NIVA – NEW IACS VISION IN ACTION

Work Package 2 – Large Scale Pilot

D2.6 – Monitoring and Benchmarking (M36)

Deliverable Lead: RVO

Deliverable due date: 30/11/2022

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 842009.

Document Control Page

Document Control Page	
Title	D2.6 – Monitoring and Benchmarking (M36)
Creator	Folkwin Poelman
Description	This second version of the Deliverable D2.6 sets the blueprint for the monitoring and benchmarking of the Key Performance Indicators (KPIs) that were formulated by the nine Use Cases of the NIVA project.
Publisher	"NIVA - New IACS Vision in Action" Consortium
Contributors	WR, RVO, TRAGSA
Date of delivery	20/12/2022
Type	Text
Language	EN-GB
Rights	Copyright "NIVA - New IACS Vision in Action"
Audience	☐ Public ☒ Confidential ☐ Classified
Status	☐ In Progress ☐ For Review ☒ For Approval ☐ Approved

Revision History			
Version	Date	Modified by	Comments
0.1	23/05/2022	Folkwin Poelman	Initial version and outline
1.0	15/11/2022	Jesús Estrada, Paloma Vega, , Sofía Siahalou, Agnieszka Tarko, Dominique Laurent, Kadri Pärnpuu, Martynas Rimgaila, Ismael Rodriguez Cabado, Dave Hearne, Jaap van Os, Peter Paree, Jesper Stendal Sørensen, Ada Mancuso, Hector Manuel Sánchez Pastor, Marina Peña Gallardo	Partners contributions
2.0	16/12/2022	Tomaso Ceccarelli, Jesús Estrada	Integration of General Analysis
3.0	20/12/2022	Jesús Estrada	Statistical Analysis, Final version

Disclaimer

This document is issued within the frame and for the purpose of the NIVA project. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 842009. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the European Commission.

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1. Management summary and Introduction

The Task *2.4 Impact Assessment & Benchmarking* is part of the *Work Package 2: Large Scale Pilot*. The Task will produce the Deliverable *D2.6 Monitoring and Benchmarking* on three occasions: M12 (May 2020), M24 (May 2021) and M36 (May 2022).

The specific objectives of Task 2.4 are:

1. Accomplish the user validation of the previous deployments in real conditions;
2. Measuring the KPIs according to the impact assessment framework in T2.1;
3. Collect feedback from Use Case stakeholders/users;
4. Monitoring KPIs of Use Cases;
5. Benchmark the impact of each Use Case against the baseline.

The results of the planned work is updated and summarized at the end of the NIVA project (M36) in this document.

The first version of this Deliverable D2.6 (M12) sets the blueprint for the monitoring and benchmarking of the Key Performance Indicators (KPIs) that were formulated by the nine Use Cases of the NIVA project. These KPIs were formulated in the pre-project phase of NIVA and were already present at the start of the project in June 2019. These KPIs were based on the assumptions that were made in the drafting of the project proposal. In the current version of this deliverable, the KPIs reflect the final experience. As a result of the developing and testing of the Use Cases, the initial assumptions were validated and in some cases forced an adjustment of the KPIs.

In the main section of this document, the KPIs that the Use Cases formulated will be shown. In Chapter 3 we will look forward to see how the monitoring and benchmarking of the KPIs of the Use Cases have been updated in the previous year. Finally, Chapter 4 Conclusions will provide a short summary of the document.

A reminder of the NIVA Theory of Change (ToC) has been provided as annex, providing the general framework where to logically place the KPIs through the NIVA LogFrame. The original NIVA ToC was adjusted during the project period. It also stimulated a discussion among partners on the existing KPIs and new ones that ought to be considered to indicate the change NIVA envisaged and track progress.

Acronyms

Regarding acronyms and NIVA specific concepts, the information is publically accessible in the NIVA Common Glossary[1].

[1] https://www.niva4cap.eu/uploads/downloads/D3.1_NIVA_CommonGlossary%20-%20M12%20-%20V1.0.pdf

2. Updated Use Case KPIs

NIVA WP2 UCs development was planned as a three-step iterative cycle. The different cycles to be applied were:

First Cycle: Gathering requirements/needs from EC, MSs and other stakeholders. Mapping available data and software used by different stakeholders. Proposing standards and describing APIs for data exchange between stakeholders and IACS; Development and test APIs in real conditions. NIVA tools have been designed and developed by each of the 9 Use Case teams chaired by a national Paying Agency. In this first phase, the NIVA tools were developed in a national context as Single Member State Pilot (Single MS Pilot).

Second Cycle: Continued Development and test APIs in real conditions, at least in one MS. Stakeholders feedback and validation. Further improvements development and test. Missing software tools election. Test might be done in more MS. This second cycle is called the *Single Member State testing*: the NIVA tools are tested in real conditions by the developing MS.

Third Cycle: Cross MS testing and Call for contributions developments, test and validation. Bringing also other MSs or PAs not involved in NIVA through the Call for Contributions (especially Financial Support for Third Party Mechanism). This third cycle is called the *Multi Member State (MMS)* testing or Cross MS testing. The objective of this MMS is to ensure that NIVA tools may be reused with reasonable effort by other European Member State and its or their concerned PA (what is the main aim of NIVA project).

The development cycles end up with a deployment in real conditions phase, setting up the tools in real conditions in the IACS system where it is possible and as much as possible.

After 4 years of work and taking into account the results of the interative development cycles and the outcomes of SMS, MMS testing phase and Deployment Phase, in this Chapter the final KPIs are shown.

For any external reference, the name of the KPIs are built by a combination of UC name and the number located in the following tables. Therefore, the second KPI in the UC1a table will be referenced as KPI_UC1a_2, for example.

UC1a - Earth Observation Monitoring and Traffic Lights

UC1a, developed in Greece by Opekepe, is a decision support system aiming to help the implementation of Checks by Monitoring as well as the forthcoming Area Measurement.

It integrates EO-driven results obtained from a classification engine and it generates a traffic-light categorization based on the original data sources and the payment schemes. The subcomponents developed by UC1a to carry out those processes have been: User management, Data Import, Business Rule Engine, Decision Engine, FieldMap and Data Export.

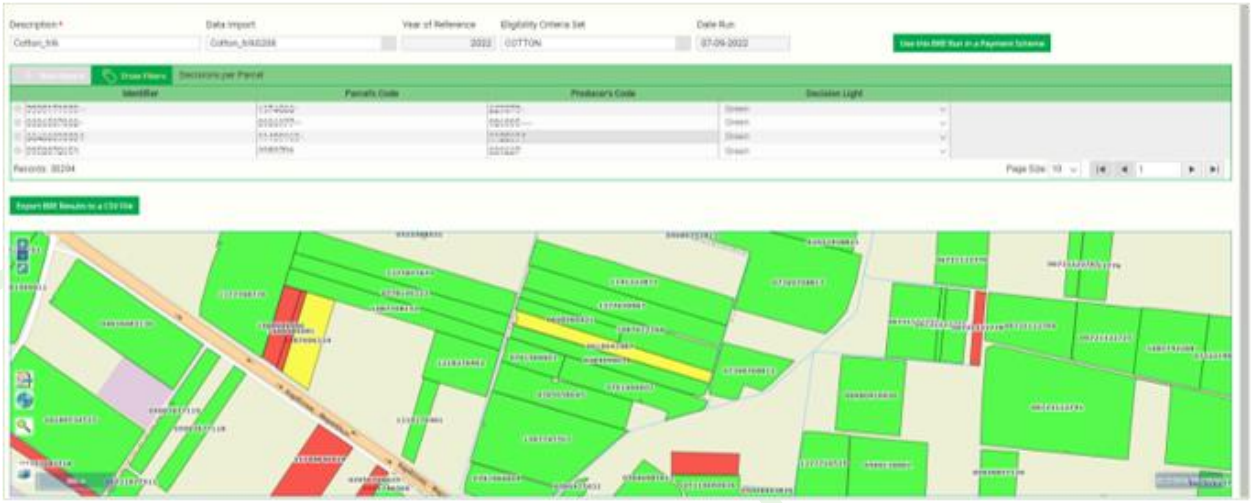

Figure 1 UC1a Classification results

Real data from claim year 2022 are used, regarding 3 prefectures and covering 9560.39 km^2. The DSS-tool is tested and used by 16 PA inspectors. It is connected to UC4a AgriSnap though an API. It is not connected directly with the Greek IACS, but exchanges data manually. The quality of the traffic light results is checked by the geotagged information received from the actual yellow/red cases. Specifically, 10 inspectors (5 teams) validated the traffic light results of 1800 'yellow' parcels declared as 'cotton'. The validation of parcels with permanent crops was also achieved by CAPI.

The traffic lights which is the output of the DSS will be used in the actual payments through the Greek IACS system. In the deployment phase PA inspectors are involved by sending back geotagged field photos. In addition, 'alerts' were sent to farmers and the farmer associations regarding the doubtful cases. Many of them responded either with amendments in their declarations or by performing farmer activities.

This UC has achieve successfully its defined KPIs as stated in the following table:

Number	KPI Description	Deployment phase	KPI target
1	**Number of developed eligibility criteria algorithms (Decision Trees) by using EO Monitoring**	Accomplished since M24.	3
2	**Number of system components developed**	Accomplished since M24.	5 subcomponents (1 system)
3	**Number of farm holdings that will be included in testing in real conditions**	In deployment phase extra 39k holdings (BPS) & 13k (cotton) are checked.	5% of farm holdings (~35k holdings)
4	**Reduction of non eligible cases**	Accomplished since M24.	20 non-eligible cases to become green. Baseline is 100 non eligible cases (yellow&red)
5	**Reduction of administrative burden for PAs**	Accomplished since M24.	20 objections not to appeal after the "running" of the DSS procedure of UC1a. Baseline is 100 objections (20%).
6	**Number of collaboration established between PAs**	Accomplished since M24.	1 PA reused and found useful the NIVA-DSS

Table 1 UC1a KPIs benefits

Regarding the Number of developed eligibility criteria algorithms (Decision Trees) by using Earth Observation Monitoring, the UC has developed 3 land-related eligibility algorithms in order to assess eligibility. UC1a has already defined the 3 land-related eligibility criteria in our DSS: these are BPS scheme - VCS scheme (rice) - Cotton scheme. The tests on those three decision algorithms (BPS, VCS and Cotton) have been performed using specific samples.

