

- One objective of the EUCLID program is to propose existing or innovative integrated pest management strategies to the stakeholder community of the bio-control.
- **EUCLID_DSS** was developed to promote sharing and use of these strategies. EUCLID_DSS is free.
- EUCLID_DSS is implemented by some strategies of protection for tomato crops under greenhouses. Because DSS application is generic, other cropping systems can be taken into account. Application allows to use the decision rules contained in the DSS. Experts in this field will be able to create and validate new strategies.
- Advices for phytosanitary management against pests or diseases are generally provided according to attacks severity. The crop health state, as well as environmental factors, are evaluated using specific field indicators, by mean of regular samplings. Protocols can be shared on-line.
- Strategies of integrated protection are composed by decision rules for which using bio-control methods is a priority. Archiving of advices and phytosanitary actions allows to describe the crop protection history.
- Online surveys are made to collect information on existing protection strategies used in different cropping systems: sampling methods, crop health state indicators, protocols for phytosanitary actions. After validation, these strategies could be integrated to the DSS catalogue.
- **EUCLID_SAMPLING_TOOLS**, free of use, is complementary to the EUCLID DSS application. The user can set-up crop monitorings consistent with existing decision rule indicators or define fully customized sampling methods. Some examples are provided by the application.
- EUCLID_SAMPLING_TOOLS allows to record in a database, then administer, all the observations made on the field and the cropping history. This information can be edited and displayed in graphical form.

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1. INTRODUCTION

EUCLID_SAMPLING_TOOLS is to facilitate the crop monitoring in the framework of integrated pest management. This application allows the recording, the consulting and the storage of collected data.

The whole system, which contains DSS et SAMPLING_TOOLS applications, is downloadable from the « *Download DSS + STools* » link, on the home page. Once installed on a personal computer with Oracle Virtual Box, the system will run in total autonomy. The installation process is detailed on the following chapter.

User is owner and responsible for the information he will integrate to the system and for the interpretation and using that he will do.

General guidance of the EUCLID_DSS application, which allows to create and implement strategies of crop protection, is available from the « *DSS General Guidance* » link, on the home page.

This guidance for installation and use of EUCLID_SAMPLING_TOOLS application is organized in four main sections:

1. General information linked to the projects and to crop monitoring
2. Creation of data entry forms for the gathering of field data
3. Access to the recorded data and to the reporting display
4. Data edition for reading, modifying or deleting all or part of data

On-line helps can be viewed, under the bold/major characters or under icons.

Help-pages specific to the sections 2, 3 and 4 are also available.

2. SOFTWARE INSTALLATION

The install consists to install on the Virtual Box software a full operating system provided by the virtualization archive support. This system includes an OS Linux CentOS7, an Oracle MySQL database and the DSS and SAMPLING_TOOLS applications. The initial size of this support is about 2Go but it can dynamically increase to 30Go, depending the quantity of data recorded.

2.1. INSTALLATION OF VIRTUAL BOX ON A PERSONAL COMPUTER

Download and install Virtual Box from the official site <https://www.virtualbox.org/> with the version for 64 bits processor. NB : it is possible that some operating system need to turn on the virtualization process (BIOS advanced parameters : Off /On).

2.2. INSTALLATION OF EUCLID_DSS and EUCLID8SAMPLING_TOOLS APPLICATIONS

Download the virtualization archive support from the « *Download DSS + STools* » link on the Euclid_DSS home page.

https://isaceaweb.sophia.inra.fr/euclid_dss/SOURCES/download_euclid_dss/

Start the Virtual Box as any software then « Import Appliance» with the archive previously downloaded « *EUCLID_DSS_CentOs_date.ova* ». After a few minutes, once the import is achieved, a right-click or double-click on the virtual machine (Powered off) will start it.

To extinct it, a right-click and « Close » lead to the extinction menu. The shutdown of the Virtual Box will also extinct the virtual machine. It is possible to save a full archive of the system, including the data, from the « Export Appliance» menu.

2.3. STARTING APPLICATIONS

Open a browser and type the address http://localhost/euclid_dss/.

