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1 Introduction

The present Document constitutes the deliverable 5.4.1. “Re-calibration of the model (document)” / Action 5.4 “Re-calibration of the model” / Work Package 5 “Implementation of the model” of the project “AgroQuality: Towards a Common Quality Control and food chain traceability system for the Greek – Italian primary sector of activity”. TEI of Epirus, the leader partner (LP) of AgroQuality, was in response to implement the corresponding study for the Region of Epirus.

AgroQuality project aimed at developing a model of the total management of olive growing in order to:

- Monitor the conditions under which the olives are cultivated
- Produce and distribute a “best practice” roadmap for the cultivation of olives
- Prove the quality of the product through quantitative measures, strengthening the positioning

The rational following question *“how can we issue a health certificate for plants?”* was the core question for the AGROQuality project, which leads the initial concept and the overall development. Towards this, a novel platform based on a special purpose Geographical Information System has been developed, in order to integrate the first Electronic Cultivation Record for olive products sector (cultivation, processing, trading). The system provides traceability systems through the whole chain from farm to shelf which

The objective of WP5 was the implementation of the model at farm level, in various typologies of farm. The implementation would result a number of comments regarding alterations of the model in order resemble better the real world conditions. The evaluation of these comments in order to produce information which could be used for the re-calibration of the ECR model is the main scope of the present document. Aleso ideas regarding new features of the ECR (for next versions) are proposed.

2 Comments resulted from the application of the ECR model

According to the project application form, the main goal was to develope a model for the total management and control of olive growing process. The implementation of innovative methods and tools which was made available by the research and the best available technologies that have been registered in the framework of Agroquality for Epirus and Puglia is expected to lead to environment-friendly products. The ECR is the software which implements this model. The quality of the product can be certified via a unique QRcode (2D bar code) per farmer, cultivation and cultivation period, under which the whole of the parameters affecting the quality of the product (soil composition, position, climate, cultivation method, etc.) is kept and are available in various forms to the different categories of the system users (companies/organizations, agriculturalists, farmers, processing units managers, traders and consumers).