	Basic testing	Deployment	KPI target	Whole Country
Area (in km2)	2161.39 km^2	9560.39 km^2		
Number of parcels	135.336 (BPS) & 31.210 (VCS)	220.837 (BPS) & 45.646 (cotton)		
Number of farm holdings	31.199 (BPS) & 9.455 (VCS)	39.177 (BPS) & 13.394 (cotton)	35.000 farm holdings (5% of total holdings in Greece)	654.136

Table 2 UC1a summary of KPIs

Reduction of non eligible cases and Reduction of administrative burden for PAs KPIs were achieved in the testing phase comparing data with Zone involved in Checks with Remote Sensing (CwRS). They could not be achieved it the deployment phase because the related 2 zones of CbMs were not in CwRS. Thus, neither comparison of the non-eligible cases nor the comparison of objections was possible.

Opekepe foresee to set up UC1a in the Greek IACS system and to make improvements in farmer notification through the UC4a-tool. The most important is the management of large volumes of non-

green cases (RED/YELLOW) and inconclusive parcels. Inconclusive parcels are those that due to small size or shape cannot be assessed by the Sentinels. Adding up those cases, the total parcels may reach 3 million. Thus, other classification solutions/ new algorithms are required and higher resolution images (e.g. Planet). In addition, the integration of extra markers which detect certain farming activities will strengthen the initial classification results so as to increase the green cases (mainly for yellow parcels with low probability)

UC1b - Agro-environmental monitoring

UC1b Agro-environmental monitoring is about the analysis of Agricultural Activities, as they have a strong impact on the environment. To carry out this evaluation, UC1b has developed a set of indicators based on existing scientific methods and on data widely available in Europe (IACS, Sentinel-2 images, topographic data). These indicators may contribute to assess some of the new CAP objectives and some Sustainable Development Goals.

UC1b is not directly related to testing areas. However, sufficient testing extent is preliminary condition for KPI_UC1b_2 indicator**.** The objective is to publish one dataset per environmental indicator minimum (tier 1 component) on an area covering in total 5% of agricultural area, in France and in at last one of the other testing countries.

CT1[2](Parcel), NT1[3] (pixel) and BT1 [4](grid cell) are the candidate indicators to be published on NIVA web sites.

CT1 (pixel) is considered as uptake by INRAE and should be published on French GeoPortal and/or on the THEIA portal (https://www.theia-land.fr/pole-theia-2/centres-dexpertise-scientifique-ces/), once results have been validated. Following tables provide the details of current situation about the testing zones of each Tier 1 indicator. Therefore, it is possible to define an indicator called 'Farm holding area tested in real conditions'

Recapitulative table for CT1 (parcel)

MS	MS area	Area of the agricultural land	Target	Area tested
France	543 940 km² (metropolitan FR)	267 000 km² (agricultural area in metropolitan FR)	27 197 km² (metropolitan FR)	1 214 km² (parcel) *and* *543 940 km² (pixel)*
Spain	506 000 km²	160 000 km²	25 300 km²	8 600 km² (Seville) and 94 222 km² (Castile Leon)
Denmark	42 930 km2	26 260 km2	2 146 km2	12 100 km²
The Netherlands	41 870 km²	18 220 km²	2 093 km²	41 543 km²

Table 3 UC1b CT1 testing area

[2] CT1: Carbon Tier 1
[3] NT1: Nitrogen Tier 1
[4] BT1: Biodiversity Tier 1

The 5% target for CT1 parcel has been achieved in Spain it has been widely achieved in Denmark and even more in Netherlands as CT1 parcel has been calculated all over the whole country.

However, the 5% target has not been achieved for CT1 parcel in France but it may be considered that the production of CT1 pixel all over France as an alternative way to achieve the KPI.

Recapitulative table for NT1 (parcel)

MS	MS area	Area of the agricultural land	KPI target	Area tested
France	543 940 km^2 (metropolitan FR)	267 000 km^2 (agricultural area in metropolitan FR)	27 197 km^2 (metropolitan FR)	12 100 km^2
Spain	506 000 km^2	160 000 km^2	25 300 km^2	5 000 km2 (half of S2 tile) in Castile Leon
Denmark	42 930 km2	26 260 km2	2 146 km2	-
The Netherlands	41 870 km^2	18 220 km^2	2 093 km^2	-

Table 4 UC1b NT1 KPIs

The calculation of NT1 requires more demanding data preparation (2 agricultural campaigns information) and high computation memory (pixel level) which can explain that the testing zones are smaller than planned initially. Therefore, the 5% KPI target is not achieved but testing has nevertheless been conducted on significant testing area.

Recapitulative table for BT1 (kilometric grid)

MS	MS area	Area of the agricultural land	KPI target	Area tested
France	543 940 km^2 (metropolitan FR)	267 000 km^2 (agricultural area in metropolitan FR)	27 197 km^2 (metropolitan FR)	274 km^2 (Coteaux) and 2 631 km^2 (Gers)
Spain	506 000 km^2	160 000 km^2	25 300 km^2	8 548 km2 Province of Valladolid
Denmark	42 930 km2	26 260 km2	2 146 km2	-
The Netherlands	41 870 km^2	18 220 km^2	2 093 km^2	-

Table 5 UC1b BT1 KPIs

NT1 and BT1 will likely be tested only in France and Spain. The 5% KPI target is not achieved but testing has nevertheless been conducted on significant testing area.

It is important to mention that UC1b is not about administrative burden reduction. UC1b developed tools that are not expected to be used for CAP payments at this stage, neither for current CAP nor for post2020-CAP. They are expected to provide new services.

Overall, the UC has achieved partially its KPIs. Many actions are still on-going. Publication on NIVA web site might be replaced by publication on Zenodo. Situation depends on indicators (more advanced on CT1) and on countries (more advanced in France).

Number	KPI description	KPI target	Comment
2	**Number of open or reusable datasets published**	The objective is to publish one dataset per environmental indicator minimum (tier 1 component) on an area covering at least 5% of agricultural areas in France and in at least one of the other testing countries	CT1 in France and Denmark NT1 in France BT1 in France
3	**Number of stakeholders contacted, informed, solicited**	In France, a minimum of one stakeholder belonging to at least one of the 5 following categories of stakeholders: Farmers or farmer organisations, Advisory Services, Water or environmental agencies, Research center, national authorities. For the other testing countries: Minimum one stakeholder belonging to at least 3 categories of stakeholders	France: is achieved (see document D2.2)
4	**Number of stakeholders having adopted indicators**	Minimum one stakeholder per indicator (Carbon, Nitrate or Biodiversity) in France	Achieved: CGDD (Commissariat général au développement durable) for CT1, BT1, NT1; 3 private societies (KERMAPS, Terranis, NETCarbon) have decided to implement CT1, Terranis will also adopt BT1 and NT1 5 stakeholders for France In addition, UC1b recorded in the ENRD Evaluation Knowledge Bank.
5	**Number of Datasets reused and valorized**	Minimum one dataset per indicator reused and valorized	CT1 parcel data set valorised through the ENSG student project.

Table 6 UC1b General KPIs

Therefore, the Main KPI (Number of Datasets reused and valorized) has been achieved. On the other hand, the other indicators have been achieved partially at the end of the project in France data but it is more challenging for testing countries.

CT1-pixel has been first calculated on the Occitanie French region, on a zone of about 110km x 110km. Then it has been decided to compute it on the whole France. To do so, there was a need of high computation power. This computation power was not available among NIVA partners. UC1b team had to make some arrangements with CNES (French Spatial Agency) to get access to their relevant server and satellite databases.

The computation of BT1 of eastern part of Gers Department has been carried out on ordinary PC. In these conditions, it was necessary to cut the whole area in 8 zones of around 300 km^2 each. This has of course increased significantly the computation time, for both steps: data preparation and running the tool itself.

The 3 phases of testing (SM, MMS and deployment) have shown the feasibility of computing Tier 1 indicators on large areas: there are still difficulties but potential improvement solutions have been identified and some of them explored. In case of strong driver (e.g. legal obligation to compute these indicators), it would look feasible to move relatively quickly to real life conditions.

The situation is different for CT2 and CT3. The experience has shown that getting FMIS data was quite fastidious and costly (farmer organisations & FMIS providers) have required funding to provide data on a few farm holdings in convenient way. In other words, large scale testing has not been affordable. This situation will go on as long as farmers don't have any obligation to provide to public authorities the FMIS data required for CT2- CT3 (organic amendment, yield export). The only short term real life adoption of CT2-CT3 would be through their integration into FMIS, with farmers and advisers as target users.

Concerning the size of the final tests, the deployment impact depends on indicators: whole country for CT1 (NL – FR), significant testing areas for other T1 indicators or countries, only limited number of farms for CT2 – CT3 (still on-going).

Therefore, the definition of the impact in farmers activity or PAs is not easy. The main reason is clearly the nature of this Use Case that is exploratory: no one is yet officially in charge of computing the UC1b indicators. It means that the real-life conditions are still unknown.

However, it should be also recognized that the UC1b components are in various levels of maturity. The components for CT1 indicators have been ready first and so, more widely and strongly tested than the other ones.

Also, UC1b indicators are not used par payments during current CAP and they are not expected to be used for the post 2020 CAP. In the future (post 2027 CAP), UC1b indicators – once consolidated – might be used by PAs for the payment of some schemes, with the payments being based on results (instead of practices commitments).

The operational use of UC1b indicators depends on the existence of a strong driver; a possible one would be the evaluation of the CAP by national authorities or the consequence of the green deal on the monitoring of the CAP National Strategic Plans.

Therefore, UC1b indicators need to be consolidated and improved or even upgraded (e.g. development of NT2 and BT2).

UC1c - Farmer Performance

The objective of this UC is to provide a data-driven tool to evaluate the farmer performance taken into account the new CAP guidelines. Current IACS data alone is not sufficient for evaluating farmer performance and additional data is need.

