burnt areas to check compliance with burning restrictions	Medium	low	low	Yes	A burnt scar mapping algorithm has been developed to identify burnt parcels. The algorithm runs for multiple S-2 acquisitions through the cultivation season and produces a binary mask identifying all burnt parcels along with the timestamp of the date they were first found burnt. This way cross-check with the period of allowed stubble burning can take place and thus identify potential breaches.
D8	Ensure protection of designated landscape features	High	Medium	Medium	Yes	This cannot be solved using Sentinel data as landscape feature detection requires VHR imagery (<2 m).
D9	Provide evidence of loss of semi-natural habitat	High	Medium	Medium	Yes	Through my documents
D10	RECAP should present the inspector with a map and route to all inspection sites	Medium	low	low	Yes	Inspections menu where the inspector can view all the assigned to him inspections and open the one that is needed
D11	Allow automated records checking (i.e. inspection) via RECAP	High	High	Medium	Yes	Inspectors can upload photos (geotagged), alerts, farmers can provide access to the inspectors through the button "Make me visible", mobile application (offline mode)
D12	Allow inspectors to upload photos of any non-compliance found at inspection	High	High	High	Yes	Through the mobile application
D13	Allow inspectors to update the LPIS system during inspections	High	High	High	Yes	This may be done, if the two systems are connected through API
D14	Allow inspector to use and record computerised records during inspection	Medium	Medium	High	Yes	They are able
D15	Provide feedback on inspection broken down by regulatory area. RECAP will present the results to farmers of their OTSC	High	High	High	Yes	Farmers are able to see the results of the inspection in the CC rules - Checklist section
D16	For remote sense only inspections provide the online equivalent of a "wash up" meeting	Medium	High	low	Yes	Through messages
E1	Inform farmers of BPS changes based on farm type	Medium	High	Medium	Yes	Messages
E2	BPS application tutorial	Low	Medium	Low	Yes	Help material
E3	Provide access to help line via app interface	Medium	Medium	Medium	Yes	Help material, PA messages
E4	Photo examples of good and bad practice with explanations	Medium	Medium	Low	Yes	Help material
E5	Provide inspection report online with links to relevant resources to correcting any non-compliance	Medium	Medium	Medium	No	



**Figure 5: Priority ranking for categories by end-user type. Scoring was based on average for each priority, 3 points for “high” priority, 2 points for “medium” priority and 1 point for “low” priority.**

The developers used the output from the user group engagement as a checklist of items to consider, and then considered the ratings provided by the user group workshops to prioritise work. In total, the developers were able to incorporate 62% of the 55 user requirements and provided explanations on the suggestions that were not adopted (see Table 10 for breakdown). As so many were rated as “high”, the developers also felt it necessary to re-rate some of them, relating the scores more to the scope of the project. Those suggestions rated “low” priority did receive less attention, for example, suggestions relating to the inspection process.

The “user type” had no impact on whether the work was completed, with the developers working equally across the different user types. This was because the developers did not see the platform as separate for each user, but as a whole system, so if one user group thought a suggestion was important, then it was considered important for the platform as a whole.

Some of the suggestions made were defined as “logical” remarks, which fed into the need for the focused workflow as discussed in section 3.3.8.

**Table 11: Number of user need requirements within categories, and percentage of those the developers were able to incorporate into the development of the platform**

User Need Categories	Number identified	Number completed	% complete
General system requirements	11	10	91%
BPS eligibility and application	11	7	64%
Farmer record keeping	12	6	50%
Inspection process	16	7	44%
Farmer education and information	5	4	80%
<b>Total</b>	<b>55</b>	<b>34</b>	<b>62%</b>

Although BPS eligibility was rated as the end-users’ highest priority, the developers were only able to complete 64% of the suggested requirements. This was because many of these requests were outside the remit or capabilities of the platforms design. For example, suggestions to integrate with other platforms and data

systems used by Paying Agencies were not possible at this time. In addition, due to the nature of the project funding, it would not have been a good use of the developer's time. Also, spatial and temporal resolution of available satellite data was not sufficient to allow some of the requirements relating to remote inspection to be developed. Completion of suggestions relating to farmer record keeping was also low due to the difficulties linking the platform to various proprietary farm management software packages.

The general system requirements were easy for the developers to complete and included items such as assurances for security of data storage, simple navigation interfaces, and the addition of simple functions like logging of activity, varying account privileges and allowing data to be tagged. Many of the comments raised here echoed issues that had been seen in the development of a platform by England's Rural Payment Agency in 2012. Farmers played an important role here reiterating their past experiences of platform development, hoping to highlight them early enough that they would be avoided a second time around.







Below in Table 12 are examples of suggestions made which were not incorporated into the final platform, and the reasons why they were rejected.