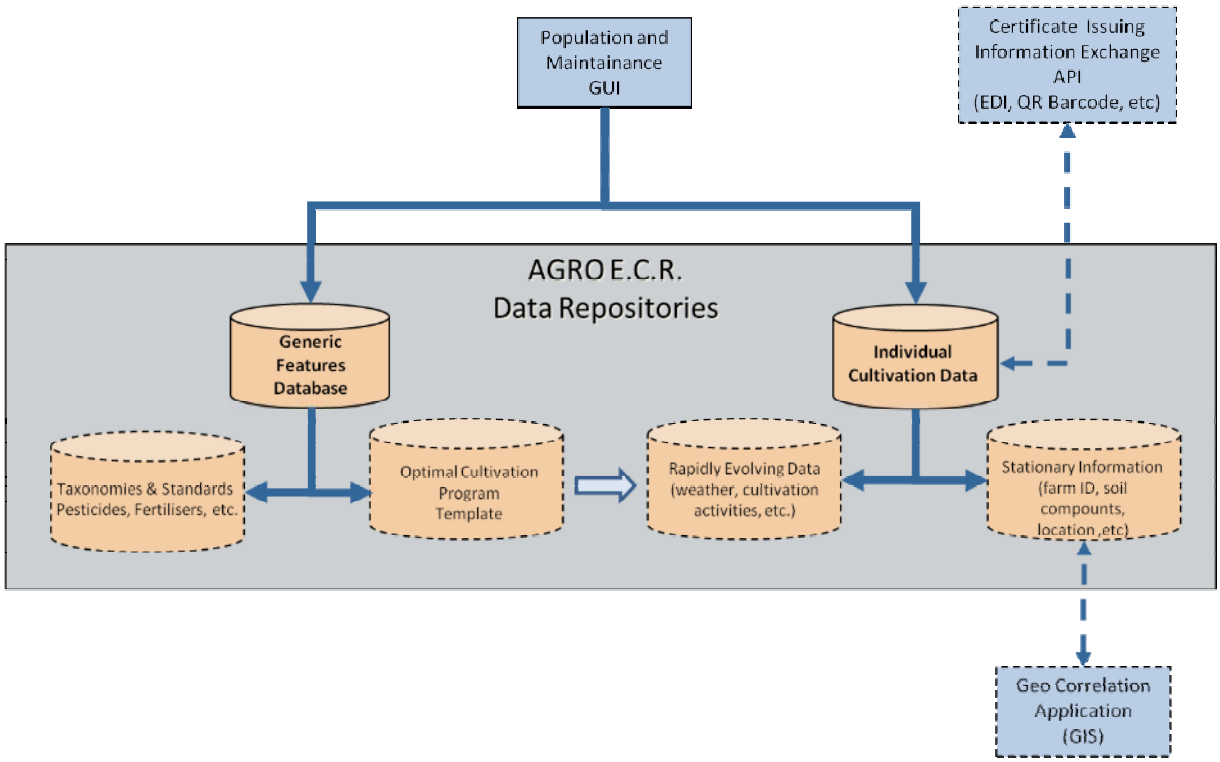

Figure 1 Agroquality ECR components

For the definition of the model, the following activites have been completed:

a) In depth analysis of olive growing best practices with regard to their effects in socio-economic and environmental fields has been made.

b) Identification of the practices having the best effects both with regard to the sustainability of olive growing and incomes for farmers.

After definition of the model, the ECR was developed. The core of the model is a Geographical Information System (GIS), which integrates a full Electronic Cultivation Record for table olives and olive oil. According to it's developers, the general features of the GIS platform are the following:

a) GeoPresentation of the information; composition of new information levels; retrieval of the geo-correlated data. Soil composition, hydrological and climatic data are presented on new automatically created levels of information and

b) Correlation of the Geographical data with the Electronic Cultivation Record.

c) Generation of reports regarding conditions and treatments during cultivation and processing activities.

d) Issuing of certificates which provide plentiful information regarding the course from field to table.

The technical features of the ECR according to it's developers are the following:

a) Web based and Stand alone application.

b) Open Architectural design and development based on XML technologies, strictly defined by widely accepted XSD and DTD schemas

c) Management and processing of multilayered digital maps.

d) Metadata handling, geo-correlation and storage.

e) Robust Role management.

f) Bidirectional Interconnection for data exchange with leading applications (ESRI ArcInfo, Autodesk-Automap)

According to it's developers, the development of the ECR passed through the following stages:

a) User Requirements gathering and functionality definition

b) Use Cases identification: the potential Use Case scenarios were identified and analysed.

c) Identification of the nature of the information recorded. The data records gathered were correlated and Geo-referenced and special layers have been designed to hold the data.

d) Identification of the processing needed. The Geo-referenced data were fed to the system data repositories to facilitate fruitful information extraction.

e) Data records storage development. According to the nature of the data gathered and corresponding to the information layers introduced, the new databases have been developed. The databases are complementary to the GIS architecture, and serve as a metadata repository for the platform. The databases have been delivered in the form of SQL equivalent and were installed to the system database server ready for initial data population

f) Development of special case GIS software platform. Based on the specific nature of the costal data and information processing and retrieval a novel case specific GIS platform has been developed.

At the end the platform has been delivered in the form of well documented software, installed on the system server and ready to use.

After development, the model would be implemented at farm level in various typologies of farms, in order to monitor the technical activities, assess their achievements step by step and with regard to the environmental and agronomic aspects. All the relevant information would be used for re-calibration of the model (if necessary) and delivery of final guide-lines regarding the road map to the most efficient in

cultivation, environmental and economical terms, productions or the various products of olive cultivation.