Missing information about farmer activities has been obtained from Farm Management information Systems (FMIS) according to the following architecture:

Figure 2 UC1c Concept architecture

Therefore, the final outcome of the UC has been a prototype API for exchanging data between IACS and FMIS. Those data are eventually used for the generation of a Farmers performance dashboard.

The evaluation of this UC based on area KPIs is not possible due to this use case does not have area related KPIs. Nevertheless, the general evaluation of KPIs, using data from the tests performed by AGEA in every phase, can be shown as follows:

Number	KPI Description	Basic testing	Deployment phase	KPI target	Comments
1	**Number of farmers involved in co-design**	1567 farmers completed the Estonian farmers web survey	2 farmers tested the farmer performance dashboard deployed in Estonia	> 1000 Farmers	KPI target was to involve > 1000 Farmers via co-design and testing activities
2	**Number of farmers involved in testing**	0	2		
3	**Number of FMIS providers**	1	1	at least 1 FMIS provider	KPI target was to involve at least 1 FMIS provider via co-design and testing activities
4	**Number of PAs**	1	1	at least 3 PAs	KPI target was to involve 3 PAs via testing activities (1 NIVA partner, 2 outside NIVA)

Table 7 UC1c General KPIs

In testing phase of farmer dashboard with 1 farmer (representing 3 legal entities) and his real data, decrease in perceived administrative burden was assessed. For KPI_UC1c_2, we also had as target at least 1 FMIS provider and, at least, 3 PAs. It has been achieved with more than 1000 farmers, 1 FMIS provider and 2 PAs.

UC2 - Prefilled application

Each claim submission year data about two main topics is requested from the farmer submitting the declaration: parcel boundary and crop type. The Use Case is mostly aimed to benefit the farmers by creating the methodology and algorithm with preliminary information about parcel boundaries. Farmers use the GeoSpatial Aid Application (GSAA), which allows them to submit parcels' boundaries, to specify crop types on the respective parcels and to provide additional information to Paying Agencies.

There are 3 objectives identified for the UC2 Prefilled application:

- development of the open-source algorithm for the automated parcel preliminary boundary detection and delineation based on Sentinel-2 data (Prototype);
- test of Sen4CAP algorithms for early stage crop classification, which are based on Sentinel-2 10m resulotion images;
- find and test a robotic process automation tool suitable for data harvesting from external registers.

Through the new tools, farmers should be provided with additional data, necessary for submission of the GSAA, thus allowing them to avoid errors and to reduce their administrative burden. Therefore

Paying Agencies should identfy less errors in GSAAs and thus reduce their administrative burden related to additional controls.

In order to evaluate this UC, Area was not identified as target but the number of parcels. As can be seen in this recapitulative table, this KPI, among others, has been achieved:

KPI Description	Basic testing	Deployment	KPI target	Whole country
Lithuania				
2020				
Area (in km2)	24 895			29 440
Number of parcels	652 058		50 000	1 178 817
2021				
Area (in km2)	3 128			29 604
Number of parcels	827 174		50 000	1 178 899
2022 Sentinel2				
Area (in km2)	-	3 409		28 999
Number of parcels	-	51 508	50 000	1 102 031
2022 1x1m super-resolution				
Area (in km2)	-	2 811		28 999
Number of parcels	-	72 456	50 000	1 1020 31
Spain				
2020 Castile and León				
Area (in km2)	72 434			94 226
Number of parcels	1 764 732		50 000	3 440 052
2020 Andalusia				
Area (in km2)	56 101			87 599
Number of parcels	1 319 991		50 000	2 207 783

Table 8 UC2 General KPIs

Regarding users, the KPIs defined, and achieved, were:

KPI Description	Basic testing	Deployment phase	KPI target	Whole country
Number of farmers (number of farmers which would have at least one detected boundary in GSAA)	25%	62%	40%	100% - 125 000
Number of other stakeholders	2 – Lithuania NPA, Spain FEGA	4- Lithuania Hungary, Turkey Ukraine		

Table 9 UC2 Users KPIs

The following table summarizes the general KPIs of the UC:

Number	KPI Description	Deployment phase	KPI target	Comment
1	**Number of prototypes developed**	2	2	2 prototypes
2	**Quantity of data automatically filled**	2	2	2 data sources customized with robotized tool for automated data transfer- copying
3	**Number and % of farmers reached**	71.500 parcels 62% farmers	50.000 parcels 40% farmers	Mar 2022: 30.735 and 25% farmers based on testing results
4	**Reduced errors (mistaken crop classifications and/ or mistaken delineated boundaries)**	By using UC2 boundary tool (with super resolution data) mistaken delineated boundaries – 11,9% Mistaken crop selection by famers reduced to 2,3%	Mistaken crop selection by farmers – 3%, Mistaken boundary delineation by farmers - 10%	Mar 2022: Mistaken crop selection by farmers – 2,3% Mistaken boundary delineation by farmers – 11,3%
5	**Reduced administrative burden for PAs**	28% reduction by using UC2 solution	10% reduction in administrative cost for PA	CwRS parcels delineation task to measure eligible area can be optimized by using detected boundaries. 28% of parcels could be used

				in a drawing process. In 2022 controls season overall 47 923 parcels eligible area was checked by using the RS image so 13418 parcels (28%) could be delineated faster and saved 4 min per parcel. In total saved 894,6 hours and 28% reduction in time and about 8946Euro in costs. Saved time formula: all RS parcels x 0,65 x drawing time per 1 parcel
6	**Reduced administrative burden for farmers**	33% reduction by using UC2 solution	25% reduction of time used by farmers or municipality officers on application submission	An average holding has 9 parcels and each parcel requires 3 min of time for the boundary revision and submission. In total it takes: 9 parcels x 3min – 27 min to do the claim for the average holding. 33% of parcels or 3 parcels in the average holding could be submitted automatically and it could reduce 9 min or 33% of time.

Table 10 UC2 KPIs Conclusions

Therefore, it is clear that the cuantitative KPIs related to number of farmers and surfaces have been fully achieved. Also, UC2 developed all the forecasted tools. It is important to mention that the final results regarding quality of the solution and reduction of error have been far better that defined in the initial phase of the project. For example, It is significant the time reduction and money saving for farmers in the process.

UC3 - Farm Registry

In this Use Case, the innovation consists in modernizing the IACS by optimizing the efficient use of data through the development of an architecture that can be integrated with other systems. The aim of the UC is to create a Farm Registry data model for agricultural areas and to generate update and query interfaces (web services) to exchange information. Besides this model, it has been defined a Farmer Dashboard and a supporting viewer.

Concerning the evaluation of the tools, the main indicator regarding impact (5% of farmers in the registry) has been successfully achieved.

	Basic testing	KPI target (Basic testing)	Deployment	KPI target (Deployment)	Municipalities	Whole country
Area (in km²)	**464,19**	Not applicable	**955,98**	Not applicable	**1.500**	505.990
Number of parcels	1.927	0,63 %	14.759	5%		**~ 300.000**
Number of farm holdings	6.385		49.012			

Table 11 UC3 Volume KPIs

The previous data need the following clarifications: The reason all Farm Registry data are from Spain is because Andalucía has done testing with real Data. Estonia have done theorical testing of our model and added more columns they need. For example, to load data, you need to use all components. First of all, you need to know the data model. Then you need to authenticate in the Farm Registry, use query Data List in order to verify catalogs loaded, use load component to save the data and query Farm Registry in order to verify all information have been loaded.

The burden reduction is limited due to UC3 is mainly focused on IT experts and the PAs.

Concerning users, the KPIs has been fully achieved and the tools have had, even, more testing countries than forecasted.

KPI Description	Basic testing	Deployment phase	KPI target
Number of farmers	Not applicable	Not applicable	Not applicable
Number of other stakeholders	3	2	Targets met
Countries	Complete model and WS: Andalucía Complete data model: Estonia Partially: NL and Estonia	Andalucía and Estonia	

Table 12 UC3 Users KPIs

Finally, the summary table proves that the defined KPIs regarding the number of tools to be developed and the comparative size of the datasets have been met by the UC.

Number	KPI Description	Deployment phase	KPI target	Comment
1	**Number of tools provided**	Design and development	Yes	with now a target of 2, possibly more interfaces
2	**Number of testing PA**	Testing and deployment	Yes	Two in Spain: FEGA (National Level), CAPDER (Andalusia) and Netherlands . Moreover, although Estonia is not a UC3 testing country, they have fully tested the UC3 data model
3	**Number of farm holdings datasets included**	Testing and deployment	Yes	With the mentioned target of 5%. These are Open/reusable datasets
4	**Number of collaboration established between PAs**	Development, testing and deployment	Yes	We have encouraged Spanish regional administrations to be potential testers. They have showed interest although we have not increased the number of collaboration established.

Table 13 UC3 General KPIs

The test and deployment of the tool prove that it has met all the requirements defined in the designing phase, nevertheless, the legislation for the future tool that is currently being developed in Spain. It is important to note that those legal changes are based on NIVA developments with some adaptations. This legislation is also being developed and once it is published, it will be compulsory for the truly operational use of the tools and components.

UC4a - Geotagged photos

The Use Case designed and developed an application for mobile devices to facilitate a farmer and/or advisor to upload a geotagged photograph as supporting evidence to scheme applications. The 'Geotagged Photo Application' will be an integral part of the Area Monitoring System which will be a component of the Integrated Administration & Control System in the CAP post 2020. The geotagged system is constituted by a mobile application and supporting notification system. It will include a secure and verifiable technique of picture capturing within land parcels and their agronomic land.

