



ENDURE

European Network for Durable Exploitation of crop protection strategies

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**Functioning pilot prototype “ENDURE – ALPS”
for non-chemical measures in plant protection
potato**

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Glossary

Database	Facility to persist structured data.
EPPO	European and Mediterranean Plant Protection Organization
NUTS	Nomenclature des unités territoriales statistiques
Java	Object-oriented Programming language
JSF	Java Server Faces
OR-Mapper	Object-relational Mapper
RDMS	Relational Database Management System
Report	Summarizes all the data inserted by an expert to describe a certain application of measure.
Use case	Defines an interaction between a user group and the system

Summary

The prototype of the ENDURE-ALPS is an expert system for non-chemical alternatives in plant protection. It was presented at the ENDURE International Conference 2008 during the poster session and at the ENDURE annual Meeting 2008.

ENDURE-ALPS is providing a tool which allows the collection of expert knowledge about non-chemical strategies to control pests or diseases in various crops and indicating the practicability of the measures. The target group are mainly scientists who will by using the tool enhance the knowledge transfer between different regions in Europe and foster the implementation of non-chemical pest and disease control.

In the technical part of the report the specification of the data for the application using information based data, managing the criteria, and knowledge based data for the management of the reports and content are introduced. The implementation concept explains the structure of the layer separation allowing modifications and extensions of the functionalities (for the development of the internal back office in the future) without affecting the presentation (webfrontend).

The different functions of ENDURE-ALPS are described and displayed. The search offers the search according to single criteria (crop, pest/disease, and region), a combination of the criteria or a text search. The search results are displayed in detail showing the sources referred to and indicating the availability of the report in national language.

The reports are uploaded by experts according to a protocol with certain combination of crop-pest/disease-region and the definition of the non-chemical measure. The structure of the report content and the information about the practicability of the concerned measures are described.

ENDURE-ALPS will enhance the availability of information about non-chemical measures in sustainable plant protection and will foster an uptake of strategies beyond national borders.

1. Introduction

This deliverable is the presentation of the prototype of the ENDURE-ALPS, a European knowledge system for non-chemical alternatives in sustainable plant protection. The application is providing a tool to the network which allows the collection of expert knowledge about non-chemical strategies and measures to control pests and diseases in various crops. The summarized expert knowledge of ENDURE-ALPS are reports about measures assigned to a combination of crop-pest/disease-region. The user group for ENDURE-ALPS are primarily scientists using the expert system as an additional source of information about non-chemical measures in plant protection, initiating and enhancing the knowledge transfer between different regions in Europe. Advisers can use ENDURE-APLS as well but considering that information presented is not necessarily “ready to use information” which is indicated by different levels of practicability.

The working prototype ENDURE-ALPS with its functionalities, features and the requirements regarding content was presented as “Tool presentation” during the poster session at the ENDURE International Conference 2008 and the “Tools presentation” plenary session at the ENDURE Annual meeting 2008. The application is not online yet but is already uploaded at the test server at SSSUP (IT) and will be online available for members of the network by beginning of M25 (January 2009).

The “Feasibility study for the development and implementation of a dynamic online database for optimal integration and management of relevant knowledge” (DI4.3) gave a broad explanation of all technical issues of the application and will be mentioned only briefly in the document .

2. Prototype

The prototype ENDURE-ALPS and other web-based applications as are not databases from technical point of view but may use databases to save their content in a structured manner. Work with this structured data requires processing before representing it to the user. In this document the term application is used when referring to ENDURE-ALPS.

2.1. Technical issues

The technical details were described sufficiently in DI 4.3 but will be mentioned briefly to create a coherent description of the prototype.

2.1.1. Data model

The suitable data model containing the meta-data and the content was chosen. Generally has to be distinguished between information based data (crop, pest/disease, region, measure) and knowledge based data (report, use case, summary, expert).A detailed meta-data description is part of DI 4.3.

2.1.1.1. *Information based data - Common data*

The *crop* entity is used to provide a context for any cultivated plant, the *pest* entity provides a context for all pests, diseases and other harmful effects on plant health. Both are identified with the EPPO Code (EPPT)¹.

The *region* entity provides spatial information to associate a set of specialized knowledge with a certain location. As common base for regional division the separation specified by Nomenclature of territorial units for statistics (NUTS)² of EUROSTAT is used.

¹ <http://eppt.eppo.org/>

² http://ec.europa.eu/comm/eurostat/ramon/nuts/basicnuts_regions_en.html

The *measure* entity is a specialisation of the *topic* entity. The *topic* entity intends to provide a common thesaurus for the application. Therefore the *topic* entity acts as a summary of all problems, measures and pertinent solutions the knowledge is based upon.

The *contact* entity describes all users working with the application. Especially providing information about the author of published knowledge is one of the main reasons of the *contact* entity.

The common data model serves as common knowledge pool extended by each application with their data and will be used for ENDUREs internal back office system in the future.

2.1.1.2. Knowledge based data

The reports of the application contain the expert knowledge and are related to the common data built on the information base. The core of knowledge provided by the application are the reports composed by experts.

A *report* entity always defines the practicability of the described measure and status.

The *status* entity is intended to distinguish between reports for internal use inside the Network and reports accessible and for transfer to the public without further restrictions (this feature is not implemented yet).

The *use case* entity defines a specific area of application. Therefore a use case is always related to a crop, a pest, a measure (topic) and a region. Main intension of the application is to associate such a measure type with reports already done by experts. Any use case may be described by several summaries including the indicated documents, but a summary may also describe several types of measures.