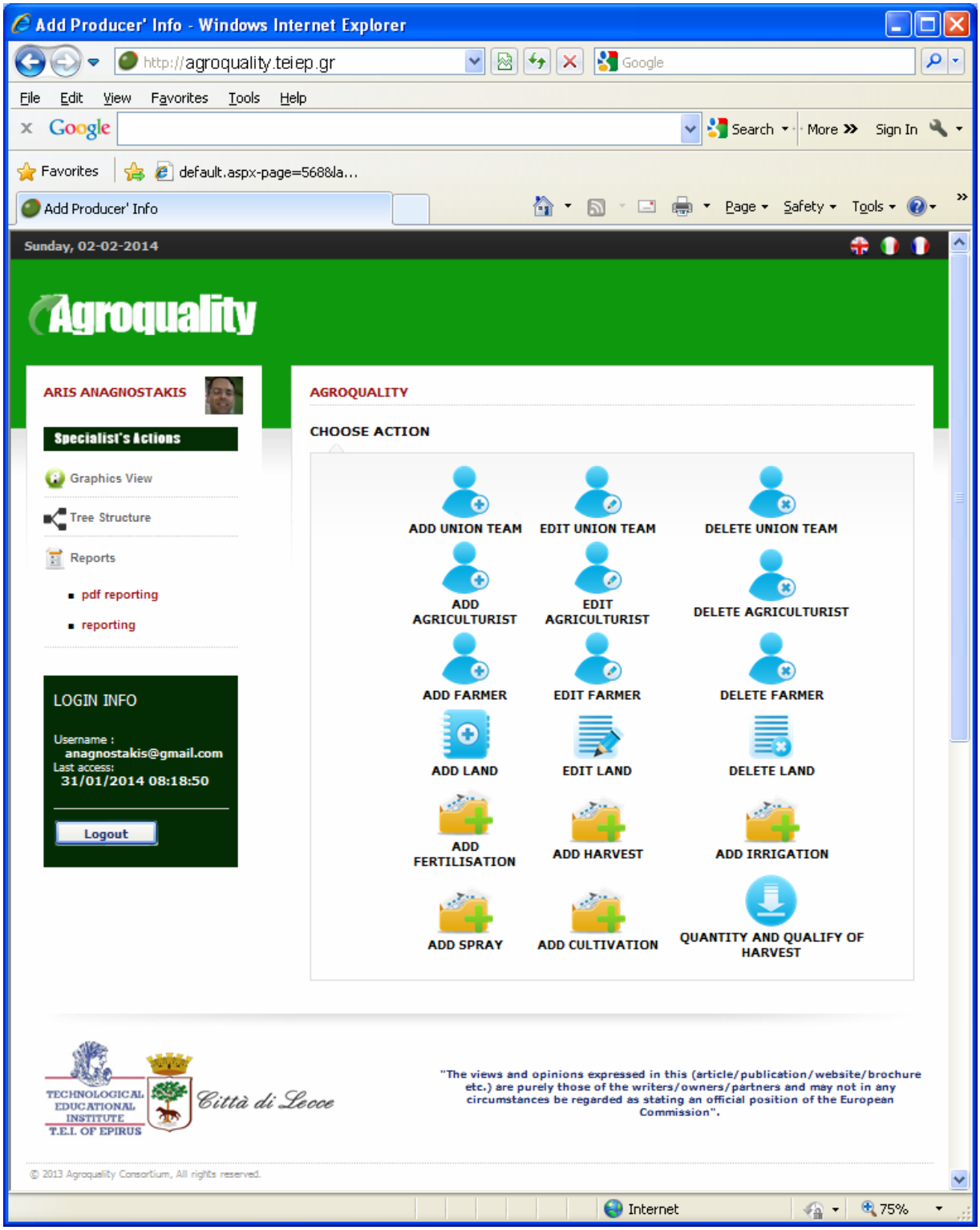

Figure 2 Control panel of the Agroquality ECR