The performing KPIswere defined as follows:

Number	KPI Description	Target	Actual
1	**Software tools in the prototype app**	1 app developed and deployed to the app store and play store	1 app developed and deployed to the app store and play store
2	**Stakeholder Engagement**	DAFM, Farm Advisors, Farm Organisations – Determine how app can positively impact key stakeholders. Farmers, – Determine how app can improve communication.	Actual - 18 key informant interviews Actual - 7 focus groups
3	**Stakeholder Engagement**	Target - Farmers, Advisors, Inspectors – co-designing an easy-to-use app and overcoming barriers to adoption/ supporting farmers.	Actual - 6 workshops
4	**Engineering Release 1 App Usage**	Target - Farmers, Advisors, Inspectors - to take an image using the app and send to the paying agencies system.	Actual 25 users
5	**Engineering Release 2 App Usage**	Target - Farmers, Advisors, Inspectors - to take an image with various security settings and restrictions using the app and send to the paying agencies system.	Actual – 1,000+ users
6	**Engineering Release 3 App Usage**	Target - Farmers, Advisors, Inspectors/ Multiple Paying Agencies - to take an image using the full features of the app across multiple Countries with testing partners.	Tested by paying agencies in Greece, France, Estonia, Lithuania and Italy. Additional testing by paying agencies external to NIVA also occurred – Austria, Germany Spain
7	**Error Reduction for paying agency**	10% Reduction	~20% (reduction in images with wrong or no data assigned)

Table 14 UC4a defined KPIs

Those data prove how the UC4a has been successfully implemented in the actual Irish IACS system and tested by a significant number of real users. It is important to mention that the errors detection reduction has been improved from 10% (as defined KPI) to 20% as actual result.

In the LogFrame, we have only retained the final figures cumulating all releases (KPI 2 to 6 in the first column). Therefore, KPI_UC4a_2 "Number of users reached" had 500 as target and more than 1000 farmers and advisors achieved, matching with KPI_UC4a_5 below. Also, KPI_UC4a_3 "Stakeholder engagement" had 500 as target and it has got more than 1000 stakeholders including testing as achievement.

On the other hand, there were not defned area KPIs. Nevertheless, the data of the following table highlight the size of the testing area.

	Basic testing	Deployment	KPI target	Whole country
Area (in km2)	n/a	n/a	Not applicable	n/a
Number of parcels	217	19,982	n/a	Approx 1,300,000
Number of photos	458	90,326	n/a	N/A
Number of farmers/advisors	170	1200 unique logins	500	Ireland
Number of other stakeholders	50	180 Inspecting Officers		Ireland

Table 15 UC4a Testing parcels and users

The analisis on the burden reduction obtained by this UC can be found in following chapters.

UC4b - Machine data in Geo-spatial 'on-line' aid application

The Use Case explored and applied the use of data from farm machines, as a new data source for IACS and as an added value data source for the farmer. This data has a high positional and temporal accuracy and can thus serve as a better source to update the farmer's agricultural parcels in GSAA, preferably in a single message. Secondly, this could be used by the farmer to update his FMIS. These two uses lead to a decrease of administrative burden for the farmer combined with greater accuracy.

This relates to improved interoperability providing access to PA of multiple sources (machine brands and FMIs linking to the PA). The areas involved in the test and deployment have been:

Number	KPI Description	Basic testing	Deployment	KPI target	Whole country
	Area (in km2)	0,5	600 – 800		
	Number of parcels	6	7000 – 10000		
	Farm holdings	6	125 – 150		
1	**N. of methods, tools, datasets**	0	7	7	
2	**Number of farmers**	6	125 – 150	50	50
2	**Number of other stakeholders**			PA staff	50

Table 16 UC4a testing summary

50 farmers have been reached through ZLTO, among others. This proves, that the defined KPI in the beginning of the project has been succesfully achieved, both KPI_UC4b_1 and KPI_UC4b_2. In Belgium and Latvia also real data are used, but at this moment on a pilot scale.

UC5a - LPIS update & change detection data

The Use Case aims to minimize manual procedures related to the LPIS administration, and the CAP application. The method to reach the goal is by providing algorithms for updating LPIS automatically. More precisely, to set up change detection processes using machine and/or deep learning based on costs of the manually updating, that the algorithms potentially can replace. Target is a 2% reduction.

As a summary, this is the list of KPIs of this UC:

1. Number of algorithms developed:
    a. Target: 7
    b. Achieved: 7
2. Number of farms/area reached:
    a. Target: Not defined at the beginning of the project.
    b. Achieved: Denmark: 100 % by 2023 in Denmark, by 2022 circa 5 % for Denmark and for France.
3. Reduced administrative burden for PA
    a. Target: Not defined at the beginning of the project.
    b. Achieved: We expect to achieve burden reduction for the PA's for 5 % for the algorithms developed – not the whole LPIS update.
4. Reduced administrative burden for the farmers
    a. Target: 2 %
    b. Achieved: Uncertain. It is very difficult to measure and the burden reduction for the farmers will be by a higher quality LPIS thereby ensuring the correct payments etc.

UC5b - Scheme Eligibility and Payment Eligibility: Click-and-Pay

UC5b has put into practice what the definition of the Automatic Claim regulation required (article 65 par.4 (f), Horizontal EU Regulation No 2116/2021 of the future CAP) for the 3 intervention: BISS, Young Farmer and Eco-schema (article 69 par. 4 e 5, Horizontal EU Regulation No 2116/2021 of the future CAP). The tools have successfully simplified the process of managing payments for CAP interventions and they are able to pay the beneficiaries quickly and without sanctions. The components developed have been:

1. **Click-and-Pay**: Seamless claim engine and management
2. **Nidas**: Certification of data and its source.
3. **Simulation Tool**: Data analysis for CAP makers to fix the unit amounts per hectare (for BISS and CRISS interventions)

The deployment phase starts with an extraction of the sample from the SIAN (Italian IACS) database; then, APIs are created in order to call up the SIAN (Itaian IACS) database and, in the end, were developed integrations with the SIAN in order to recover all the data useful to the *Seamless Claim* (Farm Dossier, LPIS, Entitlement Register and Monitoring). This UC has used always real data related to a big number of users in Italy.

KPI Description	Basic testing	Deployment phase	KPI target	Whole country
Number of farmers	593	593	45% of farmers in the pilot	Test on 593 farmers universe
Number of other stakeholders	4 CAA, 1 OP, Regioni, Ministero, Regioni, 72 European Paying Agencies through international workshop conference	4 CAA, 1 OP, Regioni, Ministero, Regioni, 72 European Paying Agencies through international workshop conference	N.A.	

Table 17 UC4b users summary

	Basic testing	Deployment	KPI target	Whole country
Area (in ha)	41.432,95ha	41.432,95ha	N.A.	Test on 593 farmers universe
Number of parcels	49885		N.A.	Test on 593 farmers universe
Burden reduction	Reducing the time for submitting the application and farmers do not have to go to the local branches for their application. Reduction of application handling costs for PA; tradeoffs with additional costs needs to be considered.	Reducing the time for submitting the application and farmers do not have to go to the local branches for their application. Reduction of application handling costs for PA; tradeoffs with additional costs needs to be considered.	Reduction of 100% for farmers, reduction of 45% for PA	Test on 593 farmers universe
Financial benefit	Paid 3,78% higher than the amount paid in GSAA 2019	Paid 3,78% higher than the amount paid in GSAA 2019		Test on 593 farmers universe
Number of tools developed	3	3	3	Test on 593 farmers universe for Click and Pay, 800.000 farms holding 10.500.000 entitlements for Simulation Tool.
Farmer involvement	100	100	45% of farmers in the pilot	Test on 593 farmers universe

Table 18 UC4a testing area summary

This tool has achieved all the KPIs defined in the inception of the project and it has also obtained a significant result related to an increase of payments to the farmers. Indeed, this tool has proved that the amount paid to farmers can be increase in 4%. Also, it means that burden reduction KPIs, KPI_UC5b_3 and KPI_UC5b_4 have fully achieved.

3. Monitoring and Benchmarking of the UC KPIs

In order to monitor and benchmark the KPIs targets of the Use Cases, all KPIs described in the previous section have been structured in the NIVA LogFrame.

NIVA's LogFrame was maintained and presented in the form of a spreadsheet (see an example for the output level indicators in the table below). KPIs are organized per UC (as well as for WP other than WP2). For each KPI we have 2 rows, Planned and Achieved, where respective values are indicated. For the initially planned ones, values are entered in the column "target". These values are by and large, the ones in the original project proposal although some might have changed during the project. During the project, there was also space to include the ones attained at the different milestones (Single Member State Pilot, Multi Member State Pilot, deployment). The finally achieved ones, at the end of NIVA, are reported in the last column.

The table below shows, as an example, the first part of the LogFrame which refers to output indicators.

Project Level	KPI N.	KPI description	UC or WP		Baseline	Target	Achievement
Output							
	KPI_1a_1	Number of developed eligibility criteria algorithms (Decision Tr	UC1a	Planned		3	
				Achieved			achieved
	KPI_1a_2	Number of system components developed	UC1a	Planned		5 subcomponents (1 system)	
				Achieved			achieved
	KPI_1b_1	Number of environmental indicators developed	UC1b	Planned		3 indicators and 5 tools at different tiers: CT1, CT2, CT3, NT1, BT1.	
				Achieved			achieved
	KPI_1b_2	Number of open or reusable datasets published	UC1b	Planned		4 datasets on Zenodo are published: CT1 in France and Denmark, NT1 in France and BT1 in France.	
				Achieved			achieved
	KPI_1c_1	Number of Farmer performance methods/indicators developed	UC1c	Planned	0	1 prototype, 3 indicators	
				Achieved		1 prototype, 3 indicators	achieved
	KPI_2_1	Number of prototypes developed	UC2	Planned	0	2	
				Achieved		2	achieved
	KPI_2_2	Quantity of data automatically filled	UC2	Planned	0	2	
				Achieved		2	achieved
	KPI_3_1	Number of tools provided	UC3	Planned	0	2 or more	
				Achieved		2	achieved
	KPI_4a_1	N. of software tools in the prototype app	UC4a	Planned	0	1	
				Achieved		1	achieved
	KPI_4b_1	N. of methods, tools, datasets delivered	UC4b	Planned	0	7	
				Achieved		7	achieved
	KPI_5a_1	N. of methods, applications, datasets delivered	UC5a	Planned	0	7	
				Achieved		7	achieved
	KPI_5b_1	N. of tools developed	UC5b	Planned	0	3	
				Achieved		3	achieved
	WP3_1	Number of recommendations/guidelines for standards	WP3	Planned	0	TBD	
				Achieved			
	WP4_1	Number of source codes (projects) delivered	WP4	Planned	0	TBD	
				Achieved			
	WP5_1	Number of stakeholders events	WP5	Planned	0	TBD	
				Achieved			
	WP5_2	Number of published communication materials	WP5	Planned	0	TBD	
				Achieved			
	NIVA_1	No. of methods, indicators, applications, datasets delivered	Project	Planned	0	TBD	
				Achieved			
	NIVA_2	No. of datasets published as open data	Project	Planned	0	TBD	
				Achieved			

Table 19 the Niva LogFrame. Example of output indicators

4. Summary of result indicators including burden reduction.

Based on the NIVA LogFrame which kept track of the progress, we can now summarise the project achievements at the result level. We have considered separately outreach and adoption KPIs.