The *summary* entity provides the textual description. Generally any report only includes one description. A *summary* entity also specifies the language it is composed in, generally the reports must be written in English but additionally the respective language can be specified.

The *expert* entity serves as a specialisation of the *contact* entity expressing the need to define between the authorised users (reading access) and experts allowed to insert knowledge. The *expert-assignment* entity assigns the category defined by *crop* entity and *pest* entity allowed for a certain expert.

Additionally any report also indicates the documents it is summarizing. Such documents can be files, links or bibliographic information.

2.1.2. Implementation concept

A major requirement for the prototype implementation is the flexibility in either allowing the reuse of many components or act as a base for a final common platform. Therefore a separation between the different layers of the application using Java Servlet Technology with an extension the Java Server Faces (JSF) framework was chosen.

A separation of *presentation layer*, *logic layer* and *persistence layer* was implemented allowing an easy exchange of each layer and changes within the functionalities without affecting the presentation layer (fig 1). Any processing aspects are moved to logic layer.

In the *logic layer* the core functions of ENDURE-ALPS are separated into components using Enterprise Java Beans (EJB) to provide the reuse of the functionality and exchanging the SEARCH EJB by a more powerful implementation, not only able to search in ENDURE-ALPS application but also in other sources (e.g. the other applications and the future ENDURE internal back office).

The *persistence layer* contains those mechanism used to persist any kind of data which is generally an RDMS³. In our case we do not access the RDMS by its own text-based protocol, but by an object-relational mapper (OR-mapper), which creates an internal object-oriented representation of the data and inflicts fewer changes within the data structure without concerning other parts of the application.

³ Relational Database Management System

2.2. Functionalities

The main task of ENDURE-ALPS is uploading and searching for the reports of non-chemical measures for certain crop-pest/disease-region-combinations. But the scale of functionality will exceed this simple task by interacting with other applications and serving as internal back office for the ENDURE network in the future (tasks of the 3rd JPA).

2.2.1. Search

The main task of the application is to search for reports by setting the parameters. Possible search criteria are the search for a crop, the search for a combination of crop and pest/disease and a search for the combination crop-pest/disease-region (fig.1).

A text search will enable the user to search for text modules which can be a single term, several terms or a phrase.

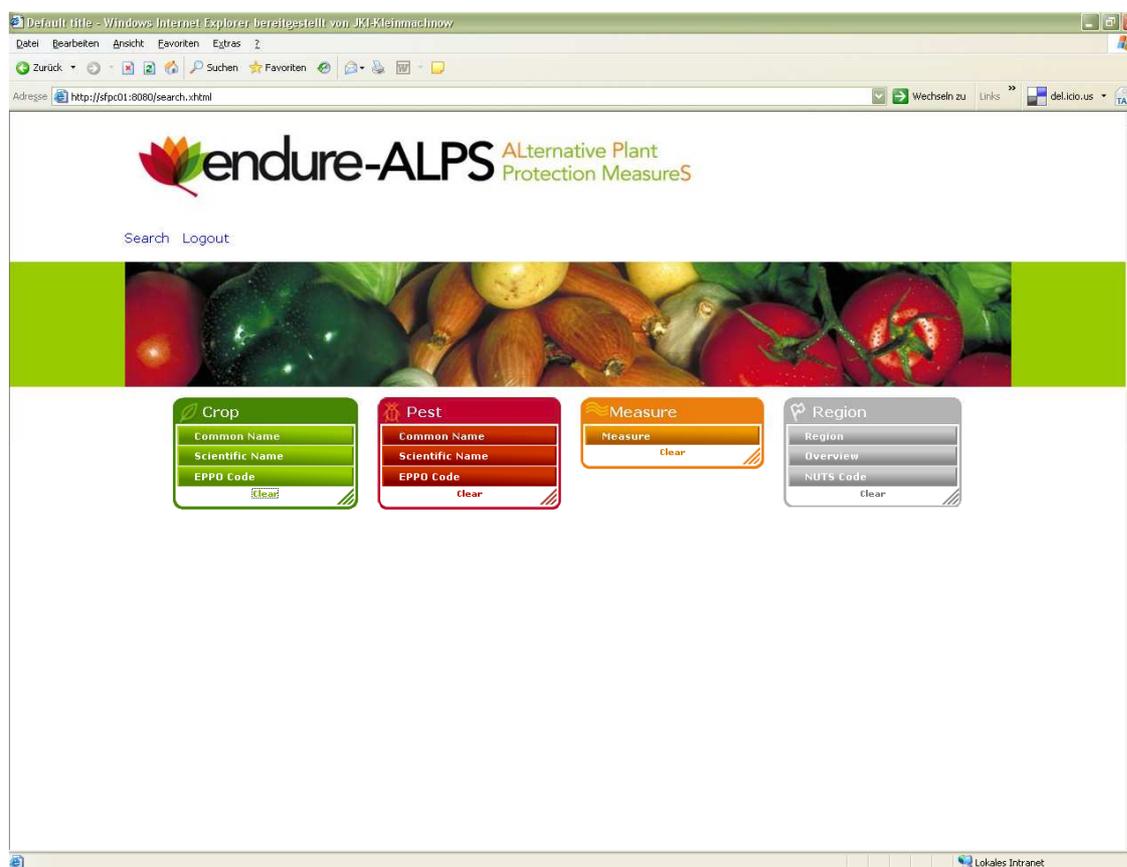


figure 1: Search mask

The fields of search criteria (crop, pest/disease, measure, and region) can be extended for the search displaying the hierarchical order of entries. The criteria can be typed in as common English name, the scientific name or the EPPO-Code. For common and scientific names an auto-fill function is available (fig. 2).