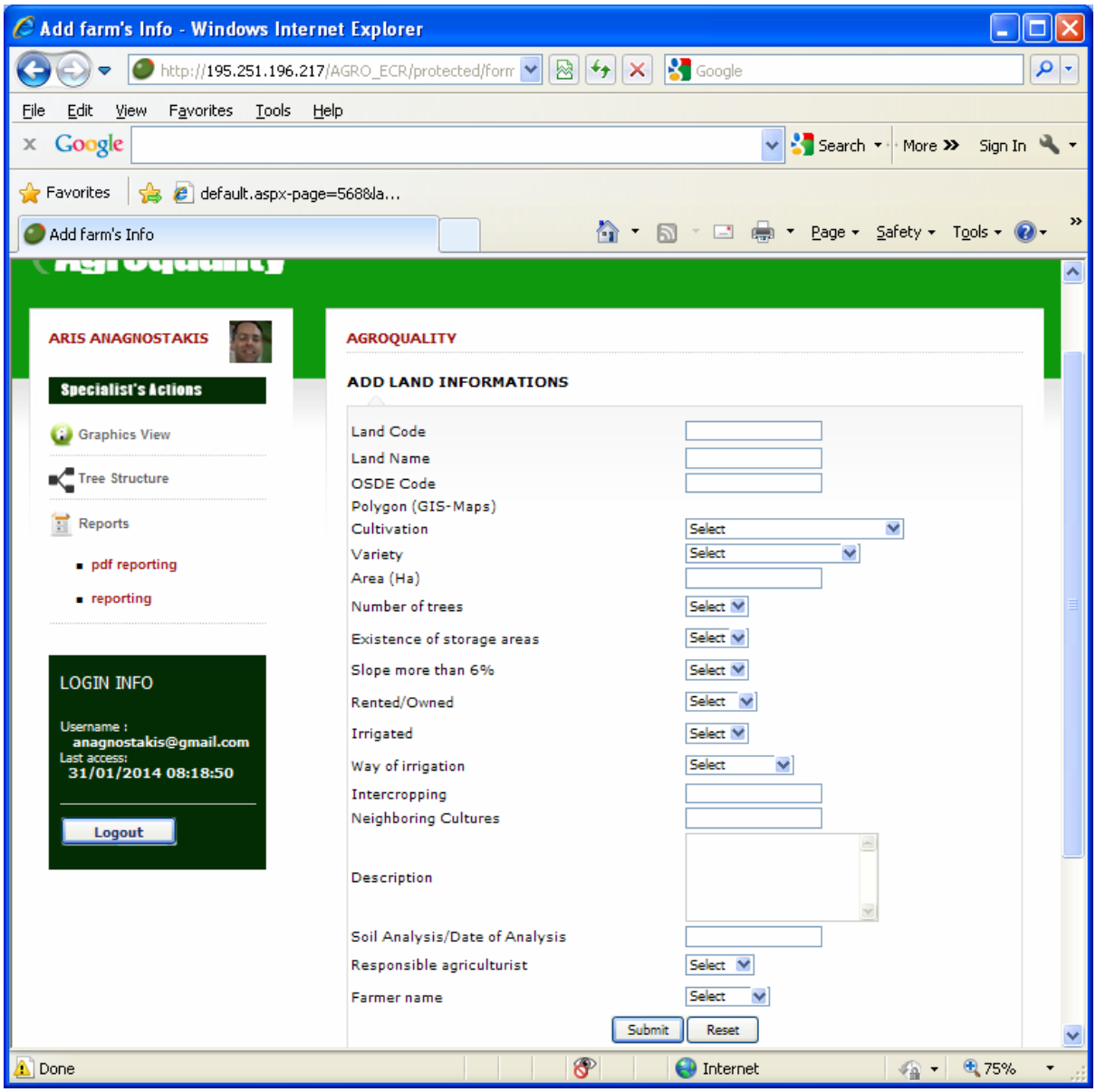

Figure 3 Sample cultivation treatment window (Add Land)

