

Economic evaluation of input reductions in protected cultivation in Europe



Workshop “Results of the EU Project
“Euphoros - Efficient Use of inputs in Protected
HORTiculture”

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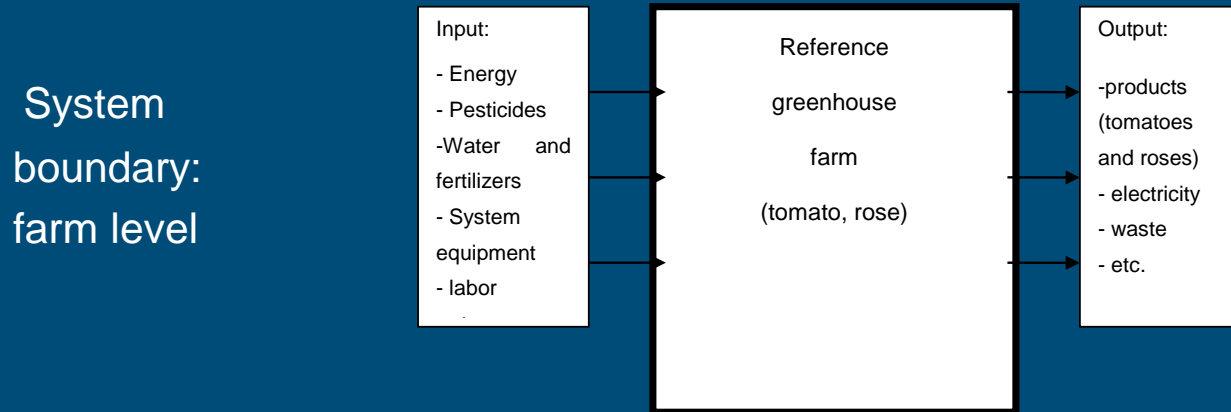
Contents

- Economic evaluation - introduction
- Scenarios and options
- Closing growing system
- Reduced volume and increased life span of growing media
- New type of multi-tunnel greenhouse with improved ventilation
- Webtool – Economic simulation model
- Questions

Economic evaluation – cost-benefit analysis



- Description of reference situation: all costs and benefits



- Description of options: specific costs and benefits
- Economic indicators:
 - net financial result: balance of benefits and costs
 - payback period: time when an investment is earned to repay
 - investment capacity: calculated investment related the balance

Scenarios and input reducing options



■ Scenarios

- 1. Tomato crop in multi-tunnel greenhouse (Spain/Italy)
- 2. Tomato crop in Venlo greenhouse (The Netherlands)
- 3. Rose crop in Venlo greenhouse (The Netherlands)



■ Input reducing options for scenario 1

- Closed growing system
- Reduced volume and increased life span of growing media
- New type of multi-tunnel greenhouse with improved ventilation



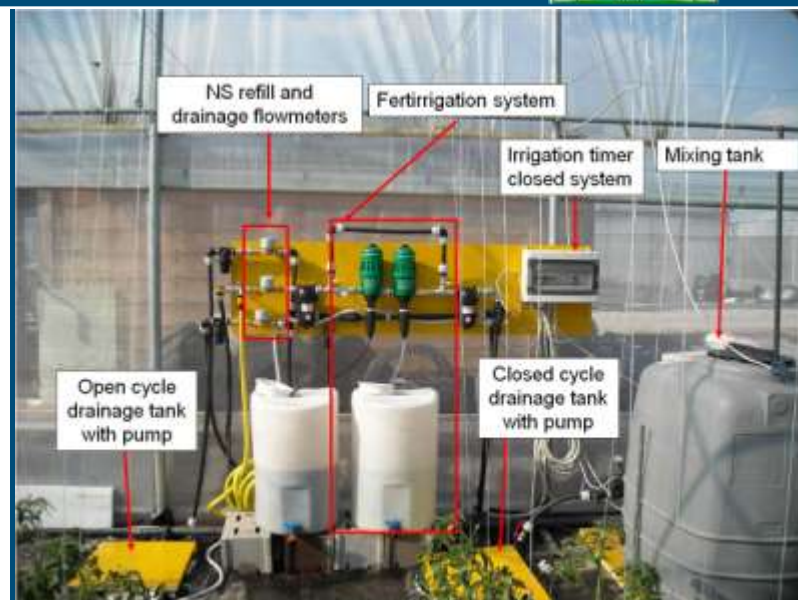
Closing growing system for tomato crop



Investment and yearly cost of closing growing/ cultivation system (€)