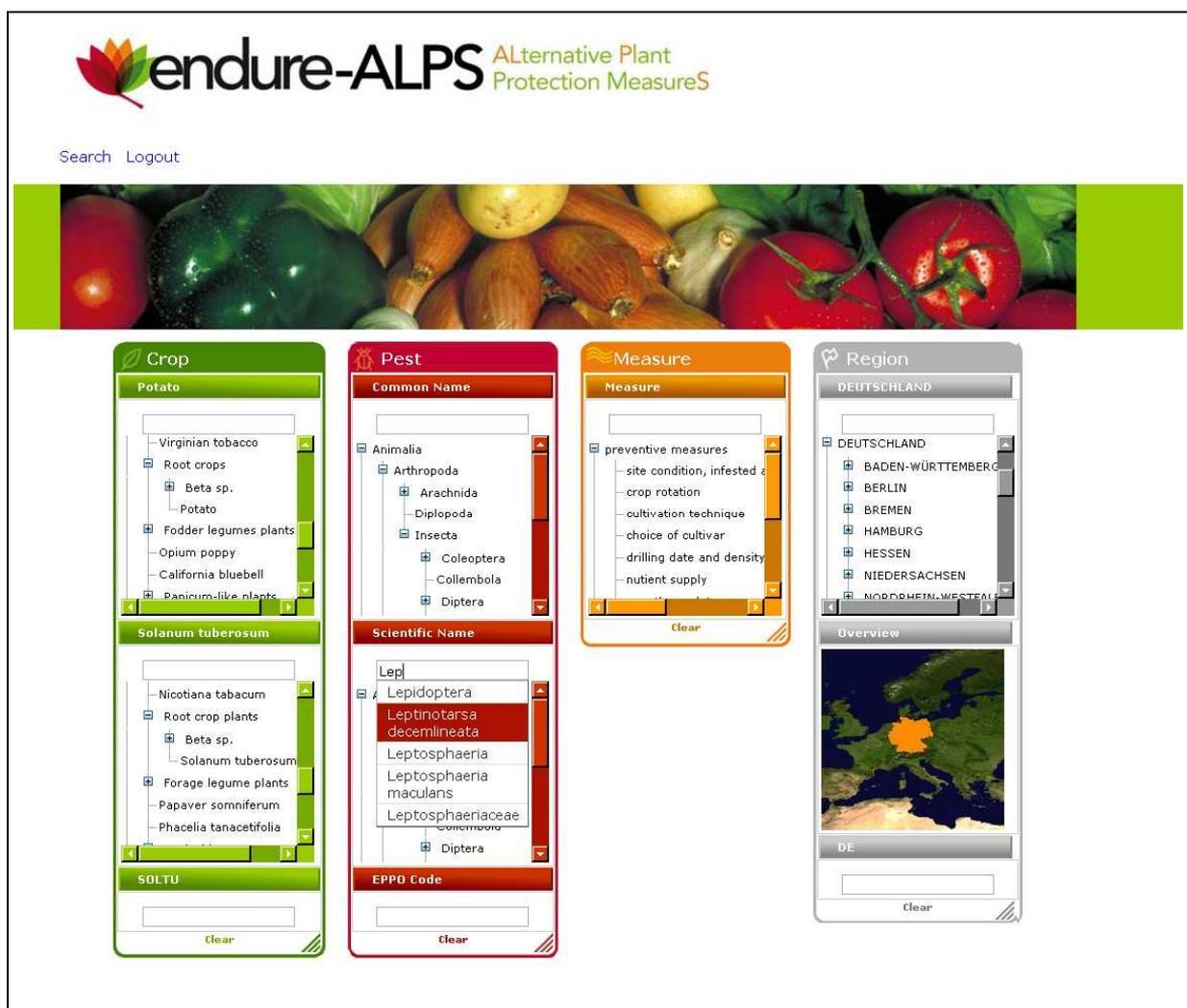


figure 2: extended search mask and auto-fill

2.2.1.1. Search results

After setting the wished search parameters the application provides all relevant reports as a result list. The relevance depends on the level of specialisation of search.

The list is set by relevance of the included reports. Additional reports matched by a certain degree of automatic generalising of search criteria are displayed as well. Generalising search criteria means going a level upward within the crop categories' taxonomy (e.g. species to familia) and a level more specific in pest/disease taxonomy (e.g. familia to species or subspecies).

The relevant report can be chosen from the list and is then displayed. The description of content and structure of the reports is subject of chapter 3.

The screenshot shows the 'endure-ALPS' web application interface. At the top, there is a logo and navigation links for 'Search' and 'Logout'. Below the header is a banner image of various vegetables. The main content area features four filter panels: 'Crop' (Potato, Solanum tuberosum, SOLTU), 'Pest' (Colorado potato beetle, Leptinotarsa decemlineata, LPTNDE), 'Measure' (empty), and 'Region' (empty). Below the filters, there are tabs for 'Reports', 'Projects', and 'Back Office'. A message indicates '4 Reports found, displaying 4 reports, from 1 to 4. Page 1 / 1'. A table displays the search results with columns for Crop, Pest, Measure, Region, Title, Practicability, Expert, and Language.

