



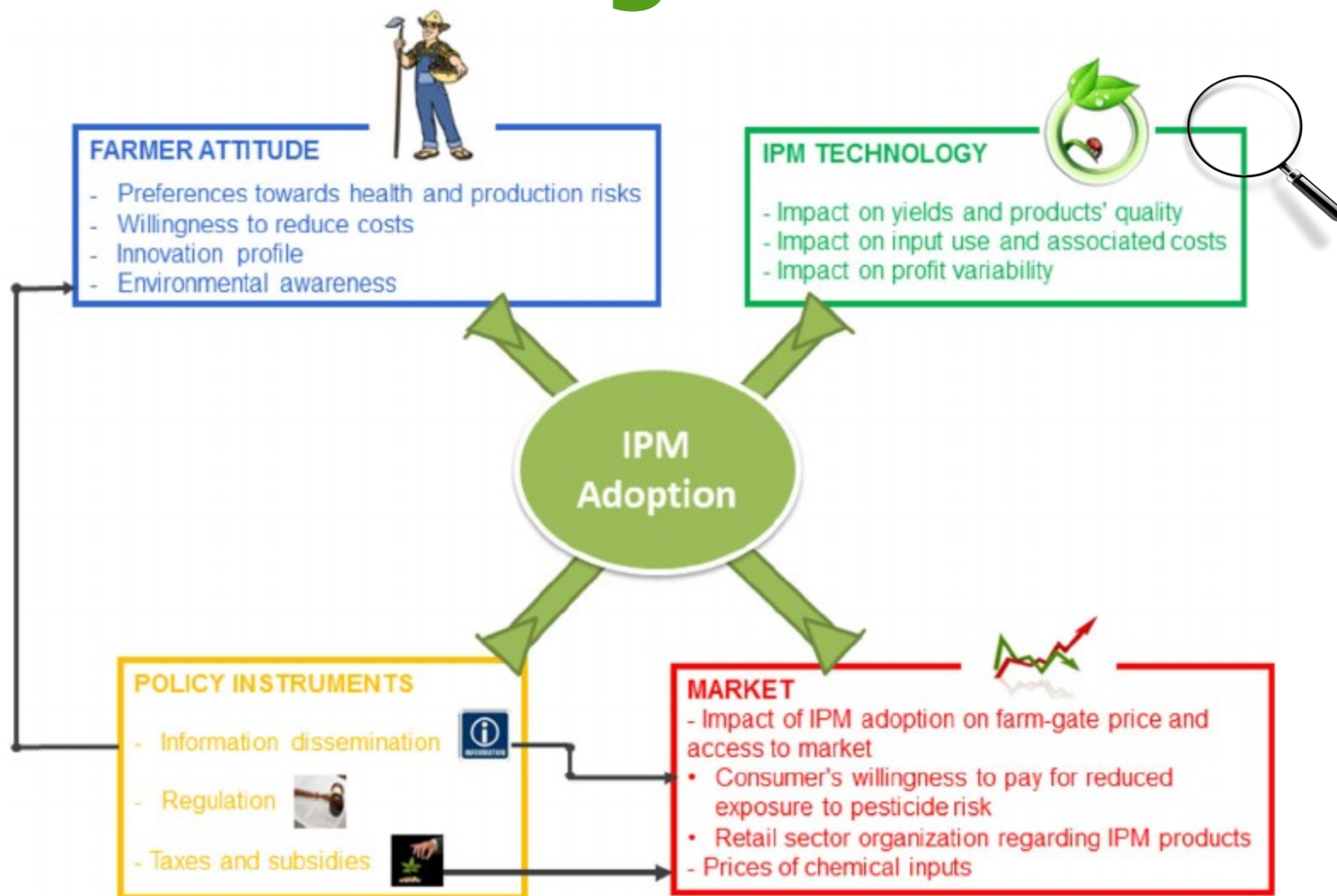
Cost Benefit Analysis: a methodology for the evaluation of the economic performance of IPM

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IPM innovation in Europe, Poznan, 14-16 January 2015

Background



Incentives and policies for integrated pest management in Europe: a review,
M. Lefebvre, S. R. H. Langrell, S. Gomez-y-Paloma,
Agronomy for Sustainable Development (2015) 35 (1): 27-45



1. Cost Benefit Analysis as implemented in the PURE project



PURE
Pesticide Use-and-risk Reduction in European farming systems with Integrated Pest Management

Grant agreement number: FP7-265865

Collaborative Project
SEVENTH FRAMEWORK PROGRAMME



Funded by the European Union

D1.5
Cost-benefit analysis of IPM solutions

Due date of deliverable: M 48
Actual submission date: M 48
Start date of the project: March 1st, 2011 **Duration:** 48 months
Workpackage concerned: WP 1
Concerned workpackage leader: Jean-Noël Aubertot
Organisation name of lead contractor: JRC-IPTS