Input reducing option	Closed system Chem analysis by LAB		Closed system Chem analysis by Quick test UV filtration (disinfection)	
	Investment	yearly costs per ha	Investment	yearly costs per ha
<i>System component</i>				
<i>Fixed costs</i>				
Slow sandfilter	2500	250		
Hydraulic components	5000	500		
UV filtration			17500	2625
Rough sand filter + add hydr			5000	500
Quick test (Reflectoquant))			800	160
Maintenance costs (5%)		375		1165
Interest (2,5%)		190		580
<i>Sub total</i>		1315		5030
<i>Variable costs</i>				
Frequent chem anal (12x/2x)		600		160
DNA scan		600		600
Reagents for quick analysis				50
<i>Sub total</i>		1200		810
Total costs		2515		5840
Saving water + fertilizers		4650		4650
Financial result		2135		-1190
Pay-back period (years)		2.4		8.7

Source: UNIFI, Italy; Quantitative Information Greenhouse Horticulture 2010, 2010



Photos:
UNIFI,
Italy



- Test site: Pistoia, Italy
- Farm scale: 1 ha



Reduced volume & increased life span of growing media

Savings of reduced volume and increased life span substrate (€)

<i>Substrate bags (perlite)</i>	<i>Reference</i>	<i>Option 1:</i>	<i>Option 2:</i>
	<i>3 yrs life span</i>	<i>25% volume reduction</i>	<i>4 yrs life span</i>
Units of bags per ha	4650	4650	4650
Investment (€/unit)	1.80	1.42	1.80
Investment (€ total)	8370	6591	8370
Depreciation (%)	33.3	33.3	25.0
Maintenance+interest (%)	7.5	7.5	7.5
Costs (€/ha)	3420	2690	2720
Savings (€/ha)	-	730	700

Source: EEFC, Almeria, Spain

Perlite bag after 3 year cultivation



Photos: Perlite Italiana, Milano, Italy

- Scenario: Multi-tunnel greenhouse, Spain
- Tomato crop
- Farm scale: 1 ha



New type multi-tunnel with improved ventilation

Costs and benefits of new type multi-tunnel greenhouse (€/m²)

		<i>Multi-tunnel and improved ventilation</i>
Starting points		
Extra investment		9.50
Extra production (kg/m ²)		14.9
Extra costs for grafted plants, fertilizers, CO ₂		
Extra benefits	yield	9.10
Extra variable costs		
of which:	plantmaterial	0.50
	water & fertilizers	0.80
	CO ₂	2.50
	electricity	0.25
Extra fixed costs		
of which:	labour	1.65
	depreciation, mainten. & interest	1.40
Net financial result		1.60
Payback period (years)		5