An English home page will be displayed when connecting to the site.

Three language are then available: English, French, Chinese (home page). On some pages and using the flags, it is possible to switch the language during browsing.

3. USE OF SAMPLING TOOLS APPLICATION

3.1. NEW CROP MONITORING

SAMPLING-TOOLS application was developed mainly for applied research. Recorded data are structured by project. Each crop monitoring depending on a project generates spatio-temporal sampling data.

A new crop monitoring has to be linked with an existing project (default selection) or to a new project (other choice).

The main menu displays the status of each project once spatialized data are linked to.

3.1.1. Link a crop monitoring to an existing project

Four types of information are mandatory and asked one time. Note: on-line help appears when the pointer is located on the bold or major characters.

NEW CROP MONITORING

Create a new project

Link a crop monitoring to an existing project

Select a project

Mandatory entry

DEMO PROJECT
NEW PROJECT

General information

Monitoring title* <input type="text" value="New crop monitoring"/>	Start Year* <input type="text" value="2019"/>
Country* <input type="text" value="France"/>	Region <input type="text" value="South-West"/>
Location name <input type="text" value="site 1"/>	Main production <input type="text" value="salad"/>

Crop information

Family <input type="text" value="Solanaceae"/>	Usual name* <input type="text" value="tomato"/>
Genus <input type="text" value="Lycopersicum"/>	Cultivar <input type="text"/>
Species <input type="text"/>	Rootstock <input type="text"/>

Crop disposition

Total number of rows <input type="text" value="52"/>	Distance between rows <input type="text" value="120"/>
Number of plants by row <input type="text" value="122"/>	Distance between plants <input type="text" value="30"/>

Soil

Crop area <input type="text" value="2220"/>	Irrigation mode <input type="text" value="drip irrigation"/>
Soil <input type="text" value="soiless"/>	Soil texture <input type="text" value="rockwool"/>
Type of shelter <input type="text" value="glasshouse"/>	Climat regulation <input type="text" value="pulsed air"/>

Type of shelter and coverage, i.e.: plastic greenhouse, glasshouse, plastic tunnel,...30 characters maximum.

ENTER

3.1.2. Create a new project

The appropriate button allows to create a project. It is asked first to specify its name then to provide global information (2 screens).

After validation, it is possible to fill information about the crop monitoring on the lines of § 3.1.1.

3.2. DATA RECORDING

Spatialized observations intended for be recorded into the database have to be formatted by entry forms which are specific to each sampling plan. Observations are performed on each unit of a sampling plan formed by n sampling-units et n observed variables. Required information has to be short and explicit texts because it is displayed in the data entry and result forms.

3.2.1. Creating data entry forms

If any entry form does not exist for a crop monitoring, the menu proposes to create it before starting the data recording. A specific guidance is available.

To design a data entry form perfectly adapted to the needs, it is important to check its compliance with the sampling plan before starting the recording. Although it is possible to create several entry forms for a given crop monitoring, it is advisable to use only one, and modify it if necessary.

Caution: we must never significantly modify the coordinates of an entry form during the crop monitoring at the risk of making difficult or even impossible the understanding of the charts. The same, we must never radically modify the meaning of a variable having already be used to record spatialized data (see § 4.3.2.).

The display order of sampling-units and variables by the entry form is important when the recording is made on field conditions, using the step by step option (see § 3.2.2.2.).

To create a data entry form, select "CREATING DATA ENTRY FORMS".

The creation of a data entry form is done following three steps.

Step 1: record the main parameters of the data entry form: name, number of sampling-units, number of variables to measure or to observe.