Crop	Pest	Measure	Region	Title	Practicability	Expert	Language
Potato	Colorado potato beetle	insect pathogenic bacteria	POLSKA	Controlling the Colorado beetle with Novodor	practical	Edward Arseniuk	PL, EN
Potato	Colorado potato beetle	cultivation technique	DEUTSCHLAND	The effects of straw mulch on the infestation by Colorado potato beetle	less practical	Silke Dachbrodt-Saaydeh	EN
Potato	Colorado potato beetle	organic substances	REGION PÓ? NOCNO-ZACHODNI	Activity of Spinosad (Biospin, Dow Agro Science) against Leptinotarsa decemlineata (Say) under different temperature regimes	not practical	Claudia Wendt	EN
Potato	Colorado potato beetle	Pyrethrine	Potsdam-Mittelmark	Combined use of NEEMAZAL-T/S (Neem seed-extracts), NOVODOR FC (Bacillus thuringiensis ssp. tenebrionis) and SPRUZIT NEU (pyrethrum/rape oil) for control of Colorado potato beetle (Leptinotarsa decemlineata).	practical	Claudia Wendt	EN

figure3: list of search results

2.2.2. Input/upload of reports

The upload of reports follows a preset procedure. A report refers to a crop, a pest/disease, a non-chemical measure and a region. These parameters are set similar to the search mechanism.

An expert is authorised to add reports after registration. The report includes the title, and a summary (Annex2).

The tables establish the combination the expert wishes to upload his/her knowledge in. A simple editor allows the choice of language of the reports and simple functions for editing the report.

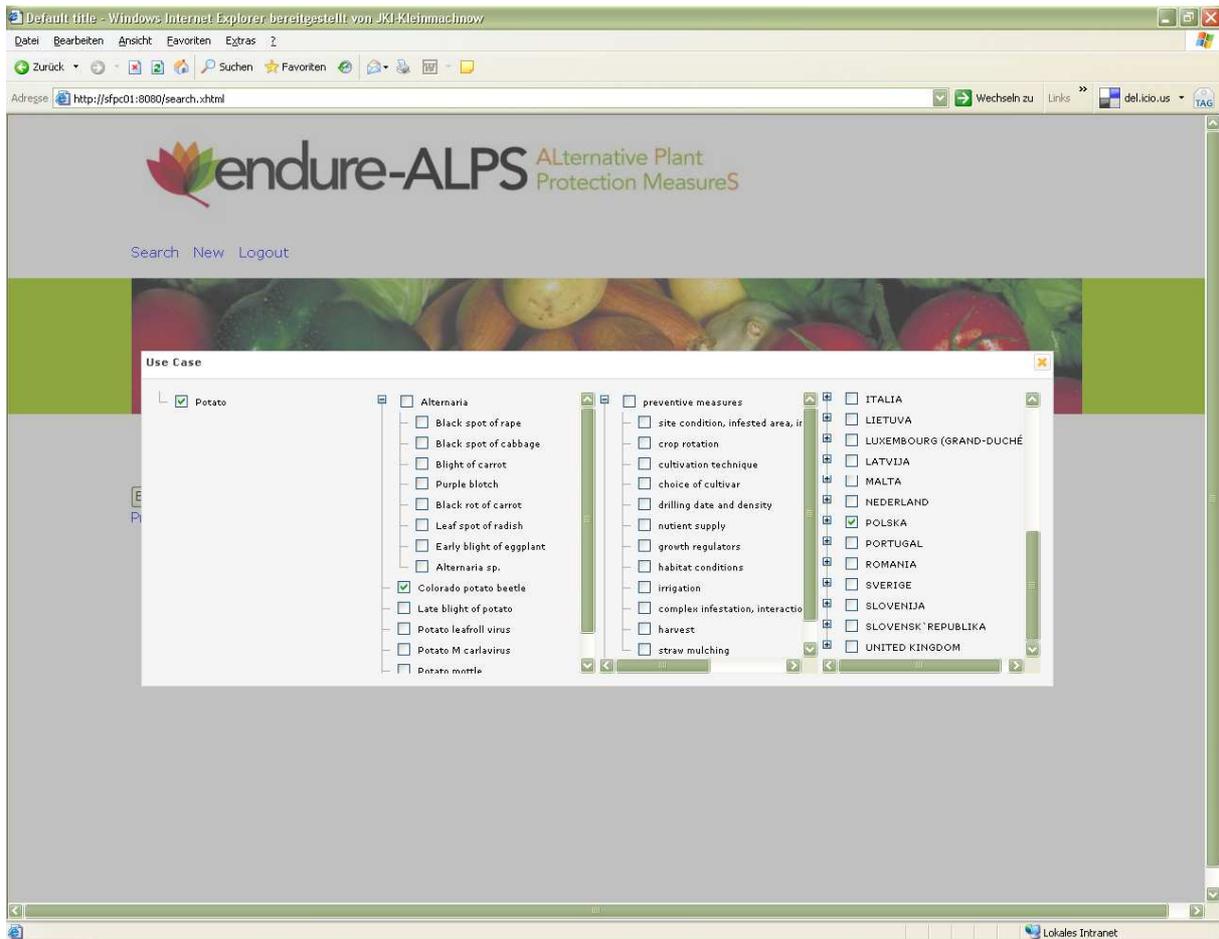


figure 4: definition of criteria for upload

The summary contains simple text formatting.

Bibliographical reference can be inserted in the summary by the expert.

Furthermore the expert must specify the documents he relates to regarding their status of accessibility, for public sources (websites) a simple reference to the site is sufficient, for not public sources documents have to be attached as files (pdf, word, images) and should be submitted if line with copyright.