Source: EEFC, Almeria, Spain



Photos: EEFC, Almeria, Spain

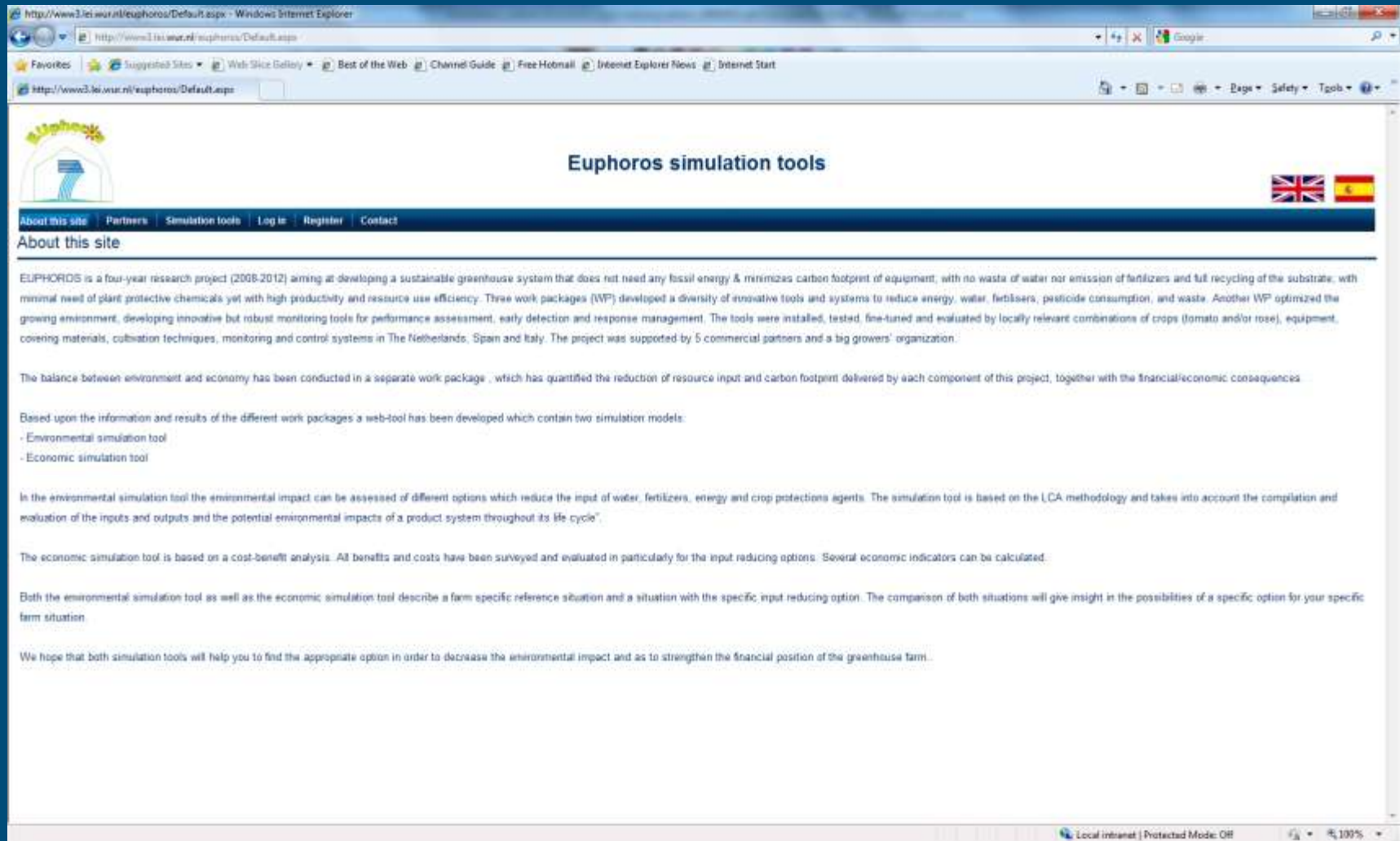
- Scenario: Multi-tunnel greenhouse, Spain
- Tomato crop, long cycle (July – June)
- Farm scale: 1 ha

Euphoros webtool

Environmental simulation tool

Economic simulation tool > demo

Webtool – Economic simulation tool



The screenshot shows a web browser window displaying the 'Euphoros simulation tools' website. The browser's address bar shows the URL 'http://www3.tni.wur.nl/euphoros/Default.aspx'. The website features a logo on the left and a navigation menu with links for 'About this site', 'Partners', 'Simulation tools', 'Log in', 'Register', and 'Contact'. The main content area is titled 'About this site' and contains several paragraphs of text describing the EUPHOROS project, its goals, and the simulation tools developed. The text mentions that the project aims to develop a sustainable greenhouse system with minimal fossil energy use and high productivity. It also notes that the simulation tools are based on LCA methodology and cost-benefit analysis.

Euphoros simulation tools

[About this site](#) | [Partners](#) | [Simulation tools](#) | [Log in](#) | [Register](#) | [Contact](#)

About this site

EUPHOROS is a four-year research project (2008-2012) aiming at developing a sustainable greenhouse system that does not need any fossil energy & minimizes carbon footprint of equipment, with no waste of water nor emission of fertilizers and full recycling of the substrate, with minimal need of plant protective chemicals yet with high productivity and resource use efficiency. Three work packages (WP) developed a diversity of innovative tools and systems to reduce energy, water, fertilizers, pesticide consumption, and waste. Another WP optimized the growing environment, developing innovative but robust monitoring tools for performance assessment, early detection and response management. The tools were installed, tested, fine-tuned and evaluated by locally relevant combinations of crops (tomato and/or rose), equipment, covering materials, cultivation techniques, monitoring and control systems in The Netherlands, Spain and Italy. The project was supported by 5 commercial partners and a big growers' organization.

