

## DEVELOPMENT OF A TRAINING PROGRAM FOR ENHANCING THE USE OF ICT TOOLS IN THE IMPLEMENTATION OF PRECISION AGRICULTURE

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### **Training package 1**

### **Practical Activity. Cost-benefit in PA:**

### **Tutor instructions**

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**Note to the teacher:** This document contains mainly the same information as the document 'Student guidelines', except for the answers in blue color.

## 1 Objective

The aim of this practical activity is to understand the different aspects and parameters to be considered for evaluating the profitability of an investment in PA technologies.

This practical activity will be developed using the web-tool PAMCoBA developed in the framework of an ERA-NET ICT Agri project financed by the European Commission (<http://ict-agri.eu/node/36322>). The objective of this tool is to calculate the profitability of precision agriculture technologies considering costs and benefits of different technologies.

## 2 Student's Guidelines

- Go to the PAMCoBA web-tool (<https://tool.pamcoba.eu/>)
- Watch the brief online tutorial or alternative read the user manual (see in the bottom right of the web-tool for both resources). Read also the section below pointing out some remarks about the use of the web-tool.
- Once familiarized with the tool, do the exercises presented in the following section using the tool and then answer the questions.

### 2.1 Remarks about the web-tool use

In this section, those aspects showed in the different screens of the web-tool that can be misleading are explained.

#### **First screen – My farm**

- It is required to select the country. If it is not selected, the web-tool does not run any calculation after introducing all the values.
- If you do not find your country, choose the most similar one (from agricultural characteristic) showed in the list. All the values considered can be modified.
- You can work with one or more crops.

#### **Second screen – Selection of option and operation**

- When selection one or more option/s, wait few seconds until the menu right below is showed. It is necessary to select at least one operation in which the technology is applied to run the tool.
- It is important to underline that as many operations are implied in the calculation as much potential profitable will be the evaluated technology.

- You have to select operation for all the crops selected in the first screen.

### Third screen – Economic benefits

- *Profits.* Wait until the default values are shown. You can modify the values by clicking the lock icon (next to the title “Default profits based on your selection”). The values will be available to be modified when you slide the mouse arrow over the values. Be aware that the increment of the yield derived from each operation are added up. It means that if you add a yield increase of 1% related to seeding operation and a 1% related to fertilization operation, then the yield increase considered for the tool is 2%. In contrast, reductions of inputs are only related to the operation in which is related.
- *Cost and amounts of inputs.* As it was said for profits, the default values can be changed.
- *Investment.* This section displays only the extra investments of the precision farming equipment. The other investments and equipment’s costs are not taken into account because they are as standard equipment. The investments are amortized in 8 years with the interest rate selected (2%, 5% and 10%)

Once all the data filled out, you can run the tool.

### Results

It is worth noting that all this values are referring to the difference between the situation when applying the PA technology/ies previously selected and the standard situation (i.e. not applying PA technology/ies). It does not correspond to the financial balance of the farm and the operations. The tool shows the following values:

- *Total initials costs:* the total cost of the PA technologies selected
- *Averages Benefits per year:* benefits of applying PA technologies coming from the inputs savings and potential yield increase
- *Operating costs per year:* extra cost per year related to the application of PA technology
- *Net present value (NPV):* it shows the profitable of the investment. If the net present value is  $> 0$  it means that, according to the tool the investment is profitable, alternatively, if the value is  $< 0$  then the investment is not profitable, according to the tool’s calculation

When the result is displayed, you can modify the data set and recalculate the results.

### 3 Exercises

1. Imagine a farm of 70 ha of maize that wants to invest for an auto steered tractor with RTK-GPS (without CTF). Consider a yield of 12 tn/ha with a price of 150 €/tn. For this situation, calculate the net present value in the following cases.

Note: Consider that if nothing is explicitly said, use the default values and always the same country. At the end of the document you can find a worksheet to summarize all the results.

a) Influence of the number of operations involved

- 1) if the system is only applied for seeding operation
- 2) if the systems is applied for seeding operation as well as fertilization and spraying

For the second case (auto steered tractor with RTK-GPS applied to seeding, fertilization and spraying, and keeping the default values except for the target value) calculate:

b) Influence of the parameter “profit”

- 3) if there is a yield increase of 1% related to seeding (default value)
- 4) if there is a yield increase of 2% related to seeding
- 5) if there is a yield increase of 3% related to seeding
- 6) if there is a yield increase of 5% related to seeding
- 7) if there is a yield increase of 5% related to seeding
- 8) if there is a reduction of fertilization inputs of 3% (default value)
- 9) if there is a reduction of fertilization inputs of 5%
- 10) if there is a reduction of fertilization inputs of 10%

c) Influence of the parameter “cost and amounts of inputs”

- 11)if the number of spraying (herbicide) treatments is 1
- 12)if the number of spraying (herbicide) treatment are 2
- 13)if the number of spraying (herbicide) treatments are 3
- 14)if the number of spraying (herbicide) treatments are 5

d) Influence of the parameter “investment”

- 15)if the interest rate is 2%
- 16)if the interest rate is 5%
- 17)if the interest rate is 10%

2. In my imaginary farm, in what case/s the investment for an auto steered tractor with RTK-GPS is profitable?

3. Write a short paragraph explaining which are the parameters to be considered to evaluate the profitability of an investment on a PA technology?

4. (Optional). The previous exercises in my imaginary farm were proposed in order to demonstrate the different parameters that has to be considered for a cost-benefit analysis in a PA investment. But real farms are more complex because they grow several crops, different operations involved, etc. Propose a calculation for a PA investment in a real farm considering all operations, crops, potential yield increasing, input reductions, etc. Summarize the main characteristics of this farm, the PA technologies, the benefits and costs of PA technologies and the obtained net present value using the PAMCoBA web-tool.

## 4 Exercises. Potential Answers

1. The results of the above table were calculated selecting **Italy** as a country.

Parameter	Value	NPV
<b>Number of operation</b>	1 (seeding)	-26514.74 EUR
	3 (seeding, fertilization and spraying)	-21796.40 EUR
<b>Yield increase</b>	1 %	-15281.48 EUR
<b>(seeding)</b>	2 %	-8766.56 EUR
	3 %	-2251.64 EUR
	5 %	10778.19 EUR
	10 %	43352.79 EUR
<b>Reduction inputs</b>	3%	-21796.40 EUR
<b>(fertilization)</b>	5%	-20493.41 EUR
	10%	-17235.95 EUR
<b>N° spraying treatments</b>	1	-22201.25 EUR
<b>(spraying - herbicide)</b>	2	-21796.40 EUR
	3	-21391.54 EUR
	5	-20581.83 EUR
<b>Interest rate</b>	2%	-21364.00 EUR
	5%	-21796.40 EUR
	10%	-22362.19 EUR

2. The students have to select those cases with NPV values greater than 0. It is important to remark that the parameter that influences more in the NPV value is the yield increase related to the PA technology in the PAMCoBA web tool.

3. Students has to state that the profitably of using PA technologies depends on many aspects (cost, increase of productivity, farm size, etc.) and the profitability increases as higher as are the benefits of applying the technology, lower the cost of the technology and higher the price of the crop inputs ( the differences between conventional technologies and PA technologies increases).



4. This is an optional question because 1h is a short time to familiarize in deep with the web-tool. In this exercise the idea is that students propose a real case of a farm and calculate the net value profit and in which condition the investment in PA technologies would be profitable. Another option would be only propose this last exercise (and avoid the previous ones) but probably in 1h they will not be able understand in enough detail how the web-tool works.