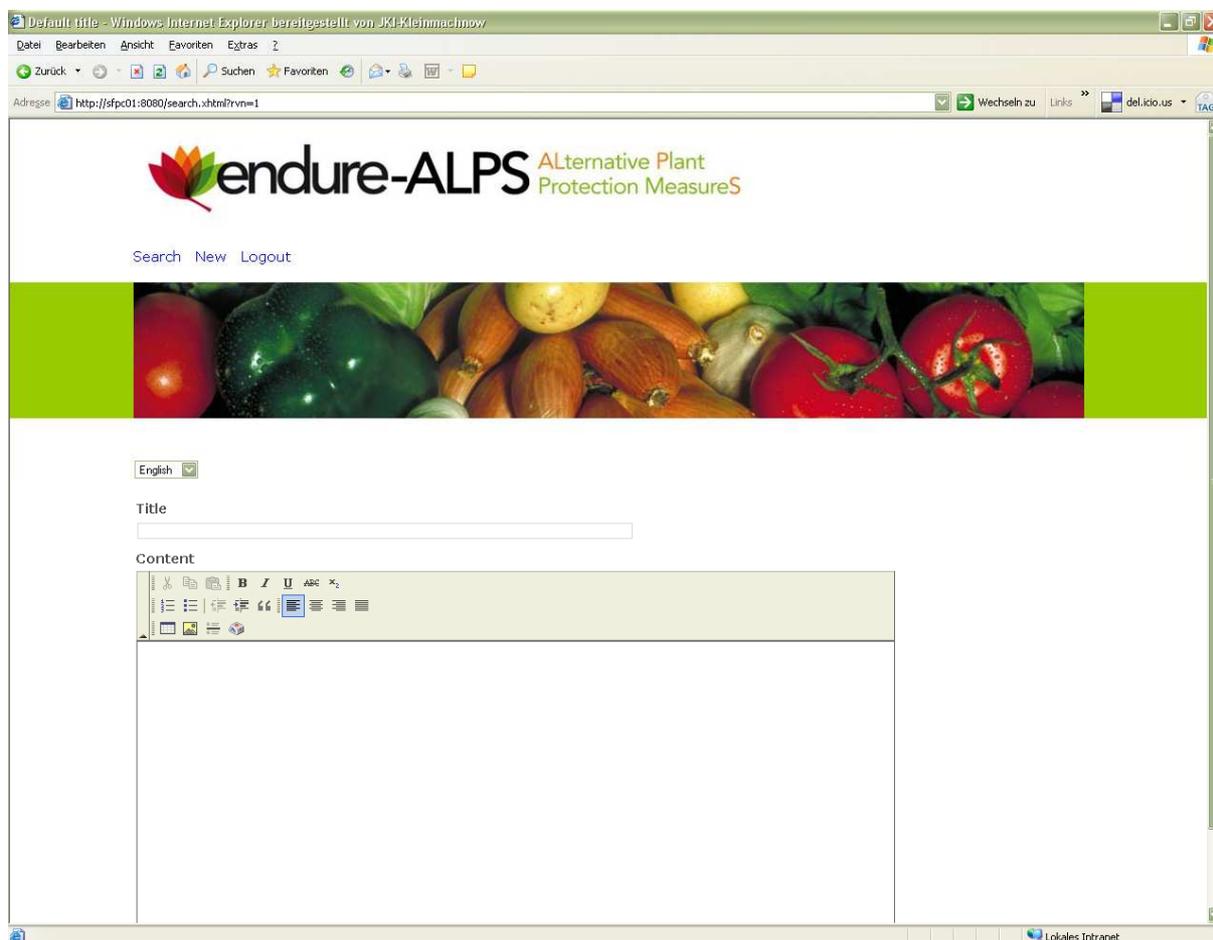


figure 5: upload of summary

3. Content

A report refers to a crop, a pest/disease, a non-chemical measure and a region according to the selected search criteria. As a result of the feasibility study and to ensure easy procedures for processing the upload of reports a guidance document regarding the content and the content structure has been developed (Annex2). Initially it was planned to upload expert knowledge about potato as a first crop but with the development of the prototype this limitation became redundant and for testing purposes a broad choice of crops, pests and disease is more efficient.

3.1. Structure of reports

A report is divided into four parts: summary, practicability status of the measure, bibliographic information and attached documents.

3.1.1. Expert summary

The core of a report is the expert summary of a number of sources describing a certain non-chemical measure referring to a combination of crop, a pest/disease, a non-chemical measure and a region.

Generally the reports must be written in English but additionally the respective national language can be uploaded and specified. This is visualized by a small flag on top of the report and the result display on the right side. This feature might support the national adoption of the application after funding ends, anticipating national spin offs and wider use at national level.

3.1.1.1. *Practicability of measures*

An additional value is achieved by the evaluation of practicability of the described measure by the expert. The system allows a short description of the measures advantages or the bottlenecks in its implementation. The rate of practicability is indicated by traffic light colours as follows:

GREEN: scientifically sound, tested in the field, practical to adopt and cost-effective;

YELLOW: scientifically sound, only practice at experimental farms, subsidies needed, etc.;

RED: strategy is still in a development stage, not practical to adopt, not cost-effective.

The following criteria shall be used for the more detailed description of the measure indicating benefits, advantages compared to common practice and bottlenecks.

Bottlenecks can be costs, labour input, risks (bad control), risk perception associated with a measure or the missing authorisation of a product. Additionally the contribution to the decrease of environmental problems can be outlined such as reduced dependency on chemical inputs, large effect to no effects for the environment and the applicability in organic farming can be mentioned.