The balance between environment and economy has been conducted in a separate work package, which has quantified the reduction of resource input and carbon footprint delivered by each component of this project, together with the financial/economic consequences.

Based upon the information and results of the different work packages a web-tool has been developed which contain two simulation models:

- Environmental simulation tool
- Economic simulation tool

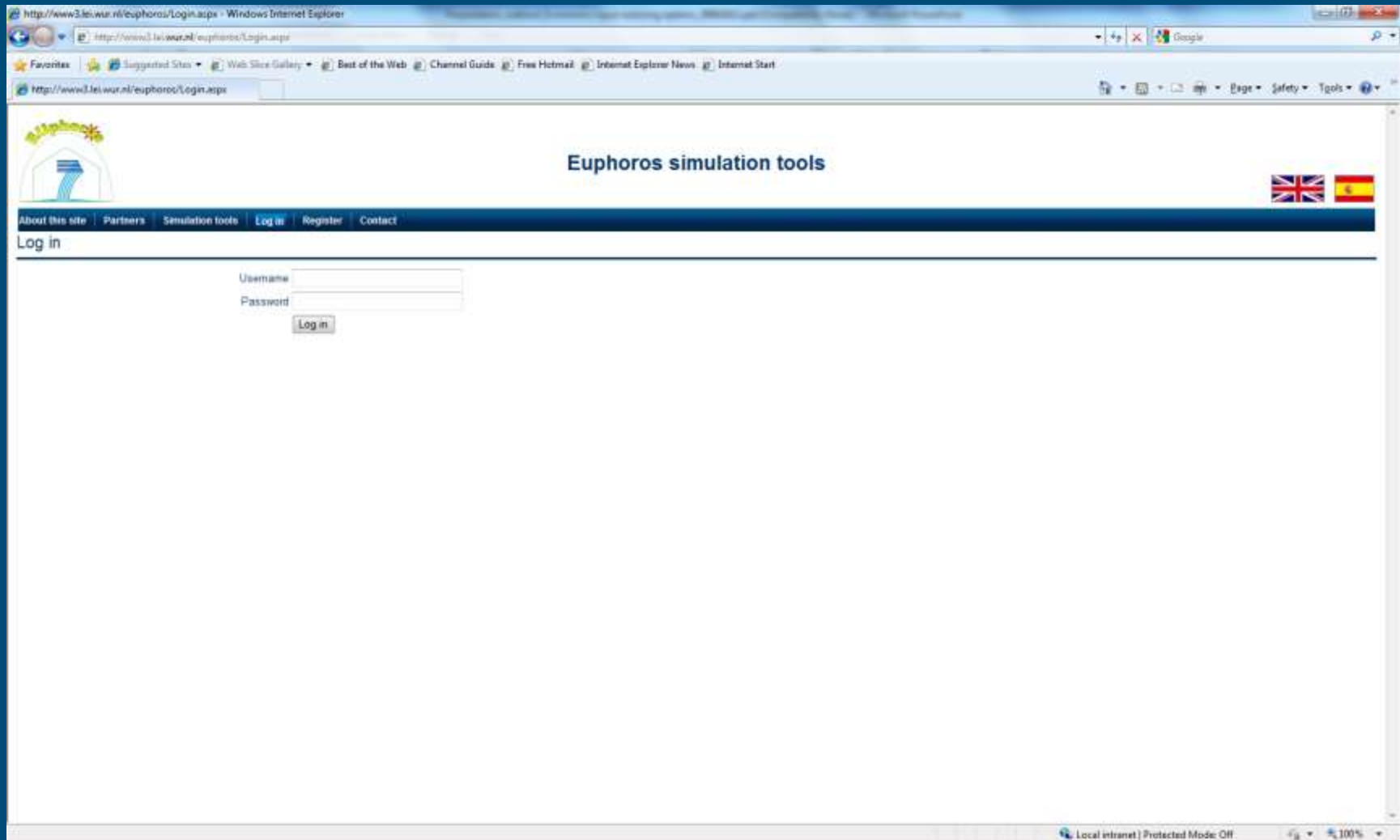
In the environmental simulation tool the environmental impact can be assessed of different options which reduce the input of water, fertilizers, energy and crop protection agents. The simulation tool is based on the LCA methodology and takes into account the compilation and evaluation of the inputs and outputs and the potential environmental impacts of a product system throughout its life cycle.