CREATING DATA ENTRY FORMS

Crop monitoring: [Nouveau suivi cultural](#)

Guidance for data entry form management

Entry form parameters

Form name*

Number of sampling units*

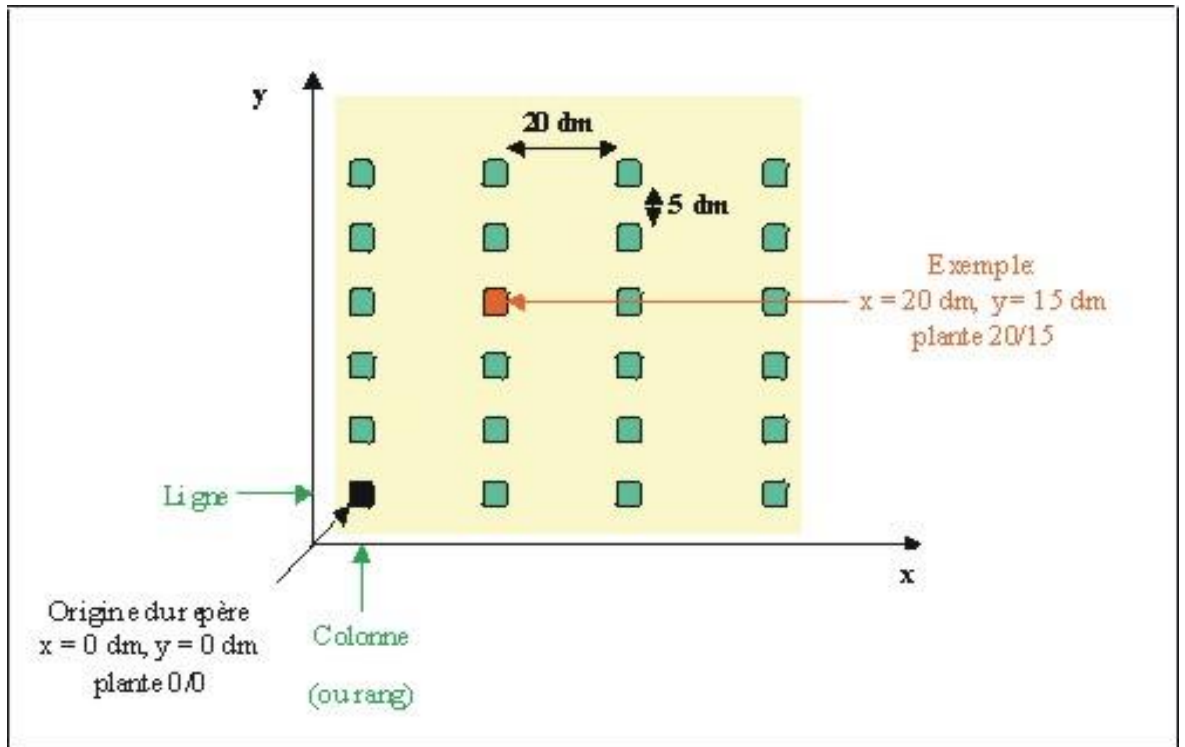
Number of variables* MANDATORY: set to 1 by default, number of sampling units to observe, 3 characters maximum.

ENTER

Step 2: record the sampling-units as an orthonormal frame. It is possible to associate 5 statistical factors maximum to each sampling-unit.

Sampling-units coordinates have to be indicated in **decimetre**, otherwise it can be used a simple linear scale (1/1, 2/2, X/Y...).

Each sampling-unit coordinate is located in the sampling plan by its **X** (column or row) and **Y** (line or rank of the plant on the row) **coordinates**.



CREATING DATA ENTRY FORMS

Crop monitoring: [New crop monitoring](#)

Data entry form: [New data entry form](#)

Registration of the X/Y-coordinates on the sampling grid made up of Sampling units

[Guidance for data entry form management](#)

Attention: to make your recording easier, register the coordinates following the order in which the sampling has been made

Register clearly the statistical factor corresponding to each sample unit

Sampling unit	Coord. X	Coord. Y	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Example	0	50	border	climat1	nutrition3	red_variety	
1	<input type="text" value="10"/>	<input type="text" value="10"/>	<input type="text" value="variety 1"/>	<input type="text" value="no pesticide"/>	<input type="text" value="c"/>	<input type="text" value=""/>	<input type="text" value=""/>
2	<input type="text" value="10"/>	<input type="text" value="20"/>	<input type="text" value="variety 2"/>	<input type="text" value="pesticide"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
3	<input type="text" value="20"/>	<input type="text" value="10"/>	<input type="text" value="variety 2"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
4	<input type="text" value="20"/>	<input type="text" value="20"/>	<input type="text" value="variety 1"/>	<input type="text" value="no pesticide"/>	<input type="text" value="d"/>	<input type="text" value=""/>	<input type="text" value=""/>

Step 3: select the variables to measure or to observe in the list of existing variables or create new variables. When creating a variable, a special attention must be paid to required information because it is displayed by the data entry and the result forms.