3.1.2. Bibliographic information and attachments

Any report lists the bibliographic information of “traditional” sources such as report articles, reviews, books, all publicly searchable and available. Additionally attached documents are listed with the report referring to publicly available web-sites and mainly grey literature such as institutional research reports. The sources not publicly available can be attached as files (pdf, word, images) and accessed only from users inside the network unless indicated otherwise.



endure-ALPS ALternative Plant Protection MeasureS

[Search](#)
[Logout](#)

Controlling the Colorado beetle with Novodor

by Edward Arseniuk

[Solanum tuberosum / Potato \(SOLTU\)](#)

[Leptinotarsa decemlineata / Colorado potato beetle \(LPTNDE\)](#)

[insect pathogenic bacteria / insect pathogenic bacteria](#)



POLSKA



The most effective method to control Colorado beetle (*Leptinotarsa decemlineata*) in ecological potato cultivation is to use a preparation containing *Bacillus thuringiensis* (NOVODOR) with addition of sugar (0,5 kg/100 l of water) and vinegar (GRU04), (ZAR08), (NOW01). Very important is eggs observation, the first spraying should be done when the larvae start to hatch.

The following plant extracts may also be used to control of Colorado beetle:

- chrysanthem acid ester - Perytryna - the mixture (0,5 kg/ha) should be sprayed very precisely with water pH no more than 7. The best is to make the mixture more acid by adding 0,5 l of 6% vinegar on 100 l of water. (GRU04), (ZAR063)
- *Neem extract - the mixture works systemically and induces lack of appetite. Recommended especially in seed potato plantations, may be also use for aphids control. (GRU04)

Practicability: **practical**

[NOW01] Ekologiczna uprawa ziemniaków szansa dla małej i średniej wielkości gospodarstw rolnych

[ZAR08] Uprawa ziemniaka w systemie ekologicznym i integrowanym a jakość plonu bulw

[GRU05] Produkcja ziemniaków w rolnictwie ekologicznym

 [2006_2_20N.pdf](#)

 [Z142_54.pdf](#)

 [0150.pdf](#)

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Potato
Late blight of potato
preventive measures

Control of Phytophthora infestance



 [2006_2_382G.pdf](#)

 [afcd8df8.pdf](#)

 [Z142_37.pdf](#)

 [0150.pdf](#)

Potato
Colorado potato beetle
insect pathogenic

Controlling the Colorado beetle with Novodor



 [2006_2_20N.pdf](#)

 [Z142_54.pdf](#)

 [0150.pdf](#)

Potato
Alternaria
use plant of plant

Control of Alternaria ssp. with BIOSEPT 33 SL



 [2007_3_LL.pdf](#)

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figure 6: report

4. Perspective

The ENDURE-ALPS prototype delivers a strong tool to collect and search expert knowledge about non-chemical plant protection for various crops in different regions. The indicated level of practicability of measures will enhance the discussion of different strategies between scientists and give indication for the adoption and adaptation of new strategies beyond regions they are already applied in. Especially the features indicating different languages of a report will support the national adoption of ENDURE-ALPS after funding ends, anticipating national spin offs and wider use at national level.

In the near future improvements of the system with regard to the user feed back on functionality and the usability of the tool will be carried out.

ENDURE-ALPS will strongly contribute to an enhanced availability of knowledge about non-chemical measures in line with current European political demands of strengthening non-chemical plant protection and the enforcement of IPM on European scale.