In the first place we consider the achievements in terms of outreach, or in other words, depending on how KPIs were formulated: how many farmers or other users were reached ? Or alternatively, on how many parcels or on what area were the NIVA solutions tested in the different phases and finally deployed? It is however difficult to add-up figures that often have very different meanings and the graphic representation below provides a better representation of what was attainend.

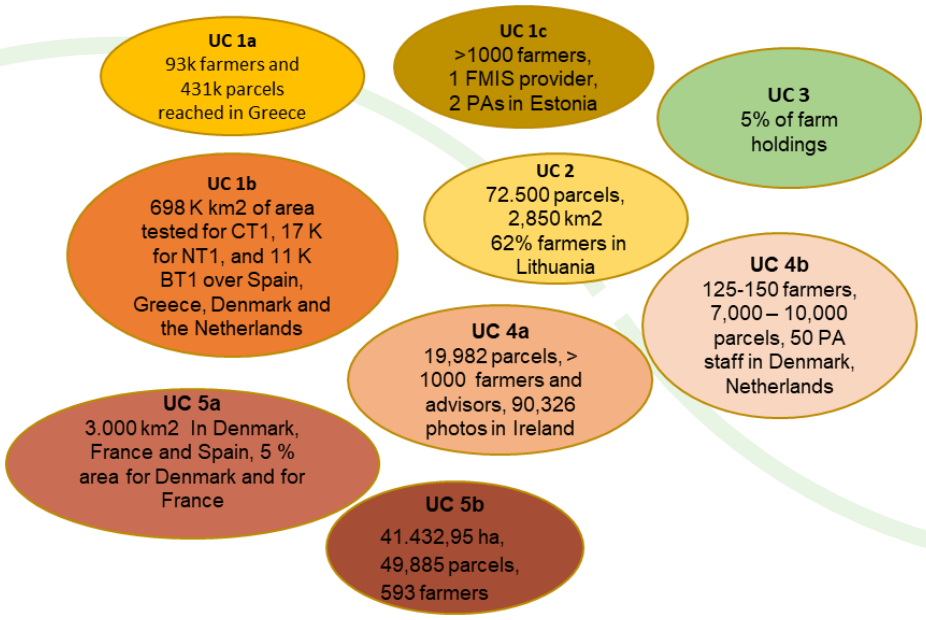

Figure 3 summary of the NIVA outreach

We can represent administrative burden reduction (ABR), which we consider as an expression of potential adoption of a NIVA innovation, in a similar way. According to Ecorys 2018, ABR is about "Information obligations and related activities due to the legislation related to IACS". In the annex, we present the framework which NIVA has used to assess ABR either quantitatively (i.e. with cost/benefit elements) or qualitatively (in terms of perceived reduction or increase in ABR) as well as 2 examples. We consider ABR from the perspective of farmers (or their advisors) and of Paying Agencies. The next figure shows the achievements in NIVA.

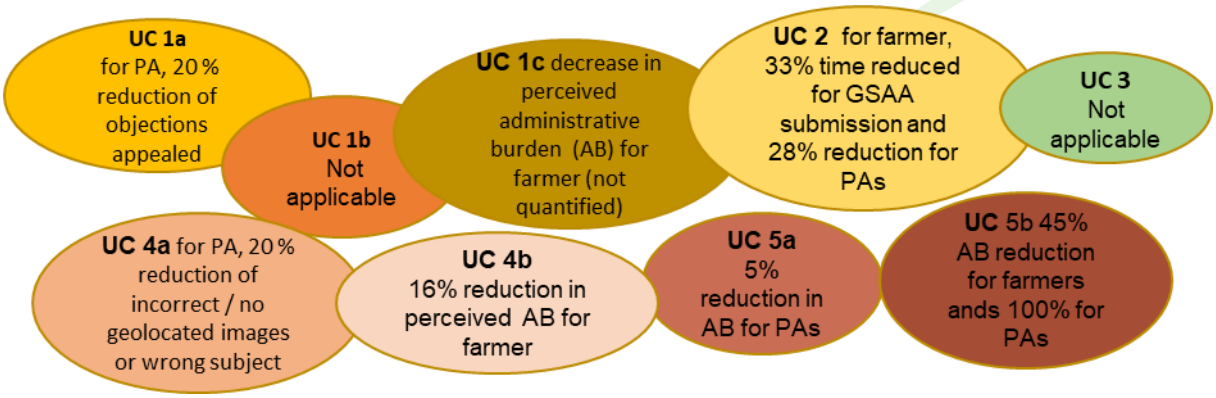

Figure 4 Administrative burden reduction

Altogether compared to the initial KPI targets, NIVA was able to assess quantitatively a relevant burden reduction for farmers in UC2, UC4b and UC5b. It also provided qualitative evidence of ABR for farmers in UC1a and UC1c. However a full assessment of all burdens incurred by farmers due to the new CAP requirements was not possible in the context of NIVA. An attempt to identify both burdens and benefits also beyond ABR, which is further documented in the Annex.

Regarding PAs, the administrative burden reduction achived was also important compared to the initial KPI target for UC1a, UC2 and UC5b, and also observed for UC5a.

Collaborations established during NIVA are a more immaterial although very important achievement which is also part of the NIVA results, and a proxy for adoption. Collaboration was mentioned by several UCs, for example:

- UC1a: 1 PA reused and found useful the NIVA-DSS.
- UC1b: collaborated with 4 stakeholders: CGDD (Commissariat général au développement durable) for CT1, BT1, NT1; 3 private societies (KERMAPS, Terranis, NETCarbon) have decided to implement CT1, Terranis will also adopt BT1 and NT1. Always for UC1b, 3 indicators being adopted by a stakeholder.

5. Conclusions

In this section, it will be provided a general analysis of the KPIs information provided in the internal surveys by the different partners and UCs.

Paying attention to the performance indicators, with respect to the surface indicators, the use cases, in case they have such indicators, respond affirmatively that these have been successfully achieved.

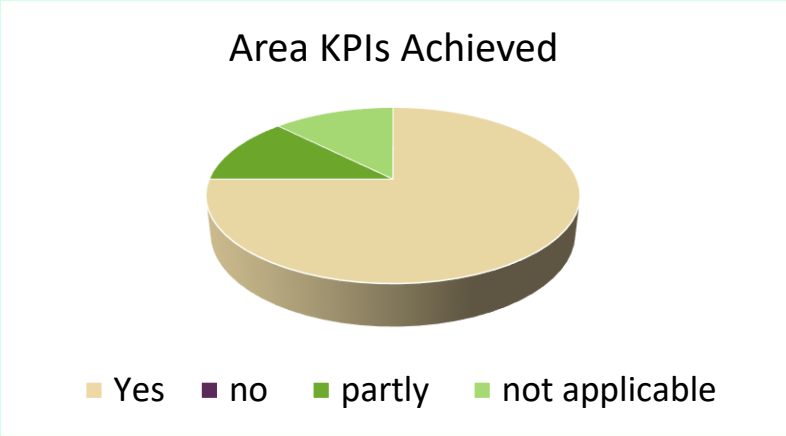

Figure 5 NIVA Area KPIs

In fact, the data samples have been really significant, applying in most cases to entire countries or to very significant areas:

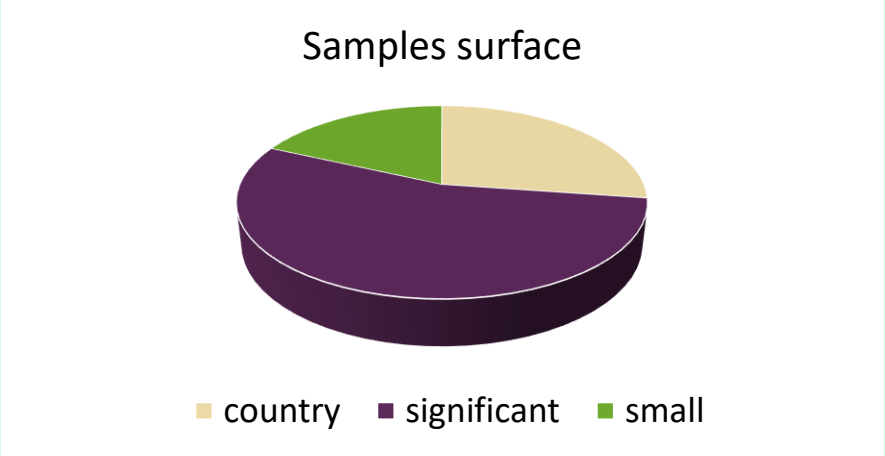

Figure 6 NIVA Samples surface

Regarding other evaluation KPIs, we can comment that the use cases claim to have generally achieved the indicators related to the relevance of the tools:

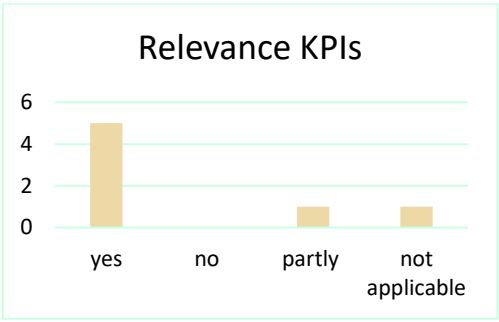

Figure 7 NIVA Relevance KPIs achievement

Perhaps more relevant is the analysis of the user indicators, where the Use Cases have been mostly able to achieve them:

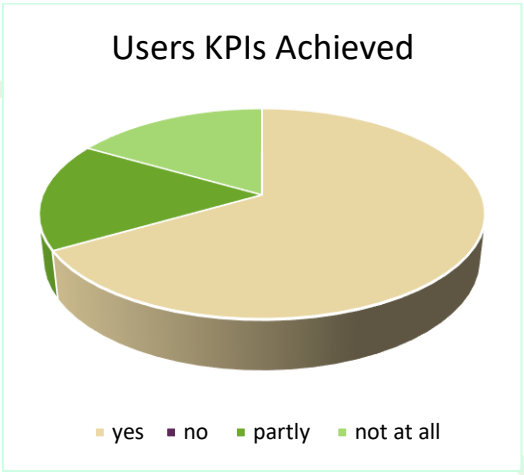

Figure 8 NIVA Users KPIs achievement

Nevertheless, what are these deployment users like? As can be seen in the following graph, these are located mainly in the PAs, however more than 25% are actual farmers and end users. In addition, there is another 25% of other users who can be classified as IT developers and academic fields, among others.