If the variable already exists: it suffices to select it on the list of existing variables for include it in the data entry form.

If the variable does not exist: it is necessary to create it by indicating the required information as on the example below.

Be careful to indicate the number of class if the variable is qualitative.
After validation of the third step, the data entry form is viewable and editable in the « DATA MODIFICATION» section.

3.2.2. Recording spatio-temporal data

From the « DATA RECORDING » menu, and after having selected a crop monitoring, it is possible (if an entry form exists) to record observations made at a sampling date.

Two options are available. In any case, the name of the data entry form is required.

If the date does not exist, it is necessary to choose one in the calendar. If the date exists, it is possible to add data only using the “step by step” entry form.

3.2.2.1.1. Recording spatialized data with a global entry form

The recording with the global entry form groups all the sampling-units and all the variables. This entry form is validated at once at the end of the entry. In case of disruption, the entry can resume using the «step by step» option.

RECORDING SPATIALISED DATA WITH A GLOBAL ENTRY FORM

Project: [NEW PROJECT](#)
 Crop monitoring: [New crop monitoring](#)
 Data entry form: [New data entry form](#)
 for the sampling date: [2018-05-10](#)

Recall of observed variables

Variable	Scale for measures or observations	Sample	Protocol
Harmonia axyridis	numbers	5 plants	Precise counts on 5 plants by plot of 25 m2
New variable	1 absence 2 1 3 individuals 3 to 4 individuals	plant	Quick visual observation during 1mn per plant maximum

OBSERVATION N°: 1 X : 10 Y : 10 Factor 1 : **variety 1** Factor 2 : **pestice** Factor 3 : **a** Factor 4 : Factor 5 :

Harmonia axyridis	Value: <input type="text" value="0"/>	Comments: <input type="text"/>
New variable	<input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	Comments: <input type="text"/>

Comments on the sampling zone:

OBSERVATION N°: 2 X : 10 Y : 20 Factor 1 : **variety 2** Factor 2 : **no pesticide** Factor 3 : **b** Factor 4 : Factor 5 :

Harmonia axyridis	Value: <input type="text" value="0"/>	Comments: <input type="text"/>
New variable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	Comments: <input type="text"/>

Comments on the sampling zone:

OBSERVATION N°: 3 X : 20 Y : 10 Factor 1 : **variety 2** Factor 2 : **pesticide** Factor 3 : **c** Factor 4 : Factor 5 :

Harmonia axyridis	Value: <input type="text" value="0"/>	Comments: <input type="text"/>
New variable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	Comments: <input type="text"/>

Comments on the sampling zone:

OBSERVATION N°: 4 X : 20 Y : 20 Factor 1 : **variety 1** Factor 2 : **no pesticide** Factor 3 : **d** Factor 4 : Factor 5 :

Harmonia axyridis	Value: <input type="text" value="0"/>	Comments: <input type="text"/>
New variable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	Comments: <input type="text"/>

Comments on the sampling zone:

3.2.2.2. Recording spatialized data with a step by step entry form

The recording with the « step by step » entry form displays the sampling-units one by one. This entry form allows to resume a disrupted entry, unlike the global entry form. In this case, a screen indicates the number of sampling-units already recorded. It is asked to which sampling-unit take back. If any observation is detected, the recording starts at the first sampling-unit. It is possible to reverse the displaying order of the sampling-units to adapt to the entry in field conditions.