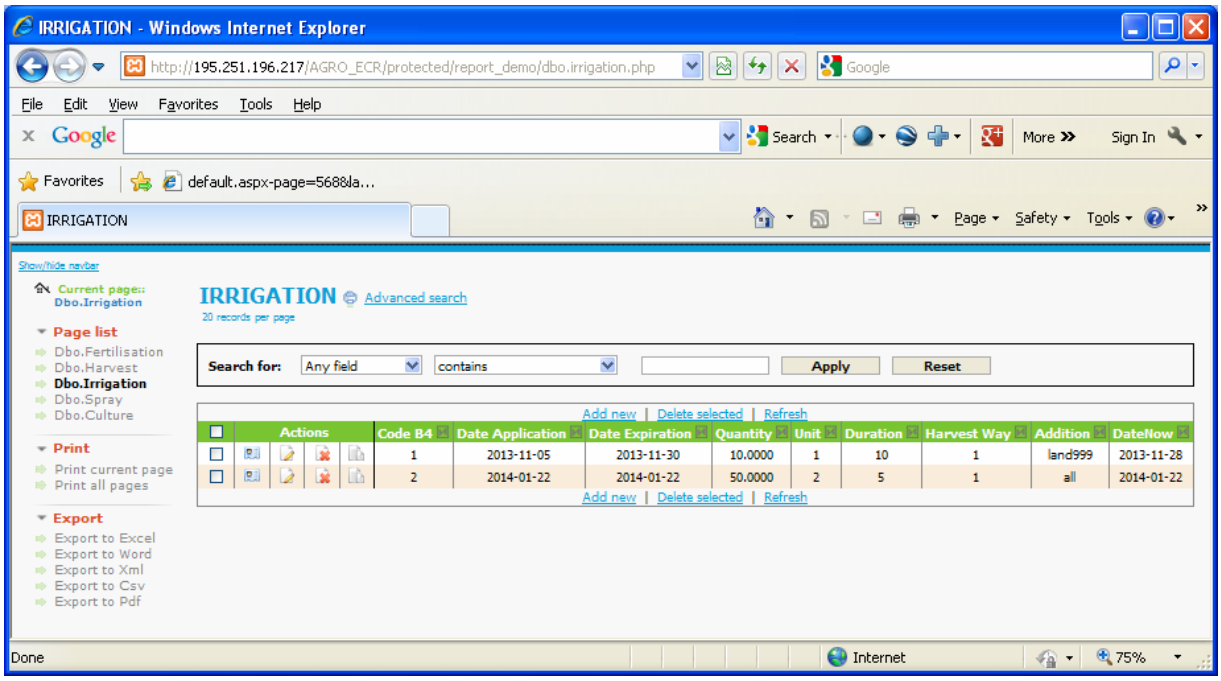

Figure 4 Sample report window (Irrigation)

The concept of re-calibration of the model has its roots in the initial plan to develop an integrated ECR for olive products, with both spatial and attribute information which would be stored, handled and presented using a special case GIS software platform and which would connected to individual all integrated DSS (Decision Support System) for planning and apply treatments (i.e. irrigation, plant protection, fertilization, harvest time, oil extraction etc) throught the olive product chain (cultivation, process, storing, trading etc). DSS models include mathematical optimisation techniques which use sets of coefficients and parameters which are defined based on research outcomes or by experience.

The concept was probably this: the partnerrs develop the model, incorporate it in the software (ECR), use it for some time in real world situations in farms of various typologies of both areas (Greece and Italy), register the data and the results, assess and analyse them and decide whether or not some coefficients and/or parameters need adjustment (re-calibration).

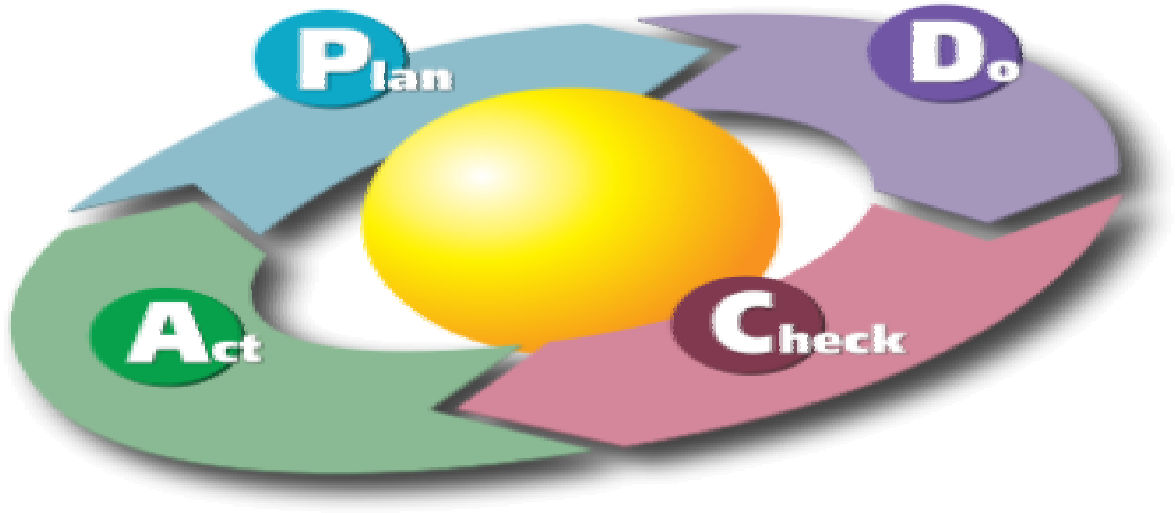

Figure 5 PDCA, Deming Cycle

This is atypical PDCA (plan–do–check–act or plan–do–check–adjust) procedure known also as Deming Cycle. PDCA is an iterative four-step management method used in business for the control and continuous improvement of processes and products. It is also known as the Deming circle/cycle/wheel, Shewhart cycle, control circle/cycle, or plan–do–study–act (PDSA). Another version of this PDCA cycle is OPDCA. The added "O" stands for observation or as some versions say "Grasp the current condition.".