The economic simulation tool is based on a cost-benefit analysis. All benefits and costs have been surveyed and evaluated in particularity for the input reducing options. Several economic indicators can be calculated.

Both the environmental simulation tool as well as the economic simulation tool describe a farm specific reference situation and a situation with the specific input reducing option. The comparison of both situations will give insight in the possibilities of a specific option for your specific farm situation.

We hope that both simulation tools will help you to find the appropriate option in order to decrease the environmental impact and as to strengthen the financial position of the greenhouse farm.

Webtool – Economic simulation tool



The screenshot shows a web browser window with the address bar displaying `http://www3.lei.wur.nl/euphoros/Login.aspx`. The page title is "Euphoros simulation tools". The browser's address bar shows the URL `http://www3.lei.wur.nl/euphoros/Login.aspx`. The page features a logo on the left and navigation links: "About this site", "Partners", "Simulation tools", "Log in", "Register", and "Contact". The "Log in" link is highlighted. Below the navigation bar, there is a "Log in" section with two input fields: "Username" and "Password", and a "Log in" button. The browser's status bar at the bottom indicates "Local intranet | Protected Mode: Off" and a zoom level of "100%".

Webtool – Economic simulation tool

The screenshot shows the 'Euphoros simulation tools' web interface. The main heading is 'Euphoros simulation tools'. Below it, there is a navigation menu with 'Simulation tools' selected. The 'Economic simulation tool' is active, showing a sidebar with options like 'Manage scenarios', 'Manage reference data', and 'Manage option and calculate scenario'. The main content area displays 'Scenario information' for 'Scenario 1 Tomato Multi-tunnel'. It includes a description 'Option 1', year '2009', country 'Spain', greenhouse type 'Multi', and crop 'Tomato'. There are two small images of a greenhouse. Below this is the 'Reference data' section, which contains a grid of input fields for various parameters. At the bottom left, there are buttons for 'Save reference data' and 'Get default values'.

Euphoros simulation tools

Navigation: About this site | Partners | **Simulation tools** | Log out | Register | Contact

Economic simulation tool

Scenario information

Scenario: Scenario 1 Tomato Multi-tunnel

Description: Option 1

Year: 2009

Country: Spain

Greenhouse: Multi

Crop: Tomato

Reference data

Please enter values in €/m², unless indicated otherwise

Production (kg/m ²)	16.48	Fuel: gas, oil, propane	0.01	Labour: crop handling	1.38
Product price (€/kg)	0.58	electricity	0.2	Labour: management	1.08
Other output (sales of electricity)	0	Other energy: gas capacity	0	Contractors	0
Plant material	0.55	CO ₂	0	Interest costs	0.64
Fertilizers	0.6	Other crops assets	0.32	General costs	0.2
Water	0.2	Sales costs	0.14		
Crop protection	0.35	Tangible assets: depreciation	2.2		
Substrate	0.34	Tangible assets: maintenance	0.8		

Buttons: Save reference data | Get default values

Webtool – Economic simulation tool


The screenshot displays the 'Euphoros simulation tools' web application. The page title is 'Euphoros simulation tools'. The navigation menu includes 'About this site', 'Partners', 'Simulation tools', 'Log out', 'Register', and 'Contact'. The left sidebar shows 'Economic simulation tool' selected, with sub-options: 'Manage scenarios', 'Manage reference data', 'Manage option and calculate scenario', and 'Environmental simulation tool'. The main content area is titled 'Scenario information' and shows the following details:

- Scenario: Scenario 3 Tomato Multi-tunnel
- Description: Option 1
- Year: 2009
- Country: Spain
- Greenhouse: Multi
- Crop: Tomato
- Option: Closed fertigation system: basic + quick chemical test

Below the scenario information, there is an 'Option data' section with the instruction: 'Please enter values in €/m², unless indicated otherwise'. It contains two input fields: 'Extra investment' with a value of 0.83 and 'Subsidy (in%)' with a value of 0. There are two buttons: 'Save option data & calculate' and 'Get default values'. The browser status bar at the bottom shows 'Done' and 'Local intranet | Protected Mode: Off'.