RECORDING SPATIALISED DATA WITH A STEP BY STEP ENTRY FORM

Project: [NEW PROJECT](#)
 Crop monitoring: [New crop monitoring](#)
 Sampling session: [2018-5-10](#)

Start the 1st entry

Complete an entry in progress Sampling-units yet registered

Enter the sampling-unit to resume

Select the order of the sampling-units for the entry form

1 to n
 n to 1

Select a data entry form

New data entry form

ENTER

The « step by step » data entry form is simplified for the recording in field conditions with miniaturized equipment. Enlarged validation buttons appear at the top and bottom of each page. The sampling-units remaining to be observed are indicated. At each validation, the recording of the current sampling-unit is performed, ensuring the safety of the corresponding data.

RECORDING SPATIALISED DATA WITH A STEP BY STEP ENTRY FORM

Project: [NEW PROJECT](#)
 Crop monitoring: [New crop monitoring](#)
 Data entry form: [New data entry form](#)
 for the sampling date: [2018-5-10](#)

Recall of observed variables			
Variable	Scale for measures or observations	Sample	Protocol
Harmonia axyridis	numbers	5 plants	Precise counts on 5 plants by plot of 25 m2
New variable	1 absence 2 1 3 Individuals 3 to 4 individuals	3 plant	Quick visual observation during 1mn per plant maximum

OBSERVATION N°: 1 / 4 X : 10 Y : 10

ENTER

Remaining to observe

Hax	Value: <input type="text" value="0"/>	Comments:
Nva	<input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	Comments:

Comments on the sampling zone:

OBSERVATION N°: 1 / 4

ENTER

[Leave](#)

3.2.2.3. Recording temporal information for the cropping history

The temporal information is global data which constitutes the cropping condition history. This facultative information is gathered from a standardised form. Note the possibility to evaluate an IFT: French official indicator for pesticide use (Treatment Frequency Indicator).

Before or after having performed entries of spatialized data, it is possible to record this information from the « RECORDING TEMPORAL INFORMATION FOR CROPPING HISTORY » menu.

3.3. ACCESS TO THE DATA

The reporting of observed data is viewable in the shape of scatterplot and barplot charts. The consultation is made by selecting a crop monitoring, a date or a sampling period and one or more variable.

The rough data are downloadable and modifiable in the "DATA MODIFICATION " section.

3.3.1. Chart understanding

- Case of quantitative variables
The numeric data are expressed using abundance classes with a class « 1 » for the zero value, plus 5 classes of equal magnitude automatically computed using the minimum and maximum values over the whole sampling period.
- Case of qualitative variables
The qualitative data are expressed using 6 classes maximum according to the scale predefined by the user. The class « 1 » of a qualitative variable is generally associated to "absence" factor. However, in terms of the setting defined by the user for the variable, this class « 1 » can have another meaning.

The user has to interpret the charts according the data set and the protocol.

For each variable, the scatterplots associate a colour to each of the 6 classes.

Caution: by default, sampling-units are materialized by a small point. It is impossible to distinguish a missing observation with a value equal to zero.

It is necessary to well first adapt the sampling plan to its reliability and to expected future reporting.

In the case of the initial sampling plan is greatly modified during a crop monitoring (sampling-units coordinates or observed variables), it is necessary to create a new crop monitoring and a new data entry form.

3.3.2. Review of the spatialized data for a sampling date

The review allows to visualise the data gathered for a sampling date and for all or part of observed variables. The selected date and two previous dates are automatically displayed. If the date to display is not well-known, we must indicate an approximate date by later to it: the system automatically searches for the earliest date.