The steps in each successive PDCA cycle are:

- PLAN Establish the objectives and processes necessary to deliver results in accordance with the expected output (the target or goals). By establishing output expectations, the completeness and accuracy of the specification is also a part of the targeted improvement. When possible start on a small scale to test possible effects.
- DO Implement the plan, execute the process, make the product. Collect data for charting and analysis in the following "CHECK" and "ACT" steps.
- CHECK Study the actual results (measured and collected in "DO" above) and compare against the expected results (targets or goals from the "PLAN") to ascertain any differences. Look for deviation in implementation from the plan and also look for the appropriateness and completeness of the plan to enable the execution, i.e., "Do". Charting data can make this much easier to see trends over several PDCA cycles and in order to convert the collected data into information. Information is what you need for the next step "ACT".
- ACT or ADJUST Request corrective actions on significant differences between actual and planned results. Analyze the differences to determine their root causes. Determine where to apply changes that will include improvement of the process or product. When a pass through these four steps does not result in the need to improve, the scope to which PDCA is applied may be refined to plan and improve with more detail in the next iteration of the cycle, or attention needs to be placed in a different stage of the process.

As no DSS capability was finally incorporated in the ECR and because of the delays regarding the development of the software along with the poor registration of the applied cultivation treatments there is no model and no data to use in order to propose any recalibration.

In this framework and in order to contribute productively to the project the present document presents relevant models and softwares that have been relaeased or published after the final decisions regarding the development of Agroquality ECR, along with new ideas regarding features that could be incorporated in future versions of the ECR.

3 Proposed feature for future version of the ECR

After studying the relevant available models and software we propose the following activities which on our opinion will strengthen the efficient use of ECR and its operability.

3.1 Training

A research which was conducted in the framework of Agroquality[1], showed that there is a great lack of familiarization of farmers with IT technology. This is a very significant obstactle regarding the use of such systems and thus relevant training sessions should be organised.