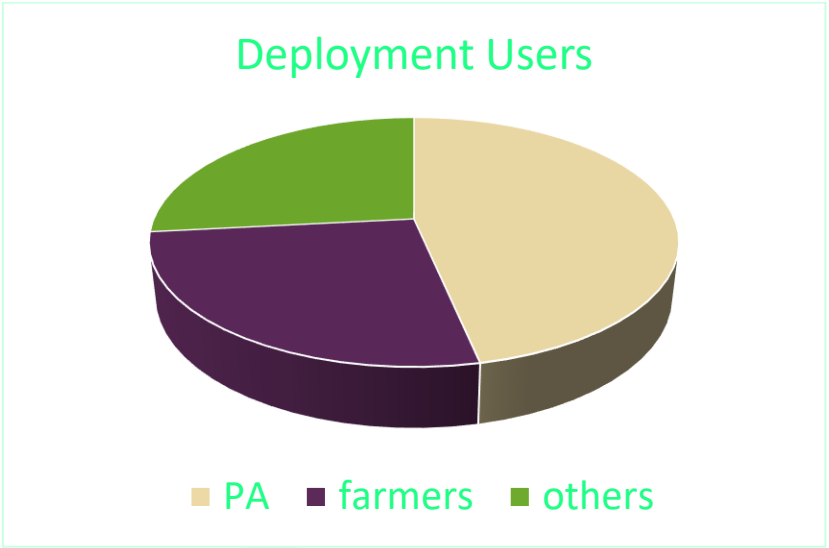

Figure 9 NIVA deployment users

We also highlight how all the use cases, except one, mention that the users worked on the deployment tests under "In real life conditions". When asked if the tools developed were evaluated in terms of their quality and if this was sufficient for their actual operation, the data obtained is, in both cases, a remarkable 84%: that is, **NIVA has successfully managed to develop tools of good quality**. They are also quality enough and easily usable in NIVA PAs, in other European countries and outside the European Union.

Before the start of the NIVA project in June 2019, KPIs were defined by the nine Use Cases. In the M12 version of the *D2.6 Monitoring and Benchmarking* some of the KPIs and their targets were updated as a result of the lessons learned during the development phase of the same Use Cases. In the initial stage there were some expectations, including KPIs and their specific targets, that turned out not to be feasible.

Also, in this M42 version some of the Use Cases have upddated their KPIs and/or their targets, namely UC1a, UC1b, UC1c, UC3 and UC5b. The other Use Cases (UC2, UC4a and UC5a) confirmed them. The reasons for updating or not updating KPIs and their targets were mainly the result of a number of developments (for instance the new national level initiative on digital farm book for UC3 in Spain) or issues (for instance in relation to a missing regulatory frameworks for sharing data, in the case of UC1c and UC4b), the Use Cases encountered during the testing phase. Some of the initial assumptions underlying the KPIs were in theory good, but in practice had proven to be more difficult to implement and hence affected the definition of the same KPIs or the full achievement of the targets. But it is also true that new insights led to new proposed KPIs.

The final outcomes of the KPI monitoring and benchmarking show that NIVA has been altogether on the right track.

Annexes

Theory of Change (ToC)

Performance management ensured that the NIVA KPIs and their targets were defined, that progress towards the project objectives were critically monitored and that timely and adequate mitigation actions were deployed in case of deviations from the targets. Performance management has been under the responsibility of WP2. At this level use case KPIs were both defined in detail and monitored for achievement. In addition, there are other KPIs which fall under WP3 and WP5, which are also to be considered.

As a reminder of the main impact chains, below is the schema of the Theory of Change (ToC), used as a framework for the NIVA KPIs. This is followed by an example of the KPI template, used for defining and registering all KPIs and Finally by the LogFrame, where we kept track of KPIs, their targets and achievements.

In the NIVA project proposal, a first version of the Theory of Change was presented. ToC serves as the reference framework for the definition and collection of the KPIs for each UC under WP2 and for the other WPs, and it shows visually how the project activities are logically connected to the short-term objectives (expressed as output indicators) as well as the longer-term objectives of NIVA (expressed as outcome and result indicators). This is ultimately connected to the new CAP goals, although the measurement of impacts is outside the scope of NIVA.

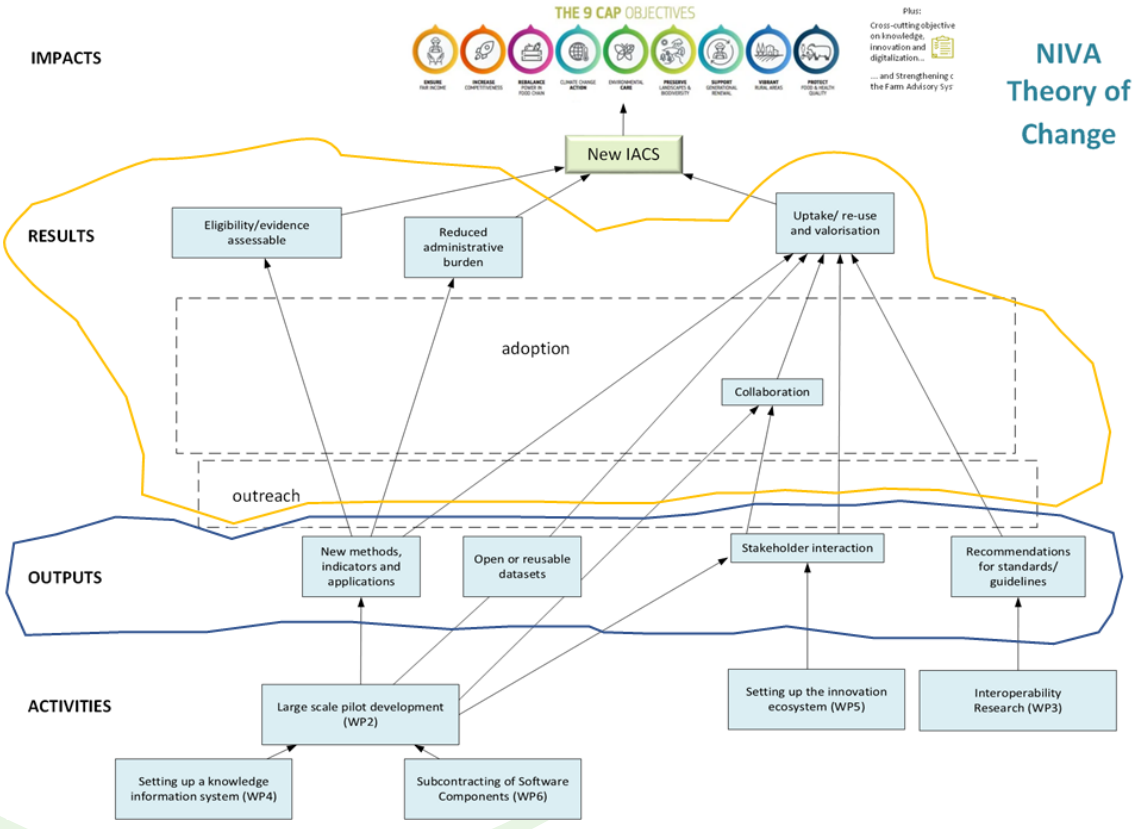

Figure 10 NIVA Theory of Change

The ToC shows (in Figure 10, from bottom to top) the following:

- The main activities of NIVA, where activities represent the work of NIVA Work Packages.
- NIVA outputs, the direct, shorter-term achievements of NIVA, that are strongly connected to the deliverables and the activities of the project.
- NIVA results: the longer-term objectives of NIVA, which are partly dependent on the work of the project itself, but also depending on external drivers and barriers. Results are subdivided in outreach and adoption.
- NIVA impact, the effects that the work of NIVA, and its uptake and use by the stakeholder communities have on the (new) CAP objectives.

KPI Register

KPIs were collected and captured through a "KPI register" (see Figure 11), initially designed for the Use Cases in WP2 and now adopted for the other WPs as well. The register helps to define all elements related to a KPI:

- The KPI definition.
- Which output or result the KPI measures.
- How it is measured (method, level of measurement, unit, etc.).
- How the data are collected and from which sources (transactions recorded from a specific device or platform, a dedicated survey, etc.).
- What the baseline value and the target values at the various NIVA milestones are.