**Table 12: Examples of suggestions made through the co-production interviews and workshops, which were eventually rejected, or for which alternative options found**

Code	Suggestion	Reason for not implementing
A11.	Option to set networks used for internet access.	This was characterised as low/ medium priority for all the interested parties. The most important function was the 'offline mode', and this was implemented for the mobile applications.
B1.	Able to update the Land Parcel Identification System register through the RECAP platform.	This needed integration with the LPIS register and it was not feasible within the project.
B3.	Ensure area calculations add up to correct totals and use the correct degree of accuracy.	We added a function that warns users if uploaded area records do not conform to LPIS parcel areas.
B7.	Provide a tool for to allow recording of land transfers.	This is not in the project's scope.
B11.	Provide transparency regarding calculations of eligible area when land cover obscured by tree canopies.	This could not be performed with the currently available Sentinel data.
C8.	Provide warnings if automatic mapping calculations detect problem.	They can see the results on the vector table (on the right side of the map section for each parcel).
C12.	Enable interaction with animal ID and movement records services through smart phone app interface.	This is not in the project's scope.
E5.	Provide inspection report online with links to relevant resources to correcting any non-compliance.	The farmers can have access to the results of their inspection report after the inspector finalises the process.

#### 4.4 Initial feedback on RECAP interface (March 2017)

This process was able to identify a lot of minor issues, but also establish some important considerations for the operability of the RECAP platform that needed to be addressed in WP3:

-  The dashboard layout
-  Readability and accessibility
-  Uploading farm data
-  Multiple users
-  Account permissions
-  Mobile vs. web demand

These issues were discussed at length by the consortium at the 3rd meeting in Navarra and have resulted in technical advancements in WP3.

## 4.5 Feedback from Webinar consultations (Sept 17)

Seventeen points of improvement were identified for the RECAP platform. There were several smaller scale improvements including improvements in accessibility (e.g. text size), improvements in integration (e.g. ensuring formatting matched the BPS system), mapping integration (including the varied implementation of cadastral and block as well as field reference LPIS systems). There was also a new user need identified at this stage, namely to allow for different roles/users on one farm (e.g. owner, contractor, agent, employee, etc.). This led to a series of in-depth conversations with agricultural consultants and the development team on the roles and permissions needed. At this stage the need for differentiation between regions was increasingly clear and after this stage the platforms were developed based on local user needs rather than through single project wide consultations.

## 4.6 Feedback from SDK & API consultations (March 18)

The detailed answers to the technical questions were all conveyed to the software developers (these weren't summarised as the numbers of respondents were low and the variation in the answers conveyed the range of requirements of the users).

## 4.7 Feedback from Taiga (Sept 18)

In total 395 tickets were raised over a 14-month period (1<sup>st</sup> June 17 to 1<sup>st</sup> Sept 18). Of these tickets, 29 contained more than one case. In total 438 cases were raised. There were 33 members within the Taiga discussion, of whom eight were technical members (developers), and 23 were testers of the online pilot. Thirteen members did not contribute any comments, whilst the top three contributors entered 42, 46 and 237 tickets and 48, 56, and 242 cases respectively. The tester had the opportunity to classify the description, severity and the priority of their ticket. This enabled the developers to prioritise those tickets that were ranked with a "high" severity or an "important" priority, especially if they were described as a "bug", and to pay less attention to more complex requests, especially if they were wish list as a "low" priority (see table 13). Developers occasionally reclassified tickets to organise their workload appropriately. For this analysis, those tickets containing multiple cases; all points within the same ticket have been assigned the same ranking, but the description (bug, question or enhancement) was determined by the analyst.

**Table 13: Classifications of cases onto the Taiga system between 1st June 2017- 1st Sept 2018 and the percentage closed by September 2018. High severity includes those assigned with "critical" and "important", low severity includes those assigned with "wish list" and "minor"**

Description		Total Cases	High	Normal	Low	
Priority	Bug	N	292	24	265	3

		%	96	100	96	33
	<b>Question</b>	N	46	3	43	0
		%	89	67	91	-
	<b>Enhancement</b>	N	100	25	67	8
		%	82	100	79	50
<b>Severity</b>	<b>Bug</b>	N	292	25	265	2
		%	96	96	96	0
	<b>Question</b>	N	46	5	41	0
		%	89	80	90	-
	<b>Enhancement</b>	N	100	23	70	7
		%	82	100	80	43

At the early stages of development, the developers reported to have paid equal attention to all cases that were submitted, regardless of their description. As the platform developed, and moved into later pilot stages with a need for a stable platform, the developers paid less attention to enhancements and focused on bugs. The developers still reviewed enhancements submitted as they may be incorporated in future developments. Questions were answered throughout the platform's development.

Developers used the level of severity assigned by the tester to assist them to identify which cases to prioritize, and how to focus their resources and efforts. The developers did not always agree with the severity rating provided by the testers and therefore altered them based on informed judgement through their experience of previous cases, time and resources available with regards the timeline of the project, the cases relevance and how disruptive the changes would be to the whole platform.

Each of the cases were assigned to one of the 12 topic category (see Table 7 above) by the analyst. The number of each category, and an example for each are outlined in Table 14. The most common category of cases was "Functions not working/ absent", with 27% of the total cases categorised. As Taiga is a system purposely used for recording bugs in new platforms, it was expected that this would be the largest category.

The second most common category of cases was "Translation issues", making up 15% of cases entered onto Taiga. This was inevitably going to be an important category, due to the working across multiple regions, although it appears that cases were predominantly provided by the Lithuanian team, comprising words and phrases being translated from English to Lithuanian. Teams from other regions may have provided their translations in an alternate format or at an earlier date, which pre-empted the need to enter each onto Taiga. Such alternative approaches might be useful (for example a list of translations, rather than individual identification during the use of the platform) to reduce the need for translation issues to be addressed using Taiga in this way.