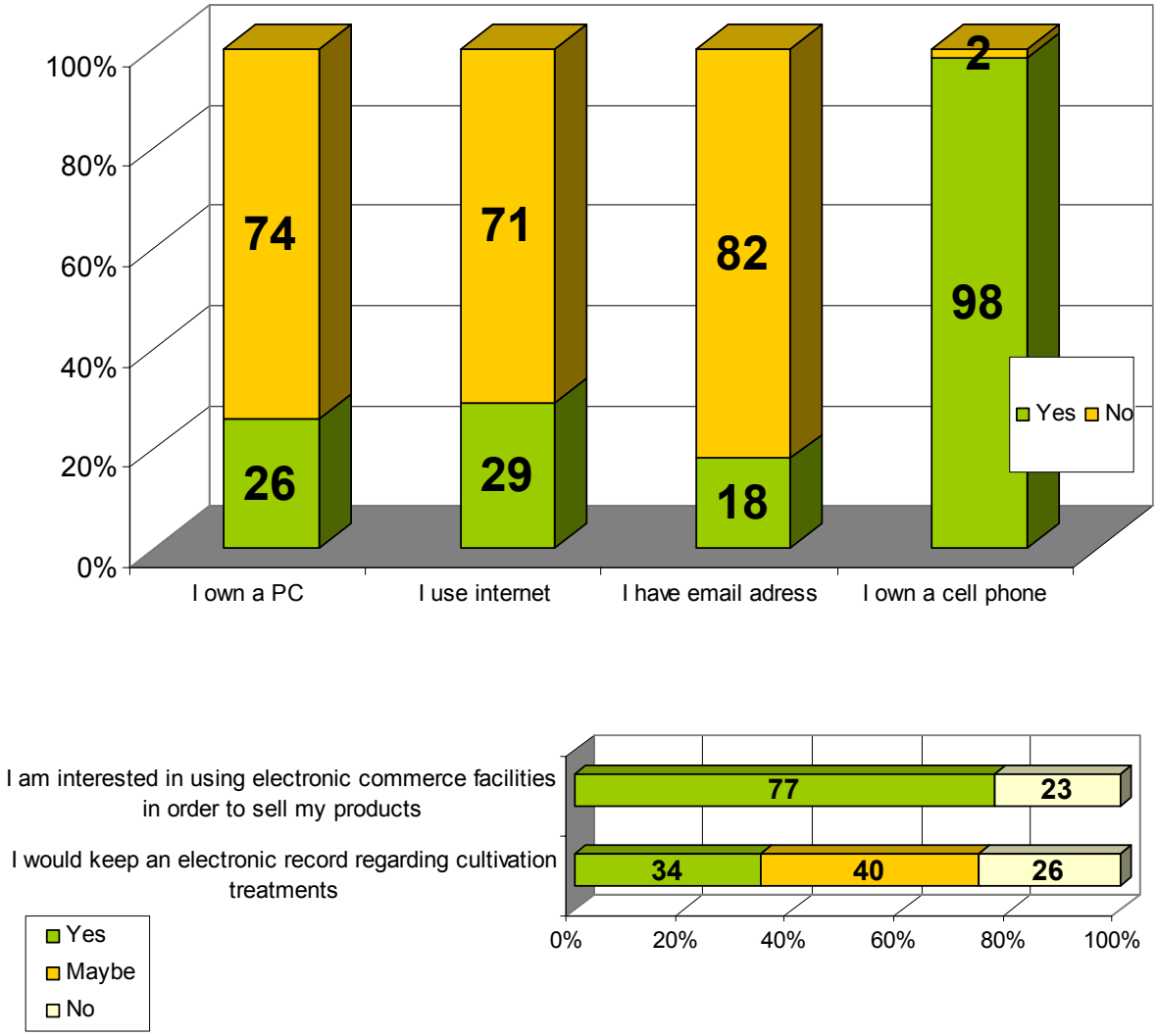

Figure 6 Selected results of Agroquality research regarding familiarization of farmers wit IT technology

[1] Period: 2013; Sample: 80 farmers randomly selected from ASAF list; Ages: 25-45: 13%, 45-65: 61%; Perecentage: 4% of the total olive cultivation area of ASAF and 5 of the total olive trees number of ASAF

3.2 Compatibility with existing relevant public administration software

It is inconceivable for this kind of software to stand alone without total compatibility capability and potential with existing or expected to be soon released relevant public administration software.

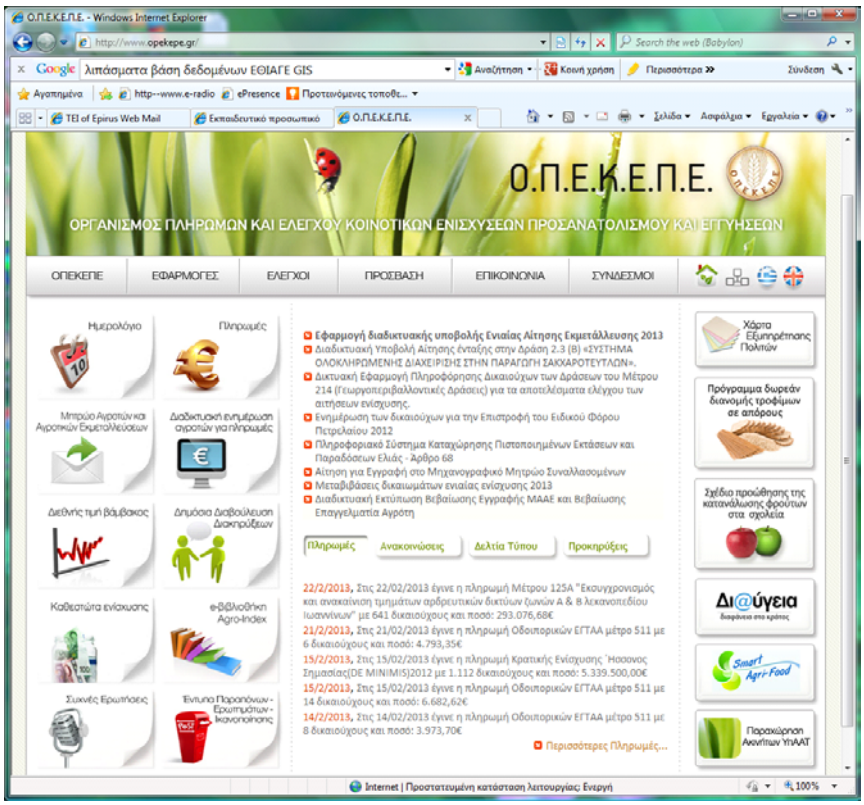

Figure 7 OPEKEPE's web site

The most common applications of such kind of software for Greece are the following:

a) YO's (Greek Ministry of Finance) TAXIS net database (http://www.gsis.gr/gsis_site/)

b) YPAAT's (Greek Ministry of Agricultural Development and Food Production) Electronic Services Web Software (http://www.minagric.gr/index.php/el/eservisesmenu-2)