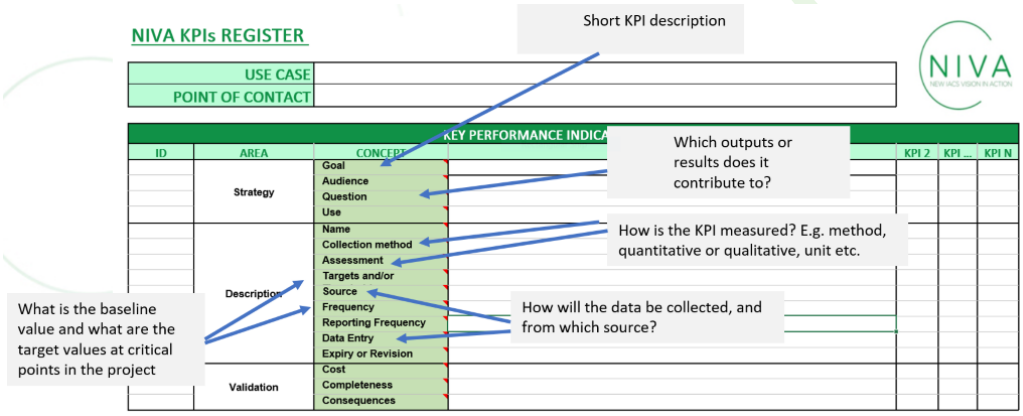

Figure 11 KPI Register

As part of the KPI definition process, using the KPI register template, every Use Case and Work Package as a first step described how its activities contribute to the outputs and results of NIVA as shown in the ToC, and defined realistic KPIs to measure the progress towards these objectives. These Use Case/WP specific representations is then the basis for an aggregation to the project level scheme, where issues of aggregating indicator measurements to outcomes and results are addressed, looking for consistency and harmonization in the KPI definitions, the ways of measurements, avoiding double counting, etc. An example of filled-in KPI register is presented in the figure below, with reference to UC1a.

NIVA KPIs REGISTER

USE CASE	UC1a
POINT OF CONTACT	Paying Agency leading the UC: OPEKEPE

ID	AREA	CONCEPT	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6
	Strategy	**Goal**	To develop 3 land-related eligibility criteria/algorithms in order to assess eligibility (BPS, VCS & Cotton Scheme). OUTPUT KPI- New methods, application, processes	To develop a Decision Support System with four components in order to conclude to an integrated dynamic EO Monitoring procedure at parcel level. OUTPUT KPI- Common Component	To include minimum 5% of farm holdings in the testing of UC1a in real conditions. RESULT KPI- Test and evaluation events	To decrease the non eligibile area of the decleared parcels (yellow-red) of the holdings that test UC1a when compare the initial output of the EO classification process (X) with the outputs after the "running" of the DSS procedure of UC1a (Y). RESULT KPI- Eligibility assessable	To lower administrative burden for PAs (secondary controls) by decreasing the number of objections appealed by the farmers when compare objections appealed from the current process (X) (GSAA + CwRS) with objections appealed from the EO Monitoring procedure (Y). RESULT KPI- Reduced administrative burden	To decrease of the work effort put in the development of other UCs that will derive from the use of the UC1a NIVA-DSS. Provided outcomes will be available for further uptake by other UCs (e.g. UC2: Prefilled Applications) thus reducing the overall effort to reach the desired outcome. RESULT KPI- Collaboration
		Audience	PAs, Farmers, Project partners, EC	PAs, Farmers, Project partners, EC	PAs, Farmers, Project partners, EC	PAs, Farmers, Project partners, EC		PAs, Farmers, Project partners, EC
		Question	Do we achieve exersicing minimum three land-related eligibility criteria through Earth Observation Monitoring and Traffic lights processes (EO Classification Engine + DSS)?	Are we capable to provide traffic light system, receive and plug-in other 'engines', incorporate outcomes from different UCs?	Do we meet the estimated minimum 5% of farm holdings through Earth Observation Monitoring and Traffic lights processes?	Do we meet the desired reduction of non eligible area assessed after the "running" of the DSS procedure and the incorporation of additional data compared to the initial output of the EO classification Engine?	Do we meet the desired reduction of objections appealled by farmers compared to current process (GSAA + CwRS)?	Do we achieve the (re)usability characteristics of the DSS platform beyond the UC1a objectives? How much do we minimize the general cost of development inside NIVA project?
		Use	Eligibility criteria 1: Distinction/classification between arable land, permanent crops and permanent grassland, 3 categories of land cover. (Assess eligibility at parcel level for BPS) Eligibility criteria 2: Crop classification by categorizing Cotton. (Assess eligibility at parcel level for Crop-Specific Payment for Cotton). Eligibility criteria 3: Crop classification by categorizing main permanenent crops and arable crops. (Assess eligibility at parcel level for VCS).	A Decision Support System with its components that will conclude to a decision-making traffic light system at parcel level by incorporating input from two EO Classification Engines and by incorporating additional data from secondary sources (FMIS, geotagged photos).	The exploitation of the temporal series of Sentinel images plus extra HHR images through subcontracting should enable the MS to decide on the traffic lights system on a minimum 5% of farm holdings.	The EO Monitoring procedure plus the DSS usability should enable the MS to decrease the final non-eligible area per each eligibility criteria.	The EO Monitoring procedure plus the DSS usability should conclude to a reduction of objections appealed to the results of the Monitoring Procedure and as a result a decrease in administrative burden for the PAs	The UC1a NIVA-DSS will cross-validate farmers declarations against specific eligibility criteria generating traffic-light indicators. This process can be integrated within the flow of prefiled applications (UC2) process allowing the identification of possible errors in application and inform farmers in a timely and nonintrusive manner.
	Description	**Name**	Assess eligibility with regards to 3 land-related eligibility criteria by using Earth Observation Monitoring (EO Classification Engines & DSS)	Number of Systems and Number of Subcomponents developed	Number of farm holdings that will be included in testing UC1a in real conditions.	Reduction of the non eligible area finally assessed through an integrated dynamic process.	Reduction of the the objections appealled by the farmers through Earth Observation Monitoring and Traffic lights processes	DSS - a tool engine available for further uptake.
		Collection method	Not applicable	Not applicable	Recruitement by OPEKEPE	Not applicable	Not applicable	Not applicable
		Assessment	Quantitative assesment	Quantitative assesment	Quantitative assesment	Quantitative assesment	Quantitative assesment	Quantitative assesment
		Targets and/or Thresholds	Criteria for assesing eligibility: 3 land-related	1 Decision Support System that will conclude in a traffic light system at parcel level that will include subcomponents	All 3 land-related eligibility criteria (KPI 3) will sum up 5% of farm holdings.	Decrease of the non eligibile area of the declared parcels before and after UC1a (DSS) by 20% (X-Y/X>20%)	Decrease of 20% of the objections appealled by the farmers compared to current process (GSAA + CwRS) (X-Y/X>20%)	At least 1 additional UC (UC2) will reuse the NIVA-DSS component that will be developed for the needs of UC1a.
		Source	Declarations (derived from IACS) fmis data, geotagged images (farmers, Ucs) EO data (produced primarly from Sen4Cap by PA) traffic light decision from DSS (developed by NP)	Declarations (derived from IACS) fmis data, geotagged images (farmers, Ucs) EO data (produced primarly from Sen4Cap by PA) traffic light decision from DSS (developed by NP)	Declarations (derived from IACS) fmis data, geotagged images (farmers, Ucs) EO data (produced primarly from Sen4Cap by PA) traffic light decision from DSS (developed by NP)	Declarations (derived from IACS) fmis data, geotagged images (farmers, Ucs) EO data (produced primarly from Sen4Cap by PA) traffic light decision from DSS (developed by NP)	Declarations (derived from IACS) fmis data, geotagged images (farmers, Ucs) EO data (produced primarly from Sen4Cap by PA) traffic light decision from DSS (developed by NP)	Declarations (derived from IACS) fmis data, geotagged images (farmers, Ucs) EO data (produced primarly from Sen4Cap by PA) traffic light decision from DSS (developed by NP)
		Frequency	Before the start of multiple MS pilot and month 36 (before the end of the project)	Before the start of multiple MS pilot and month 36 (before the end of the project)	Before the start of multiple MS pilot and month 36 (before the end of the project)	Before the end of the project, month 36.	Before the end of the project, month 36.	Before the start of multiple MS pilot and month 36 (before the end of the project)
		Reporting Frequency	Before the start of multiple MS pilot and month 36 (before the end of the project)	Before the start of multiple MS pilot and month 36 (before the end of the project)	Before the start of multiple MS pilot and month 36 (before the end of	Before the end of the project, month 36	Before the end of the project, month 36.	Before the start of multiple MS pilot and month 36 (before the end of
		Data Entry	Paying Agency leading the UC	Paying Agency leading the UC	Paying Agency leading the UC	Paying Agency leading the UC	Paying Agency leading the UC	Paying Agency leading the UC
		Expiry or Revision	Month 36	Month 36	Month 36	Month 36	Month 36	Month 36
	Validation	**Cost**	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage
		Completeness	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage
		Consequences	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage	Not determined at this stage

Figure 12 Example of filled-in KPI register for UC1a

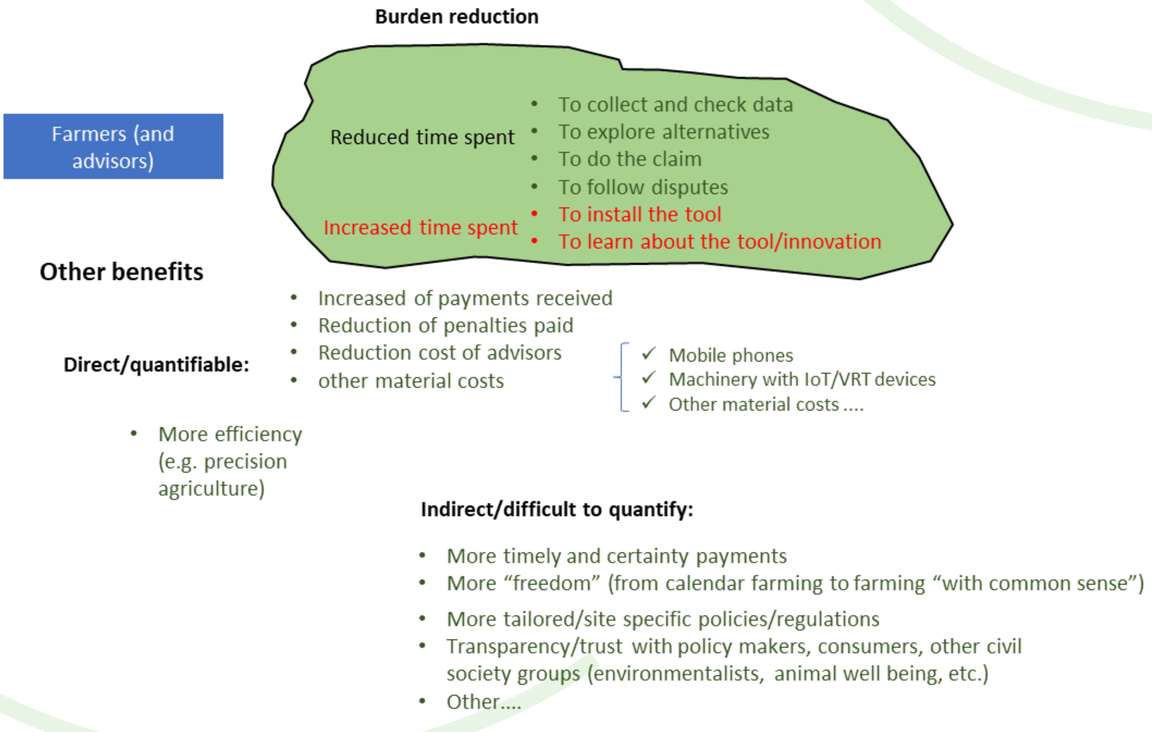

Figure 13 burden reduction and other potential benefits from a NIVA innovation (farmer's view)