Certain countries used Taiga more than others, in particular; Lithuania and the UK used Taiga for many different purposes, while technical issues meant the Greek and Spanish partners could not access Taiga. Overall the developers felt that communications through Taiga was not always simple. Some cases needed additional information to understand the issue raised, or the users needed more guidance to see the

modifications (such as a “hard refresh” or to “delete cookies” from the browser). In these instances, Skype was used to improve communications between testers and developers.

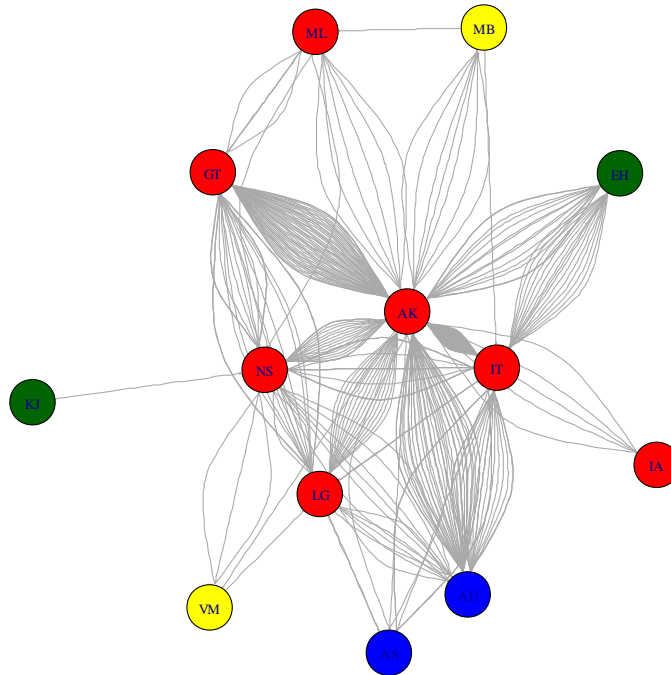
**Table 14:** List of the topic categories from Taiga, the number received and examples of cases provided

Category	Number of cases	Example
Function not working/absent	119	“Search does not work. I am entering into the search field, pressing enter and nothing is happening”
Category absent/incorrect	38	“it is unclear why remote sensing data and ortho-photo images we sent to you was not uploaded”
Data/ value/ scale incorrect	9	“It is possible to enter only 2 digits before decimal place. What to do if farmer declares 1000 ha?”
User log on/ profile issues	23	“When we edit a profile as a new user we can add and create by we can't delete”
Translation issues	65	“Underlined places shall be translated as written in red”
Terminology issues	30	“Change the name of the layers. For instance, gis.osm.landuse_a_free_1=Landuse!”
Visual presentation	44	“In internet explorer browser when we edit profile the display is not comfortable to look at”
Unnecessary stages/ functions	35	“There are some GIS layers that do not seem relevant- we will send a list of the relevant ones”
Additional stages/ function	53	«Create option to link with geometry so that maps can be drawn of the holding and can be saved as appropriate.”
Technical support	18	“Could you please clarify whether the value for "action for" can be different? Or it will be the same for all actions?”
Other/ other suggestions	4	Ticket made in error

## 4.8 Analysis of social networks during development phase

The social network shows that the development team are the most highly connected group in this network (Figure 5) the red nodes in this diagram denote the users in the development team and these users occupy the central region of the network diagram. The only connections pilot users formed was with the development team and this network did not contain any connections between either members of the same of or different pilot teams, potentially limiting the flow of development ideas. Different teams achieved very different degrees of connectedness. The Lithuanian team had the highest degree of connectedness compared to the other pilot teams suggesting a stronger network between the Lithuanian pilot team and the Development team compared to the other pilot teams in this network.

**Figure 4: Social Network of Taiga responses grouped by team. Red, development team; blue, Lithuanian pilot team; yellow, Serbian pilot team and green, UK pilot team.**



### 4.9 Feedback from the workflow meetings

Although Taiga was considered the primary route for feedback and reporting of enhancements or modifications in the platform, in some instances, the nature and technical characteristics of issues required a physical meeting between partners and developers for the modifications to be resolved effectively. As a result, partners from two regions, Greece and UK, held face-to-face meetings with the developers to work through issues together. From these meetings, two workflows were created.

#### Greek Workflow

The Greek team suggested four areas for improvements which they grouped into two types (necessary and enrichment changes). These are outlined in Table 19 below:

**Table 19: Changes identified as ‘necessary’ or ‘enrichment’ identified for the Greek version of the RECAP platform.**

Necessary Changes	Enrichment Changes
Modification of the Breaches Table	‘STEPS’ referred to in the inspection forms should be categorised per parcel
Addition of a Cumulative Table	Matrix should be created in the Breach Table

Workflows for the Breaches Table were redesigned to make farmer and the inspectors’ input easier. This included having fields empty by default and having a simple step by step process for inspectors. The Cumulative table was introduced to replay STEP 14 regarding agricultural holdings and to be auto-populated from the Breaches Table. This made the information clearer to see.