c) YPAAT's (Greek Ministry of Agricultural Development and Food Production) plant protection and fertilizers database and use registration electronic services (http://e-services.minagric.gr/)

d) OPEKEPE's (Payment and Control Agency for Guidance and Guarantee Community Aid) mapping software regarding OSDE and Olive Cultivation Record (http://www.opekepe.gr/english/applications_en.asp)

e) ELGA's (Greek Organisation for Agricultural Insurance) application regarding insurance payments and amends (http://www.elga.gr/index.php?option=com_content&view=article&id=254&Itemid=145)

f) EFET's (Greek Food Inspection Authority) electronic services and databases (http://www.efet.gr/)

g) YA's (Greek Ministry of Development) database regarding market value of products (http://www.e-prices.gr/)

3.3 Compatibility with expected to be soon released relevant public administration software

Numerous software applications, most of which will be available on-line are expected to soon released:

a) YPEKA's (Greek Ministry of Environment) Special Water Secreteriat's Drillings Registration and Water Rights Definition Tool (http://www.wfd.opengov.gr)

b) YPAAT's Added Value Electronic Services for Farmers (http://www.digitalplan.gov.gr/portal/resource/YPSHLHS-PROSTITHEMENHS-AXIAS-AGROTIKES-PSHFIAKES-YPHRESIES-eYpAAT)

c) OPEKEPE's (Payment and Control Agency for Guidance and Guarantee Community Aid) software regarding agricultural services:

   a. Electronic Services for Farmers (http://www.opekepe.gr/diavouleusi.asp):

      i. National Food Traceability System

      ii. Inteligent decision making system regarding agricultural products trading

      iii. Integrated GIS for soil information

      iv. GIS system to support decisions regarding the placement of alternative energy sources and agrotouristic projects

   b. SmartAgriFood (http://www.opekepe.gr/english/smartagrifood_en.asp)

d) ROE's (Region of Epirus) e-commerce sofware regarding the Basket of Local Products (http://www.php.gov.gr/docs/kalathi_total.pdf)

3.4 Data mining from reliable existing services

News feed regarding cultivation and protection advices from the Central and Regional Services of the Greek Ministry of Agricultural Development and Food Production (http://www.minagric.gr/index.php/el/for-farmer-2/agricultural-warnings).

Connection to cultivation advices from local integrated management authorities, i.e. ASAF at ARTA (http://www.easaf.gr/index.php?ID=wwY7hYVKJtuabdZM).

Agrometeorological and weather forecast. In this category the relevant services of HNMS (Hellenic National Meteorological Service, www.hnms.gr) and NOA (National Observatory of Athens, www.noa.gr, www.neteo.gr) should be used in order to incorporate reliable meteological information to the system.

Market information. The ECR could also be connected to the relevant database of the Central Vegetable Market of Athens which provides the market prices at international markets (http://www.okaa.gr/okaa/statistics/day.jsp?context=2602) .

3.5 Cooperation with DSS systems

For example TEI of Epirus runs for 6 years a successful service regarding cultivation water needs and irrigation scheduling advices for the area of Arta. The service use data from NOA's meteorological system (www.meteo.gr), and it is available at: http://probiosis.teiep.gr.

The Soil Institute of Thessaloniki (ELGO Dimitra) has developed a software regarding the calculation of fertilizer needs (http://www.ssi.gov.gr/fertilizationadvisory.php).

Other relevant services and are expected to be available soon.

3.6 Ideas regarding new features

A list of ideas of features that future version of the ECR could contain is given bellow:

a) Improve personalization (include of photos from the farmer, the land parcels and the cultivation and processing treatments of each period)

b) Include feedback forms, for users to rate and comment the provided services

c) Include forum and chat capabilities for the users to be able to communicate for their professional issues

d) Include Guru advice (experts that cooperate with the system) connections with registered experts

e) Include a label making application, which except of the QR-code will apply all the relevant legislative obligations

4 Conclusions

The main conclusion is that software that will cover administrative needs regarding agriculture is expected to be developed centrally for the whole country. This is also most efficient as the public administration can run and update this kind of software continiously.

R&D organizations like a TEI of Epirus could contribute to these efforts by providing special parameters of specific regions, by assessing the tools and send well documented feedback to the central administration and by developing add-ons for these kind of systems.

For Agricultural Technology departments is probably better to put their efforts on developing special DSS (i.e. regarding irrigation, plant protection, fertilization, fertigation etc) which be linked to the central systems providing added value to them.

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