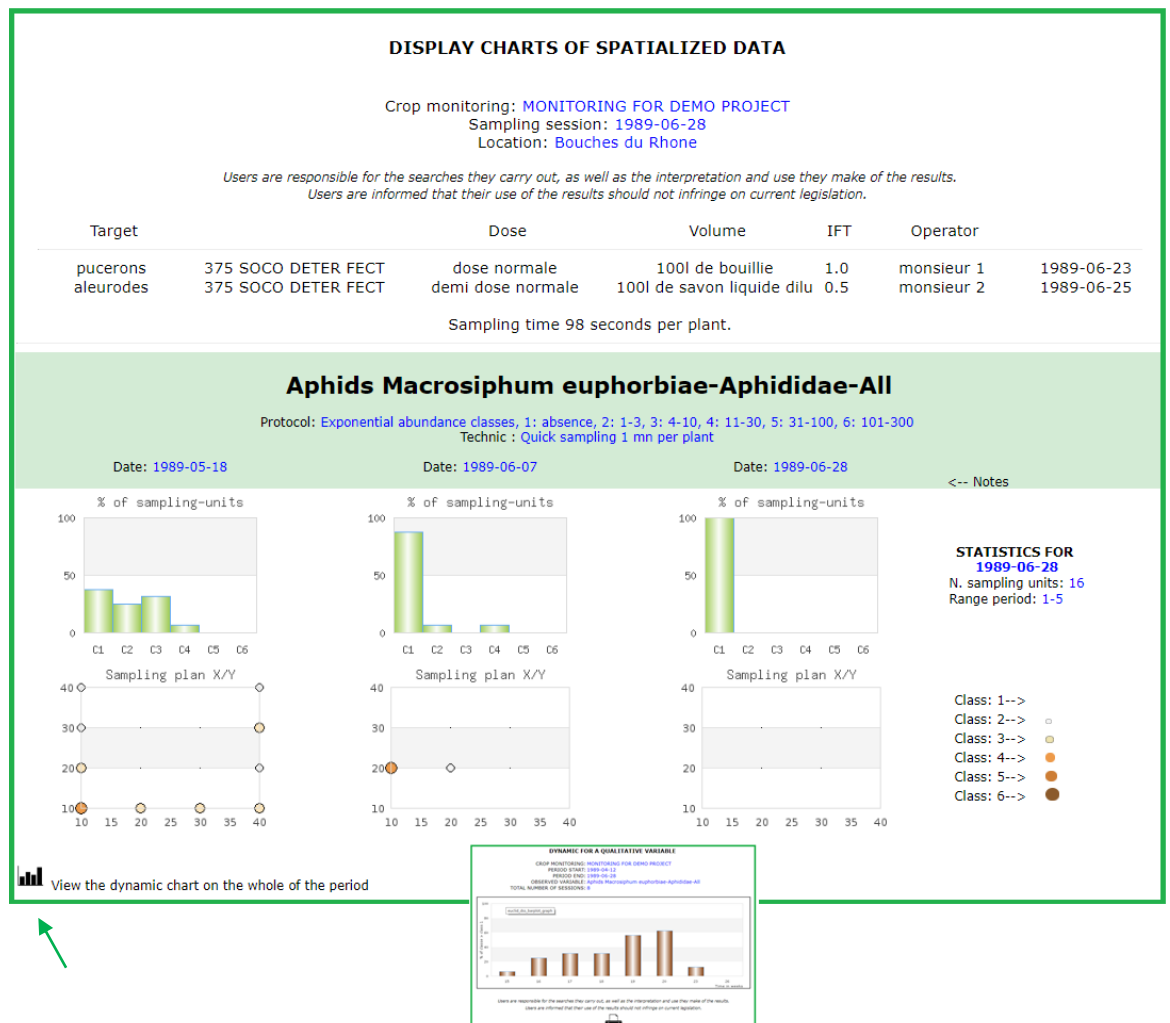
If phytosanitary information has been recorded in the cropping history for the selected date, it appears with detail on the top of the review.

For each date and variable, scatterplots and frequency barplots are vertically juxtaposed. The selected date is on the right of the screen.

For each variable, it is possible to display a chart of dynamic for the whole sampling period. For each date, all the observations performed are taken into account.

For a qualitative variable, the chart is a barplot which cumulates, for each date, the percentages of classes > class 1 (see §. 3.3.1.).

If the variable is quantitative, the chart is linear and formed by, for each date, the mean of measured values.



3.3.3. Visualise scatterplot charts for a period

It should be indicated a crop monitoring and a sampling period then one or more observed variable. The system displays all the dates included in the chosen sampling period for the selected variables. Scatterplot understanding is the same as the review for a sampling date (see § 3.3.2.).

Important: it is possible here to download the rough spatialized data on a form of a text file.