Webtool – Economic simulation tool

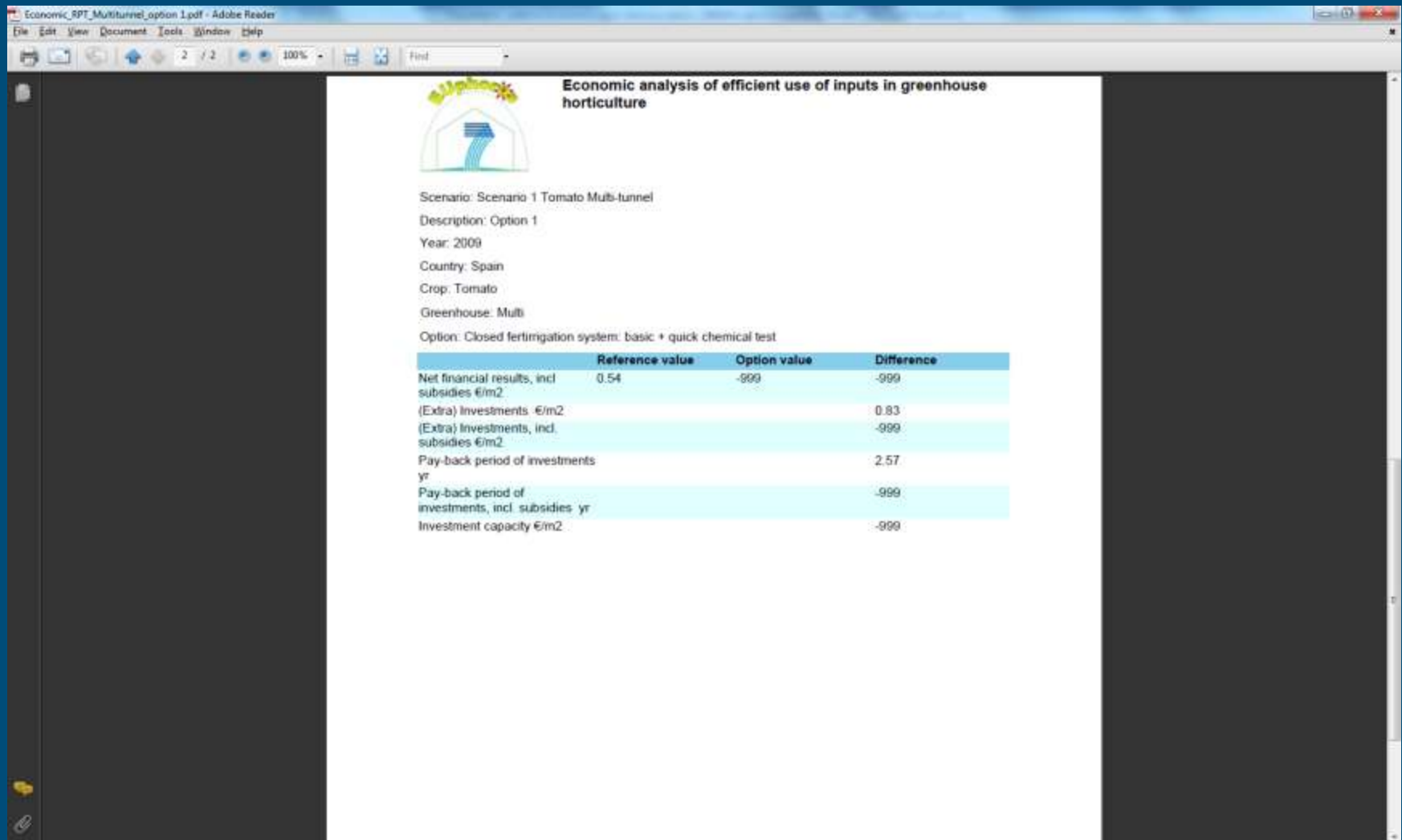
Economic analysis of efficient use of inputs in greenhouse horticulture



Scenario: Scenario 1 Tomato Multi-tunnel
 Description: Option 1
 Year: 2009
 Country: Spain
 Crop: Tomato
 Greenhouse: Multi
 Option: Closed fertirrigation system, basic + quick chemical test