Annex 1. Figures

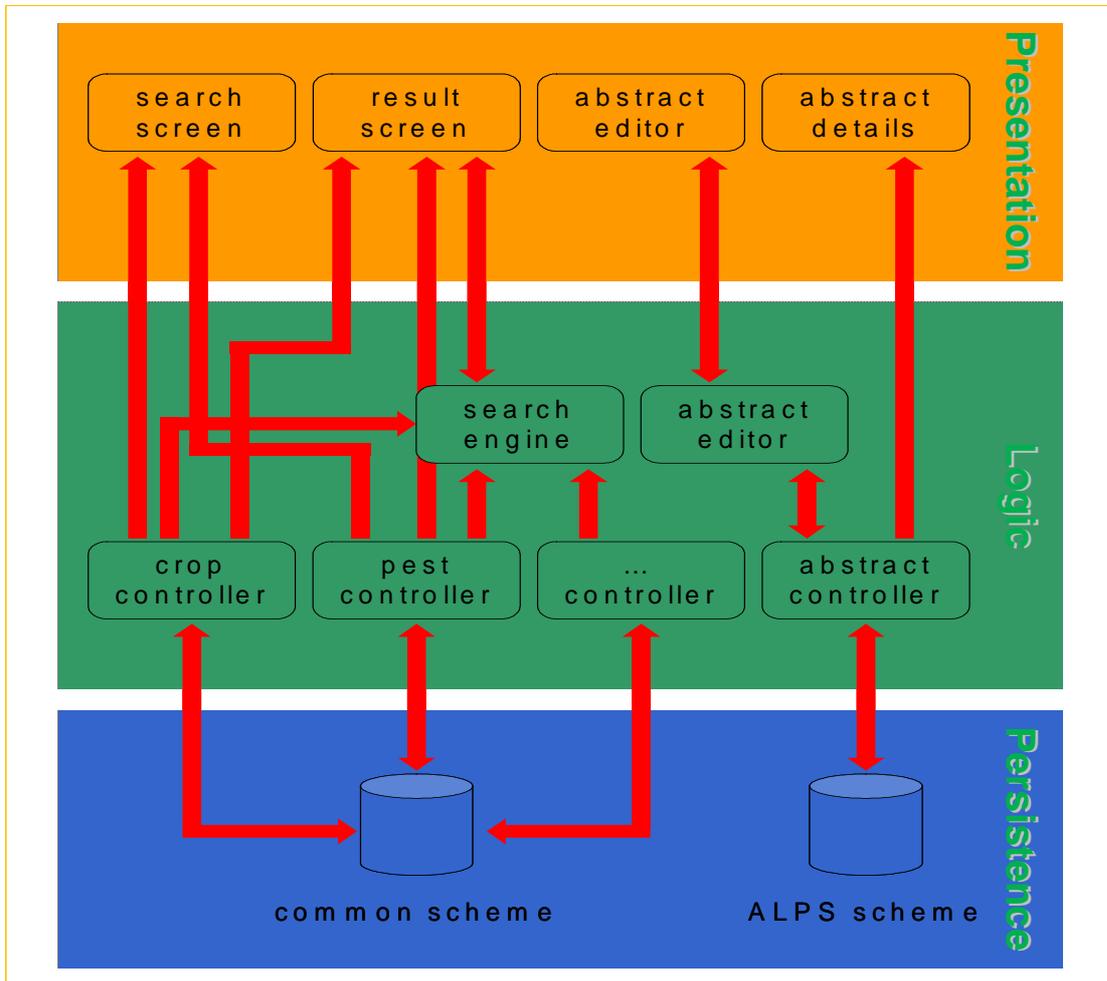


figure 7: layer separation

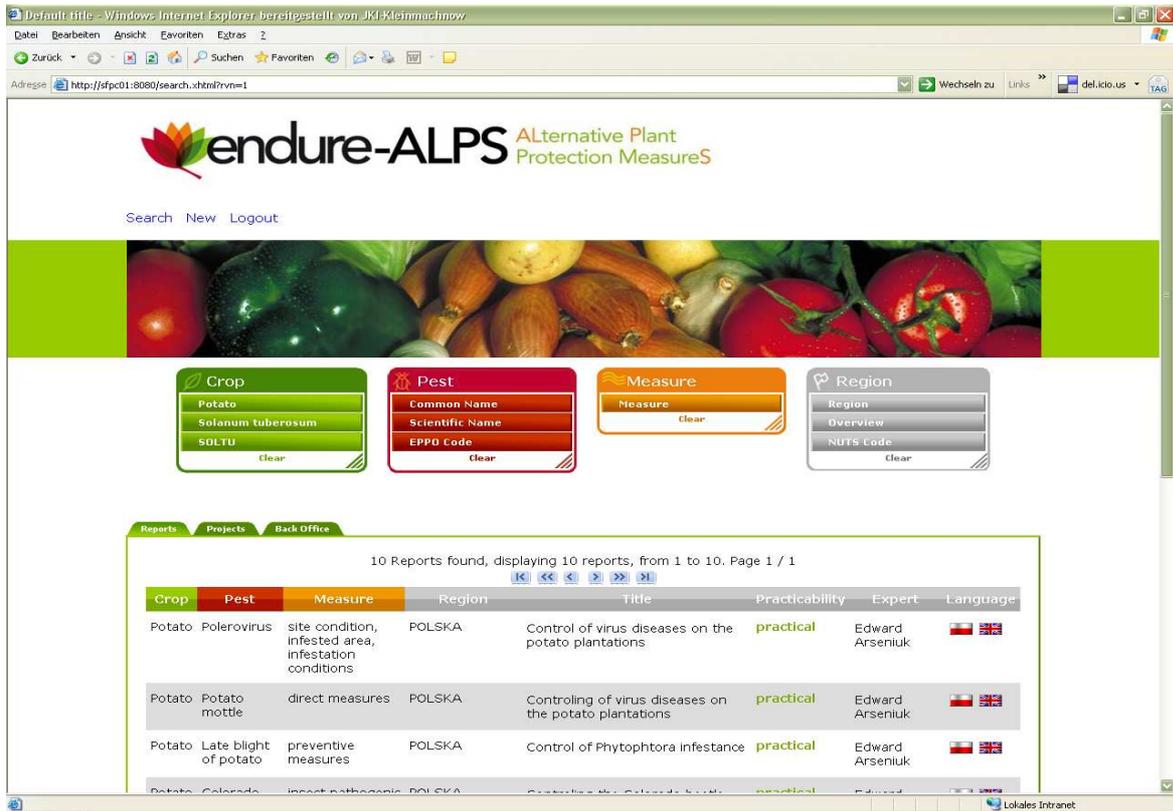


figure 8: Screenshot of search result list

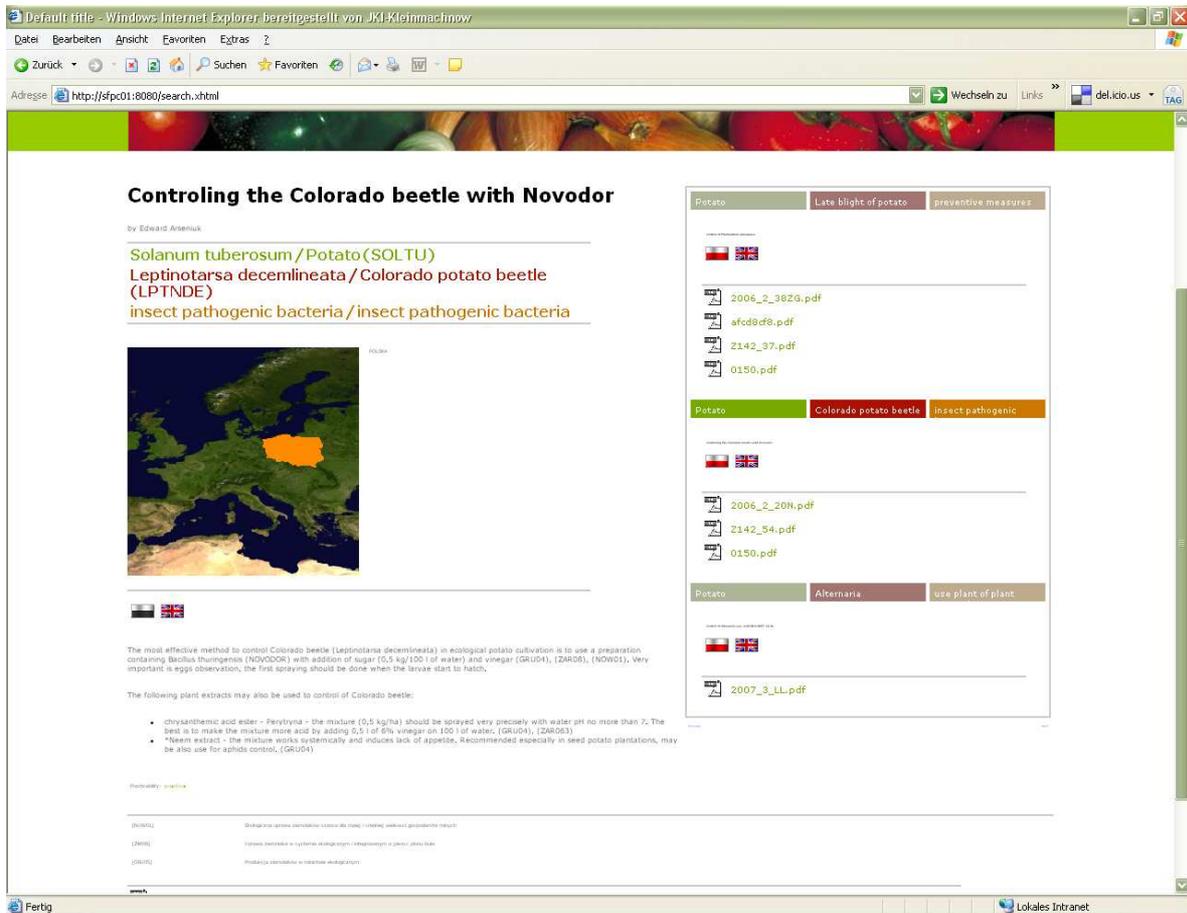


figure 9: Screenshot report

Annex 2. Templates

Template ENDURE-ALPS report

Author:		Institute:		Date:
Crop: Please use EPPO Code http://eppt.eppo.org/ SOLTU (potato)	Pest: Please use EPPO Code http://eppt.eppo.org/	Measure: Please use the table Non-chemical measures on page.2/3	Region: Please use NUTS http://ec.europa.eu/eurostat/ramon/nuts/codelist_de.cfm?list=nuts	
Title				
Summary				
<ul style="list-style-type: none"> • First 2 lines represent the most important information of the report! • <i>General information (region, global climatic conditions) were pertinent to the described measure</i> • <i>Description of symptoms (caused by disease or pest) were pertinent to the described measure</i> • <i>Special conditions for measure (e.g. ontogenesis of disease) and treatment</i> • <i>Description of measure (direct, preventive, integrated)</i> 				
Practicability				
<p>GREEN: scientifically sound, tested in the field, practical to adopt and cost-effective. YELLOW: scientifically sound, only practice at experimental farms, needs subsidies, etc. RED: strategy is still in a development stage, not practical to adopt, not cost-effective</p> <p>choose</p>				
Bibliographic reference				
(1)				
(2)				
Attached documents (<i>pdf or other files</i>)				
(3)				
URL				
(4)				

List of non-chemical measures

preventive measures

site condition, infested area, infestation conditions
crop rotation
cultivation technique
choice of cultivar
drilling date and density
nutrient supply
growth regulators
habitat conditions
irrigation
complex infestation, interaction with other protection measures