The enrichment changes included categorisation of the forms for inspection. This made the inspection process for inspectors more logical for them to undertake. The Matrix changes in the Breach Table displayed a grey-depicted value as a default for categories “Seriousness” and “Extent”. These changes were targeted at improving the usability for inspectors and farmers.

### UK Workflow

The UK team had suggested 16 changes, which, were categorised into either High or Low priority (Table 20). The priorities were linked to both supporting the creation of a working and effective tool; and to make the platform more relevant for farmers whom they were to engage with during the piloting stages of the project.

**Table 20: List of the changes requested by the UK team, and their prioritisation following discussions with the developers.**

	High Priority	Low Priority
	Importing the farm parcel data and .shp files (a file that contains geographical reference data as individual objects)	Area Summary
	Revision of the Cross Compliance Rules-checklist	“go-to” button that takes the user to a specific field on the field data sheet
	Revision of reminders	Upload of watercourse buffers
	My documents	Removal of Work Diary
	Field and Subparcel Geometry	Recording hedgerows
	Self-assessment	Make me visible
	Maps	
	UK Help	
	e-learning tool	
	Others	

To enable the development of a mutual beneficial and engaging environment via the RECAP platform for both the agricultural consultants (Strutt & Parker) and the farmers, developers migrated Geodatabase to .shp or PostGIS files. Thus, by using a unique parcel reference number, the farmers were able to download and upload parcel level data for their own farms. In addition, the text descriptors of certain cross compliance rules were instigated in order to make the platform more farmer friendly. Strutt & Parker provided summary text for descriptions of rules, improved the language, and provided further information in case the farmer required further explanations of rules.

To make the tool more efficient at providing farmers with relevant information on important dates, Strutt & Parker provided reminders linked to each Cross-Compliance rule and made this even clearer by having the reminders colour-coded in relation to their deadline. Some useful shortcuts were also suggested, such as a “select all” function when selecting options.

## 4.10 Feedback from pilot evaluation responses (Sept 2018)

In total, 308 responses were collected and used for analysis. The distribution between countries and the end-users are below in Table 15. The respondents for the pilot evaluation were not significantly different in age (Table 16), but on average had a higher level of education (Table 17) compared with 2017 data on EU farmers from EuroStat (Eurostat 2017).

**Table 15: Total number of responses by region and end-user type to the global evaluation questionnaire.**

Region	Consultant	Farmer	Organic Farmer	Total
Greece	11	129	0	140
Serbia	0	0	22	22
Lithuania*	NA	NA	NA	NA
Spain	1	9	0	10
UK	0	136	0	136
<b>Total</b>	<b>12</b>	<b>274</b>	<b>22</b>	<b>308</b>

\*Note, LT used a different feedback mechanism and so this data is not available for Lithuanian users.

**Table 16: Distribution of EU farmer age compared with the age of respondents- statistics using chi squared tests.**

Sample	Age (% of respondents)		
	15 - 39 years	40 - 64 years	>65 years
Sample responding to RECAP questionnaire	30.9	56.4	12.7
EuroStat population working in Agriculture	31.8	59.2	9

**Table 17: Distribution of the EU farmer education attainment compared with educational attainment of responders- Statistic using chi squared tests**

Sample	Educational Attainment (% of respondents)		
	No Formal Qualifications	School	University
Sample responding to RECAP questionnaire	24.4	33.9	41.7
EuroStat population working in Agriculture	40.7	50.2	8.9

**Table 18: Responses received from quantitative questionnaire conducted alongside the piloting of the online version of the RECAP Platform.**

Statement		Level of Agreement			
		Agree	Neutral	Disagree	No response
Using the RECAP Platform has / will increase my understanding of the Cross Compliance rules?	n	165	69	33	41
	%	61.8	25.8	12.4	
Using the RECAP Platform has / will decrease the likelihood of me breaking Cross Compliance rules?	n	148	86	31	43
	%	55.8	32.5	11.7	
The RECAP platform would make CAP implementation more effective in my region	n	104	51	24	129
	%	58.1	28.5	13.4	
The RECAP platform would increase citizen involvement in CAP implementation in my region	n	91	62	28	127
	%	50.3	34.3	15.5	
The RECAP platform would make CAP implementation more efficient in my region	n	103	52	26	127
	%	56.9	28.7	14.4	
The RECAP platform would improve my satisfaction in CAP implementation in my region	n	90	41	50	127
	%	49.7	22.7	27.6	
In my opinion, it is valuable to include farmers in the development of public services	n	102	41	38	127
	%	56.4	22.7	21	
This platform was developed with a group of farmers, does this impact how likely you are to use the platform?	n	127	100	41	40
	%	47.4	37.3	15.3	



Statistical analysis showed that none of the responses to the statements above were significantly related to the end-user's age or their region.

## **4.11 Results from the semi-structured interviews (Sept 2018)**

Towards the end of the RECAP project, a series of semi-structured interviews were undertaken by the University of Reading team to gain further insight from partners and end-users on the co-production process. In total, feedback on the co-production process was received from 19 individuals, ten were partners on the project, and nine were end-users involved in at least one co-production activity during the lifetime of the RECAP project.

The answers to these questions as well as cross-cutting themes are discussed in the following sections, with feedback from project partners discussed separately from feedback from end users.