	Reference value	Option value	Difference
Benefits (€/m2)			
Production (kg/m2)	16.48	16.48	0
Product price (€/kg)	0.58	0.58	0
Turnover - product €/m2	9.56	9.56	0
Other output (sales of electricity)	0	0	0
Total output €/m2	9.56	9.56	0
Variable costs (€/m2)			
Plant material	0.56	0.56	0
Fertilizers	0.6	0.17	-0.43
Water	0.2	0.16	-0.04
Crop protection	0.35	0.35	0
Substrate	0.34	0.34	0
Fuel: gas, oil, propane	0.01	0.01	0
Energy: electricity	0.2	0.2	0
Other energy: gas capacity	0	0	0
CO2	0	0	0
Other crop assets	0.32	0.4	0.08
Sales costs	0.14	0.14	0
Total variable costs	2.72	2.34	-0.38
Fixed costs (€/m2)			
Tangible assets: depreciation	2.2	2.37	0.17
Tangible assets: maintenance	0.8	0.84	0.04
Labour: crop handling	1.38	1.38	0
Labour: management	1.08	1.08	0
Contractors	0	0	0
Interest costs	0.64	0.66	0.02
General costs	0.2	0.2	0
Extra investment			
Subsidy			
Extra yield			
Total fixed costs €/m2	8.3	8.53	0.23
Total costs €/m2	9.02	8.86	-0.16
Economic indicator			
Net financial results €/m2	0.54	0.7	0.16

Webtool – Economic simulation tool



The screenshot shows a PDF document titled "Economic analysis of efficient use of inputs in greenhouse horticulture". The document includes a logo at the top left, a title, and a table of results. The table compares reference and option values for various financial metrics.

Economic analysis of efficient use of inputs in greenhouse horticulture

Scenario: Scenario 1 Tomato Multi-tunnel
Description: Option 1
Year: 2009
Country: Spain
Crop: Tomato
Greenhouse: Multi
Option: Closed fertirrigation system: basic + quick chemical test

	Reference value	Option value	Difference
Net financial results, incl. subsidies €/m2	0.54	-999	-999
(Extra) Investments €/m2			0.83
(Extra) Investments, incl. subsidies €/m2			-999
Pay-back period of investments yr			2.57
Pay-back period of investments, incl. subsidies yr			-999
Investment capacity €/m2			-999

Webtool – Economic simulation tool

Scenario: Scenario 1 Tomato Multi-tunnel 1
Description: Option 2
Year: 2009
Country: Spain
Crop: Tomato
Greenhouse: Multi
Option: New type multi-tunnel: improved ventilation

	Reference value	Option value	Difference
Benefits (€/m2)			
Production (kg/m2)	16.48	31.4	14.92
Product price (€/kg)	0.58	0.6	0.02
Turnover - product €/m2	9.56	18.68	9.12
Other output (sales of electricity)	0	0	0
Total output €/m2	9.56	18.68	9.12
Variable costs (€/m2)			
Plantmaterial	0.56	1.08	0.52
Fertilizers	0.6	1.17	0.57
Water	0.2	0.41	0.21
Crop protection	0.35	0.45	0.1

Webtool – Economic simulation tool

http://www3.jel.wur.nl/euphoros/economicOptionData.aspx - Windows Internet Explorer

http://www3.jel.wur.nl/euphoros/economicOptionData.aspx

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http://www3.jel.wur.nl/euphoros/economicOpti...

Euphoros simulation tools

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Economical simulation tool
Manage scenarios
Manage reference data
Manage option and calculate scenario
Environmental simulation tool

Economic simulation tool

Scenario information

Scenario: Scenario Tomato Multi-tunnel 2

Description: Option 4

Year: 2009

Country: Spain

Greenhouse: Multi

Crop: Tomato

Option: Free option with estimated reduction of inputs

Option data

Reduction in %

Water 0

Fertilizers 0

Crop protection 0

Substrate 0

Fuel gas, oil, propane 0

Other energy: gas capacity 0

Electricity 0

Save option data & calculate

Get default values

Local intranet | Protected Mode: Off 100%

Webtool – Economic simulation tool

- Other scenarios and options
- Scenario 2: Tomato crop in Venlo greenhouse (NL)
 - Energy saving cultivation method
 - Double glazed greenhouse (3x AR, 1x low energy coating)
- Scenario 3: Rose crop in Venlo greenhouse (NL)
 - Diffuse glass and AR coated greenhouse
 - Reduced growing media (SPU rock) and new plantmaterial (plugs)

Webtool – Environmental and economic simulation

- Webtool will be operational in 2012
- Versions in Spanish, Italian, etc?

Thank for your attention

Are there any questions?

For more information:

- www.glastuinbouw.wur.nl
- www.lei.wur.nl