3.3.4. Visualise barplot charts for a period

It should be indicated a crop monitoring and a sampling period then one or more observed variable. The system displays all the dates included in the chosen sampling period for the selected variables. Barplots understanding is the same as the review for a sampling date (see § 3.3.2.).

3.3.5. Cropping history

This section allows to access the information recorded about the cropping history. Note that any modification of this information be made in the corresponding « DATA MODIFICATION » section.

Important: it is possible here to download a text file of the crop monitoring history.

4. DATA MODIFICATION

For all modification, we have first to select a crop monitoring then follow menus. Any validated **deleting** after warning information is **definitive**.

4.1. PROJECT

The information recorded about a project corresponding to a monitoring appears in respective fields as at § 3.1.2. They can be then modified. The last update is indicated. It is possible to delete a project entirely if no more crop monitoring is linked with it. The deleting is definitive.

4.2. CROP MONITORING

The information recorded for a crop monitoring appears in respective fields as at § 3.1.1. They can be then modified. The last update is indicated. It is possible to delete a crop monitoring entirely if no more sampling data is linked with it. The deleting is definitive.

4.3. DATA ENTRY FORM

In any case, it is necessary to select a data entry form.

The modification of a data entry form can concern its composition with sampling-units and/or observed variables as well as the description of the variables.

The modification of a variable must be subject to more care in order to do not change its meaning (see § 4.3.2.4.).

In case of major change on the data entry form, it is advised to create a new one.

4.3.1. Display data entry forms

This option only allows to visualise the data entry form to check-it.

4.3.2. Modify a data entry form

4.3.2.1. Modify the main parameters of a data entry form

The main parameters recorded for the data entry form appears in the respective fields as at § 3.2.1., step 1. They can be then modified. The last update is indicated.

- If the parameter « number of sampling-units » is modified, the data entry form must be recomposed with all the coordinates to put it into consistent with this new parameter.
- If the parameter « number of variables » is modified, the data entry form must be recomposed with all the variables to put it into consistent with this new parameter.

4.3.2.2. Modify existing coordinates of a data entry form

This option is only useful if the number of coordinates is **unchanged**. The coordinates and the statistic factors recorded for the corresponding data entry form appears in the respective fields as at § 3.2.1., step 2. They can be then modified. The last update is indicated.

4.3.2.3. Redraw data entry form with new coordinates

This operation is mandatory if the « number of sampling-units » parameter has been modified. You have to indicate all the sampling-units of the data entry form as at § 3.2.1. step 2, in creation mode. These new coordinates will be replacing the old ones.

4.3.2.4. Modify an existing variable

Select a variable in the list of existing variables to display the corresponding information in the respective fields as at §. 3.2.1., step 3. They can be then modified. The last update is indicated.

Important: in order to insure to understanding of the spatialized data recorded, the deleting of a variable is possible only if no more data is linked with it.

For the same purpose, **an existing variable must never be modified** to create a new one.

4.3.2.5. Redraw data entry form with new variables

This operation is mandatory if the « number of variables » parameter has been modified. You have to recompose the data entry form with variables at § 3.2.1. step 3, in creation mode. These new variables will be replacing the old ones in the data entry form.

4.3.3. Delete a data entry form

When a data entry form is deleted, the variables are conserved. They still appear on the list of existing variables and remain available to be reused. The deleting is definitive.

4.4. CROPPING HISTORY

After having selected a crop monitoring and a sampling date, the information recorded for the cropping history appears in the respective fields as at § 3.2.3. It can be then modified. The last update is indicated.

Caution : It is possible to delete a sampling date with its cropping history entirely if no more spatialized sampling data is linked with it (see § 4.5.). The deleting is definitive

4.5. SPATIALIZED DATA

After having selected a crop monitoring and a sampling date, then an observed variable, the information recorded for each sampling-units appears in the respective fields. The observed values (quantitative or qualitative) and the associated comments can be then modified. The last update is indicated.

Caution: if a great number of changes has to be done, the deleting of all the observations allows the total re-entry of the sampling date using the data entry form; data of cropping history is conserved. If a sampling date has to be entirely deleted with its history data, refer to § 4.4.