### **4.11.1 Feedback from project partners**

#### *Motivations behind RECAP involvement*

Each partner had their own reasons for getting involved with the project. Reasons varied from being part of a research process to creation of a practical platform for public use. The UK agricultural consultants, for example, got involved to keep abreast of current research and to contribute to their standing as leading experts in the field. The Serbian partners had a clear aim for their involvement in the RECAP project, to explore the "making of [a] solution" in order to "support [an] organic production subsidy scheme", while the Spanish partners were motivated by the project allowing creation of a pilot version for developing a "new RECAP". As well as organisational motivations, some partners were keen to get involved for personal reasons and for career development, including to improve negotiating and team work skills, to improve their own knowledge of cross compliance and of EU projects, or to be able to add variation into their job role by undertaking alternative activities.

#### *Multidisciplinary/ multinational working*

For some partners, it was the first time they had worked across a multi-partner and/or multi-national project, for others with previous experience, felt RECAP was "one of the most successful and effective" multi-partner/ multi-national projects that they had experienced. Working across multiple partners and regions was considered to be difficult, but the outcome to be "fruitful" and the experience to be "very useful". "Different mentalities and working patterns of the partners" were a challenge for some. It was noted:

"[M]any partners take extended leave in August with an attitude of back to work in September, for others August is almost work as usual, while September brings other duties for farmers and academics."

The differing expectations of the platform between participating regions, and between users, was identified early on as making this project complex. However, the RECAP project has being a valuable and beneficial activity at different levels for the partners. Some, referred to the project as being a successful "proof of concept" or mentioned a "new RECAP" version offering opportunities in areas less well explored during this current project. It also made it difficult for different regions to appreciate the complexity between the platforms (derived by national policies on the implementation of CAP and structure of the agricultural production sector). The language barrier was an obvious complexity as the project spanned across five regions, but this was overcome by "good will and the positive spirit of the partners."



Communication between partners was facilitated through national consortiums and tools such as Dropbox, Skype, email, web-based video conferencing applications and Taiga. Having a range of different methods enabled individuals to use whichever method they felt was most suited for their current purpose. For example, the consortium meetings enabled partners to “present demands in a clearer and more precise manner” than using other methods they considered to be reserved for co-production.

### *Working with farmers and end-users*

Some partners mentioned that due to the demanding time requirements for the develop five platforms, rather than one, and through “underestimating the amount of work that was required to understand user needs” had an impact to the time allocation for the remaining activities of the project (piloting, co-production phase). Hence, they suggested that by breaking the platform into segments and allowing for robust testing before moving onto the next stage would have increased the frequency of farmers involved and thus, improve further the structure of the platform in relation to farmer usability and expectations.

Several partners who worked directly with farmers and other end-users, felt it was difficult to engage with farmers given the two versions of the platform- the initial paper mock-up and the beta pilot, as with the first it was difficult for the farmers to conceptualise how the platform would/ could work, and the second, the platforms development was so far advanced that it was too late to make any significant changes the farmers suggested. Equally the agricultural consultants in the UK felt that taking a platform that did not work to the farmers would have frustrated them. As a result, piloting with farmers on a working platform needed to wait until the platform was as near completion as feasible, which in this case was close to the end of the project. This restricted the time available for making any further alterations.

Some partners felt that “surveying farmers didn’t work” as well as direct contact with the farmers through interviews, and would therefore consider using more interviews and focus groups in the future. They felt this type of involvement was “much more efficient and constructive,” and that their users found direct contact “more rewarding, more satisfactory than with surveys”. This is likely to be due to the farmers being able to express opinions and make suggestions earlier on in the process, rather than simply provide feedback on the platform at the later stages.

Partners also recognised that the timing of some of the co-production activities could have been “better planned and performed in accordance with the agenda of the farmer”. For example, farmers would have been less busy during the winter months, and therefore have had more time available to commit to the project. The Spanish partners found it difficult to get active participation from their inspectors and farmers, associating this possibly to “lack of time”. The Spanish partners also believed that “cross compliance is not really a concern for farmers” and felt it difficult to get farmers to contribute towards the RECAP project. They only appeared to get more interested in the information process as they “discovered specific aspects that could be useful for them”.

### *Working with developers*

Using Taiga as a key method for collecting input seemed to work well for half of the partners, with the Serbian partners even suggesting earlier use of this tool would have been beneficial. This was not the case for all partners, particularly the Spanish and Greek partners who faced “restrictions to accessing Taiga” from office computers due to data breach and confidentiality policies in place which restrict access to websites. In these instances, feedback and suggestions were made through email contact or Skype. The developers were happy to accept feedback through any means. Using emails made conversations less transparent to others, potentially resulting in the same questions or issues being reported several times. “Bugs” reported via email were not recorded and stored in the same way as the Taiga suggestions. Consequently, they were not coded

for category type, included in social networking analysis nor ranked according to severity or priority as with the Taiga feedback presented above.

The partners felt that communicating through Taiga and email was not always sufficient when dealing with challenging and complex issues. As a result, the developers held separate face to face workflow meetings with the UK and Greek partners, and Skype meeting with Serbian and Lithuanian partners. This was considered “a more effective way of understanding issues in detail, negotiating an agreed solution and avoiding escalation”.