harvest

direct measures

biological measures and natural substances

use and support of beneficials

insect pathogenic viruses
insect pathogenic bacteria
insect pathogenic fungi
insect pathogenic nematodes
arachnids
spiders
predatory mites
insects
earwigs
predatory bugs
ladybirds
rove beetles
ground beetles
parasitic wasps
lacewings, other crysopids
predatory gall mitge (Itonididae)
predatory flies
birds
singing birds
raptors
mammals
shrews, hedgehogs
measures for active support of beneficials
mycoherbicides
system management methods
bacteria
nematods
management measures
other beneficials

use plant of plant strengtheners

anorganic substances
organic substances
microbial substances
homeopathic substances
algal substances
waxes

other plant strenghteners

other natural substances

inductors for tolerances

physical measures

mechanical measures

paste rings

catch ditches

mechanical traps

pull out and burry

cutting

covering

cutting back

fences

collars

mechanic others

thermic measures

weed burning

infrared treatment

micro waves and electricity

heat treatment/ low temperature treatment

solarization

hot water treatment

thermic others

optical measures

light traps

colour traps

optical other

energetic measures

seed electron bombardment

energetic other

biotechnical measures

genetic engineering

pheromon traps and mating disruption

other biotechnical measures

direct measures (substances) for ecological farming (authorised in Germany)

sulfur

mineral oil

Bacillus thuringiensis

Metarhizium anisopliae

Pyrethrine

Lecithin

Adoxyphys orana-granulovirus; products:Granupom (Höchst), Madex 3 (Andermatt Biocontrol AG),

Capex 2

Codlemone

Metaldehyde

Coniothyrium minitans strain CON/M/91-08

copper hydroxide

copper oxychloride

Ferric phosphate

rape oil

Neem products

potassium soap