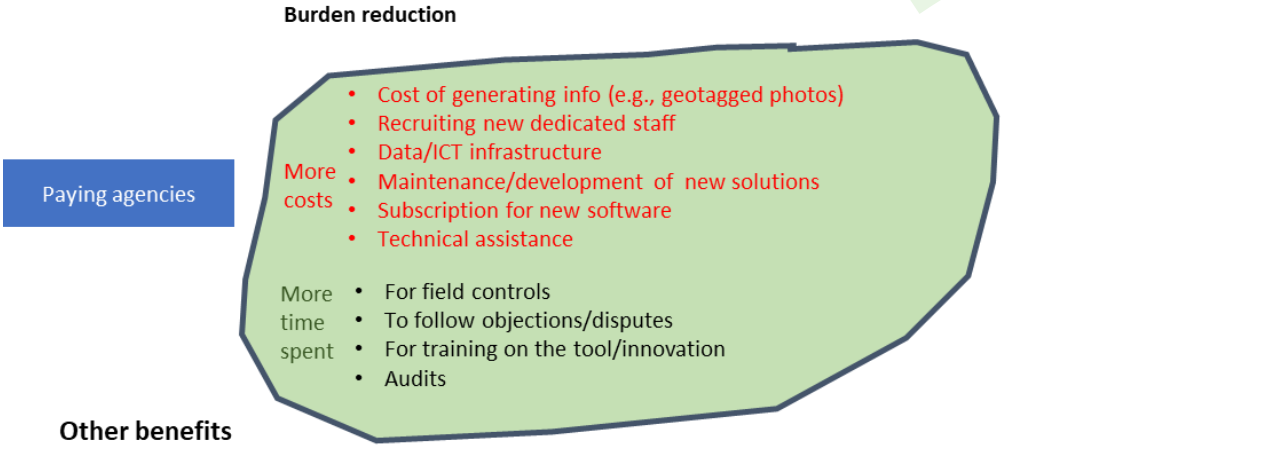

Figure 14 Burden reduction and other potential benefits from a NIVA innovation (PA's view)

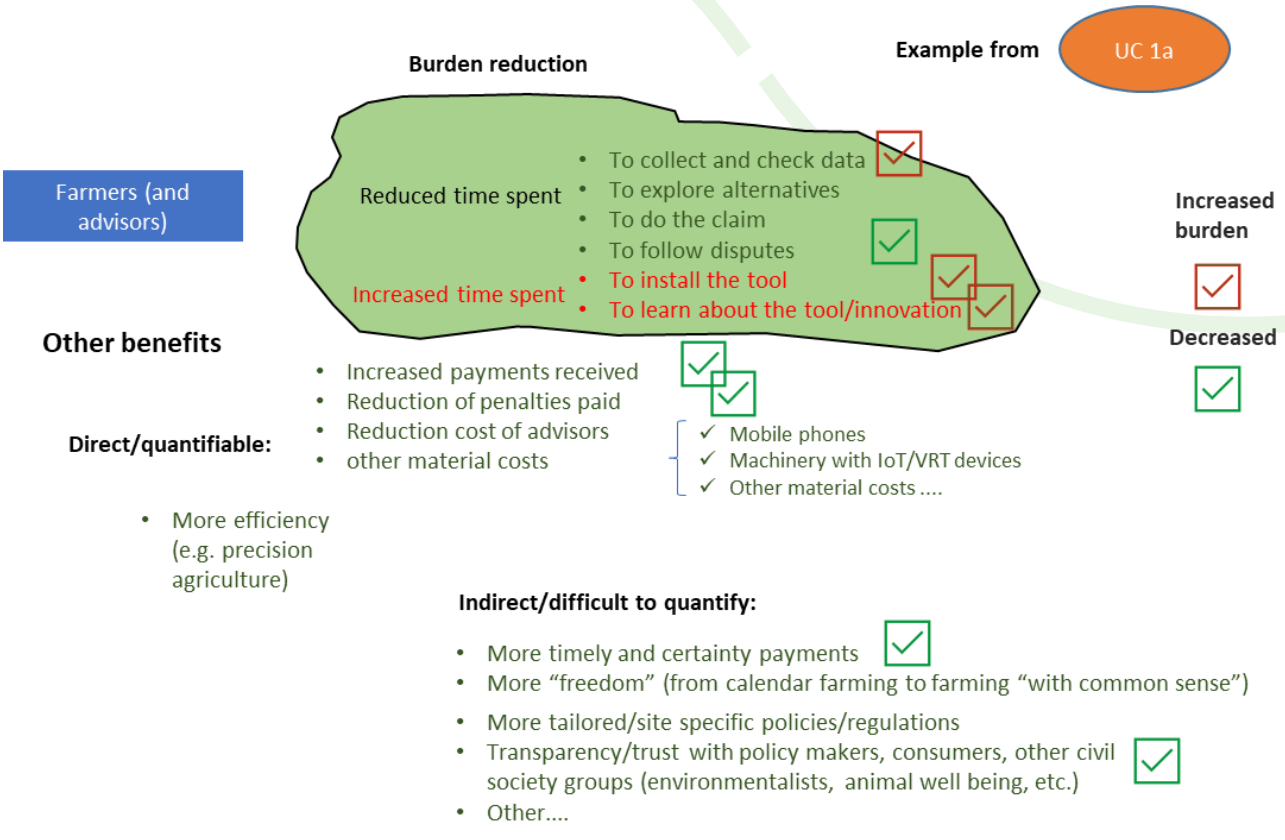

Figure 15 ABR, an example for UC 1a

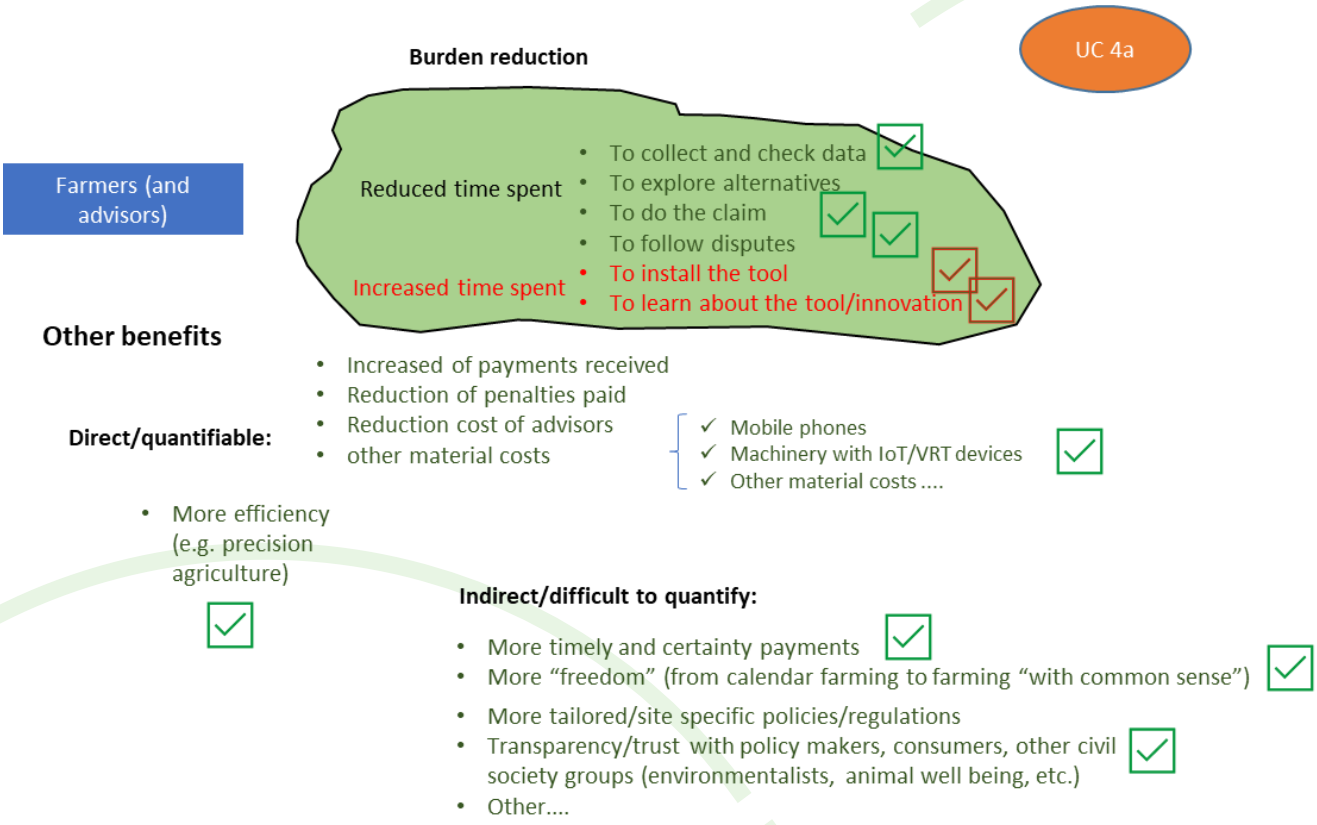

Figure 16 ABR, an example for UC 4a