As the developers were not considered to be experts in requirements of cross compliance and administration of the Basic Payment Scheme, sometimes partners found it difficult to be clear on what they needed from the RECAP project. In addition, it was suggested that a more detailed process was required at the early stages of the platform development to allow for a systematic recording and understanding of the Cross-Compliance rules. This would have allowed Cross Compliance rules to be successfully and better represented in the platform. Hence, discussing the desired outcomes for the platform earlier on, and then frequently revisiting these, this would have given the developers a clear picture of what was needed earlier and would have led to development time efficiencies and an even better product.

### *The Importance of representation*

Although working in a multidisciplinary team meant many perspectives could be considered and were represented, due to the complexity of the project and the eventual diverging of one and creation of five regional platforms, areas where representation was poor were underplayed. This was seen, for example, within the Spanish and the UK platforms where emphasis on the farmer's platform took precedence, while development of the inspectors' components was less advanced. This led to functions considered to be important, such as the inspectors viewing more than one farm at a time and being able to message multiple farmers at once, not being possible due to time constraints.

It is evident that, especially with agricultural consultants and advisors, some considered their role to be to represent farmers. This was manifest in the following ways; forming opinions on the technical abilities of farmers they represented and what “would appeal to them in look, functionality and ease-of-use”. Agricultural consultants believed they could also outline practical situations where RECAP could help interpret and rewrite information on cross-compliance in a more farmer friendly way. Another partner felt that the developers should have had direct communication and worked with the end-users, in particular the farmers, directly, rather than through representation or from interpretation using co-production activities. By involving them directly, the developers may have gained a clearer idea of the farmer needs, and the farmers themselves may have been able to justify or explain their suggestions in alternative, and possibly, more persuasive ways.

## **4.11.2 Feedback from farmers:**

### *Motivation for RECAP involvement*

Farmers were keen to volunteer to get involved with the RECAP project for a variety of reasons. These included (a) practical reasons, such as making administration and adherence to cross compliance rules easier, making the process more efficient and less time consuming; (b) personal reasons, such as to reduce the likelihood of on-site inspections, reduce the likelihood of breaches or through general interest in agri-technology; (c) academic reasons, such as improving their own understanding on cross compliance rules or ethical reasoning; and (d) moral reasons, such as to helping to find a solution and advance their field of farming. Some farmers believed there was a duty to involve farmers in the platform development, with one farmer believing “the Paying Agency should ask farmers before planning new instruments”, another farmer stating they “knew

better how an app like RECAP should be developed”, to facilitate farmers for everyday use and a third stating a “belief that farmers need to be involved to ensure systems are fit for purpose”.

### *Farmer and end-user value*

Farmers felt that they were able to provide in-depth knowledge of their farming experiences. For example, a Serbian farmer stated he could “provide specific comments and insights on organic farmers’ needs” in completing their Organic Subsidies Provision Process. They could offer “practical implementation and assess the usability based on the technical capability of a farmer”, for example, suggesting links to specific chapters in the cross-compliance handbook for easy reference.

Farmers also felt that their suggestions could “represent the opinion” of other farmers in similar situations, and not just provide specific comments about their own personal needs. They could also provide recommendations from the perspective of the end-user, rather than just their own experiences.

### *Methods and timing of involvement*

Some farmers felt that their level of involvement in the project was suitable. One farmer commented on the usefulness of the face-to-face sessions, where agricultural consultants spent time demonstrating and discussing all the functions of the platform. Bugs were still present during the piloting session and the farmer felt it would have been “a frustrating platform to review” had the consultant not been there to support him. This could have easily discouraged the farmer from reviewing the platform effectively.

Several concerns were raised by farmers and partners as the main co-production activities occurred during harvest season. This is a very busy period for farmers, which may have prevented so many farmers from getting involved or may have meant the farmers were not able to contribute as much time to the project as they would have liked.

### *Overall opinion*

Generally, the farmers felt they had positive experiences of their involvement in co-production, and often linked satisfaction to instances when one of their own suggestions was incorporated into the platform or when their feedback was “appreciated and diligently recorded”. Farmer suggestions included ways to simplify the inspection of cross compliance rules and simplify many functionalities to make the platform more useful for the farmers. Where a farmer’s suggestion was not incorporated, the farmer was not necessarily deterred from continuing to support the project; in fact, some farmers felt that they needed to be more strong-minded and push some of the suggestions that were rejected. One farmer claimed; “I would have dedicated more of my time since I now see that my suggestions are taken into serious consideration”. This highlights the importance of keeping farmers informed of progress, so that they feel part of the process, feel valued and therefore contribute more. By having more involvement, farmers may have had confidence to put forward ideas, and be more persuasive over suggestions that were not incorporated. However, there were instances where the rejection of proposed modifications to the platform did lead to disengagement with development process.

**Box 1 A farmer case study on the benefits of participating in the RECAP user needs exercise.**

Box 1: FARMER CASE STUDY – UK

Stan and Eileen\* have a 350 hectare mixed-use arable and sheep farm in the South of England. They have been managing their farm for more than forty years and the property has been in the family for four generations. Like many farmers, cross-compliance is a worry for them: “Farmers are fearful of a cross-compliance inspection” [interview quote from Daniel\*, their son, Sept 2018].

Even though the cross-compliance regulations are at least 10 years old they still find it daunting, which is understandable as the cross compliance guidebook used in England is more than 80 pages long. Many farmers share this fear and in particular share a fear of Paying Agency coming on their farm.

Stan and Eileen participated in developing the RECAP platform by participating in the user needs exercises in 2016 and 2017 and in 2018 participated in piloting the platform. Their user need requirements included: a simple to use platform that was internet-based making it easy to record information and contact the Paying Agency. In terms of technical specifications they wanted the platform to include a greening calculator and for the remote sensing application to be able to ‘see’ (remote sense) field margins 1-2 m wide. Most of all, they wanted it to provide clarity on the cross-compliance rules and key cross-compliance dates. See the following table for their user needs and how they were included in the RECAP platform.

**Stan and Eileen's user needs**

User requirement	Considered?	Included?
Simple to use	Yes	Yes
Clarity on cross-compliance rules	Yes	Yes
Key cross-compliance dates	Yes	Yes
Simple to record information	Yes	Yes
Communicate with Paying Agency	Yes	Partly: ability is there, England's paying agency did not participate in the RECAP project
Remote sense 1-2m field margins	Yes	Partly: Accuracy of 1-2 m out of scope of project but can upload photos instead
Has a 'greening' calculator	Yes	Partly: does not work as intended so parked
Internet-based	Yes	Partly: not available on iOS phones

Even though the RECAP platform is only a proof of concept pilot and not all of their needs were able to be implemented, participating in the co-production process has still been useful to them because now they understand the cross-compliance rules better. Even without the RECAP platform online, it has reduced their fear of the cross-compliance process.

\*All names are pseudonyms

## 5. Lessons learnt

### 5.1 Key lessons learnt

The key lessons learnt were:

- The importance of having members from all end-user types – including technical staff - consulted within the development process, and not relying solely on recommendations made on behalf of another end-user. This would avoid important features or key priorities and concerns being missed.
- The importance for co-production plans to be considered as early as possible as well as being agile and able to evolve to suit those involved through the project lifetime as there is a danger in under-estimating how long co-production activities can take to design and carry out.
- The importance of well timing major co-production and project activities, as this can have an impact on recruitment, level of engagement, and capacity to deliver on time and to quality for all stakeholders and end-users.
- Not all co-production methods are suitable or effective for all groups; therefore it is more appropriate to employ a range of participatory methods to ensure engagement and to gather high quality feedback from everyone.
- The importance of providing feedback to all those who participate in the co-production process to enable them to feel that their input was recognised and valued.

We expand on these key lessons learnt below to discuss ways to ensure engagement of all groups and the most effective communication with the technical team.

### 5.2 Farmer engagement in the project

Farmers were involved in the project at a number of key stages (definition of user requirements, months 1-4; reviewing the draft version of the platform, month 11; reviewing the first online version of the platform, month 17; and during the pilot phase, months 26-28). However, agricultural consultants were used on occasions during the project to predict and represent the needs of farmers within the RECAP project. Using agricultural consultants meant that farmers' involvement could be reduced to the minimum to protect them from survey fatigue (Sharp & Frankel 1983). The farmer involvement could therefore be focused strategically on periods where their experience and feedback was most useful, i.e. when testing a working platform with their personal data. There was a concern that, if a farmer wanted to be part of the whole project, they would be more likely to be a progressive thinking farmer. The tendency to involve "progressive thinking" farmers may not have provided an accurate representation of typical farmers. Payment of farmers for their participation might have allowed a more representative sample of farmers to be involved in the project in a more concerted manner, but would have had resource constraints. A limitation of the approach taken was that farmers participating in the RECAP project didn't have the opportunity to see the full picture of the project and hence they were not able to flag up potential issues or suggestions when they arose. Instead the farmer representatives (the consultants) were relied upon heavily to ensure that the farmers' needs were met in the final platforms.

To avoid this in the future, one possible resolution would be to invite farmers to participate and engage with the aims and objectives of the project from the initial stages and remain engaged throughout its lifetime, not just at strategic points. Although asking individual farmers to be partners may represent too much of a commitment, there could be an opportunity for farmers to form a working group or committee and act more like the organisations whom were involved. For example, farmers could remain involved and informed of the progress of the project, offer to take on responsibilities as a team and therefore allow individuals within the



farming group to volunteer to support the project when they had capacity. Farming members could leave or join the group and could access the other farmers support within the group when they required it. Together, a farmer working group may have had more confidence to challenge suggestions that were rejected, or be able to support the prioritisation of functions and processes in a more agile way as a response to the evolving platform rather than be invited to respond to specific activities.

An alternative way to engage with end-users, but not require their continuous involvement, would be to create an interactive newsletter or send email updates to a selected group. This method could to invite feedback to questions, suggestions and future proposals from targeted end-users who are interested in supporting the project but who may not wish to commit to anything formal. In this way, feedback could be captured about novel aspects of the platform before any resource is spent on development, and could also help manage the expectations of users before they are exposed to any form of the platform. Recruitment to this end-user email list could be done through published articles on RECAP, or during conferences. Agile, open invitations for feedback may have encouraged farmers to input more often than previously planned or initiate interesting areas for discussion, collected in an ad hoc type comments email box directly to the developers and project partners.

### **5.3 Methods to ensure engagement of all groups**

A variety of methods were used to capture the thoughts and feedback from partners, farmers and other end-users. Generally, these were all successful for their purpose. Questionnaires were used for collecting quantitative, and qualitative data (via open ended questions); interviews, meeting and focus groups were used for probing deeper into issues and generating new ideas; the Taiga system functioned well as a database for managing and storing issues reported on RECAP; emails functioned well for short communications between individuals; and project meetings provided the opportunity to delegates to witness the progression of other areas of the project in addition to sharing their own progress with others.

One suggestion that was flagged up by partners and farmers who were involved in RECAP was that the timing of the focused workshops and interviews (which farmers thought was a successful way to engage them) occurred during the harvest season, which is a very busy time for farmers. As a result, the recruitment of, and the quality and quantity of data gained from the farmers may have been lower due to their attentions being required elsewhere. Thus, farmers suggested that consultation was not conducted during harvest, but rather, around the period when BPS claims are made and cross compliance inspections are carried out. This way their minds are already focusing on the policies and requirements of cross compliance, and engagement with RECAP during this period would have allowed them to better identify with the tasks under consideration.

In a few cases the agricultural consultants were able to take a flexible and informal approach to data collection with their clients, approaching them opportunistically or combining other non-project objectives within single visits. This appeared to work well, as the farmers could answer honestly with their consultants due to the pre-existing professional relationship. This was considered to be more beneficial than if the project partner had been required to formally arrange meetings, plan agendas and travel between farms specifically for the project objectives. One concern was that as the agricultural consultants' approach was quite informal, this may have meant the farmers took the interactions less seriously than if a researcher had been present. Equally if Paying Agency staff (in the case of UK and Spain) had helped conduct the data collection, the farmers might have felt that the project had the full support of the Paying Agency and would have increased the engagement with the tasks, but conversely this may have reduced engagement due to potential consequences and caused the farmers to be fearful of giving honest opinions.

Taiga was used as a system to report, manage and store issues identified in the online version of RECAP. Although this is a typical system that developers use for reporting “bugs”, this system was not compatible with a number of partners’ computing system requirements (due to their organisation’s data security policies) as reported in the semi-structured interviews, and this was evident from their lack of input onto the Taiga system. These partners had to use other means to report issues and suggestions, which were not documented or rated in the same way as the other issues reported. This could have led to the same suggestion being raised numerous times, making more work for the developers, or the issues may have been missed off from consideration as they were not approached in the systematic way like Taiga. Reporting outside Taiga may have made it difficult to follow up on the outcomes for suggestions made by testers as they would not be assigned a clear “closed” or “rejected”. Potentially a “bug” reporting platform suitable for all partners should have been identified, or the issues should be manually put in to ensure they are all stored centrally.

## **5.4 Methods to ensure effective communication with the technical team**

Following the initial user-needs gathering exercises, partners often communicated via email, telephone and Skype to share information quickly and directly with the technical team. The content from these conversations were not recorded and therefore the development and evidence of co-production that occurred between these partners and end-users was not always documented. It is therefore difficult to evaluate the full utility of direct electronic communication for co-production but this direct communication is clearly an effective way to communicate specific needs. However, earlier engagement of the technical team in the user-needs gathering process would have been an advantage. This would have required a large amount of personnel time from the technical staff to attend (even virtually) all the early co-production workshops however this would have given the technical team a deeper understanding of the needs of the end-users and would have enable the early conversations to be bounded within reality of what the technical team were able to deliver within the constraints of the project. The involvement of the research team would still be required to facilitate the conversations and to assimilate the user needs into a prioritized list for the development team, however involving the technical staff would have been an advantage.



## 6. Conclusions

The co-production of RECAP as a public service tool to support the completion of cross-compliance applications and to demonstrate farmers have met EU CAP regulations, has been successful in not only developing an effective and accurate platform, but one that is user-friendly and efficient for its end-users. This success has been due to a multi-disciplinary and multi-regional team demonstrating commitment and the capacity to collaborate in new ways with other stakeholders and with end-users to achieve this shared objective through an iterative process of co-production.

The early work to identify end-users and their specific end-user needs enabled the project team to ensure key stakeholders and the RECAPs end-users were involved in its development. This ensured legitimacy and value in the project for many regions. This early work also quickly identified that there was a need for customisation at both a regional level and within the profile of different user groups to ensure that efficient platforms were built. It also highlighted the importance of developing the platform that was fully informed through the process of co-production.

To ensure as many user requirements were incorporated as possible, opportunities for co-production occurred throughout the project lifespan and the pilot evaluation and feedback process has identified areas for future development of the concept. By using a wide variety of co-production and participatory methods, realistic expectations from those involved in the process were met. For those end-users who were invited to contribute, but had limited time or project resources to cover their time, they could strategically participate in a range of different opportunities, including but not limited to; workshops, informal conversations, online piloting and completing questionnaires, where their knowledge and experience would have the most benefit for themselves and for the project.

Through evaluation, it was reported that not all the co-production and involvement methods were suitable or effective for everyone. Feedback on co-production was captured and this information can be adapted and applied to future projects utilising co-production..

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