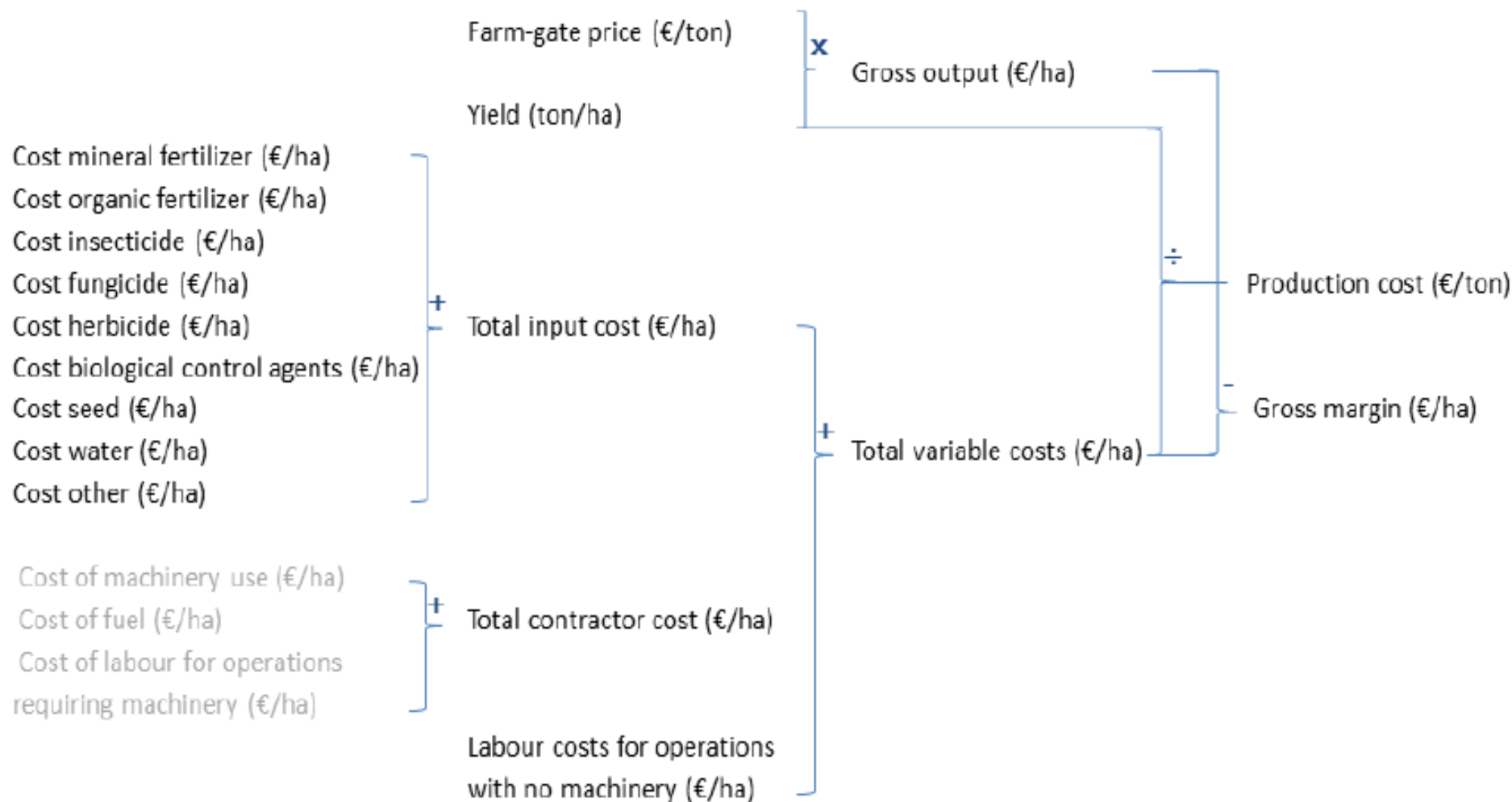
European Commission, Joint Research Centre (JRC),
 Institute for Prospective Technological Studies (IPTS), Agrilife Unit, Edificio Expo.
 c/ Inca Garcilaso, 3, 41092 Seville, Spain

Authors: Marianne Lefebvre • Stephen Langrell • Sergio Gomez-y-Paloma

Project co-funded by the European Commission within the Seventh Framework Programme (2007 - 2013)	
Dissemination Level	
PU Public	PU
PP Restricted to other programme participants (including the Commission Services)	
RE Restricted to a group specified by the consortium (including the Commission Services)	
CO Confidential, only for members of the consortium (including the Commission Services)	

Indicators of economic performance

Figure 1: Selected indicators of economic performance



Partial vs Complete CBA

	Description	WP concerned
Complete CBA	Information on costs is collected for all operations. This approach is relevant when the tested IPM solution corresponds to an important change in the system, i.e. impacting various operations.	WP2, WP3
Partial CBA	When the tested IPM solution corresponds only to a marginal change (impacting only 1 or 2 operations for example), data are collected ONLY for these operations impacted by IPM. The economic analysis limits to the comparison of the extra costs or costs saving associated to the IPM solution. Operations that are the same in both the reference system and the IPM system (e.g. fertilization) are left out of consideration.	WP4, WP5, WP6, WP7

Analysis of perennial crops vs arable crops rotations

Adapt the methodology to include all crops (not only the more profitable one)

Are all crops grown each year?

Annualized gross margin is estimated by averaging net gross margin across the years corresponding to the rotation length (one complete repetition of a crop sequence), and across each of the individual crop of a particular crop rotation.



Machinery costs

Investment costs
(Euros)



Annual costs
(Euros/ha)

- Depreciation
- Interest
- Maintenance
- Insurance



COSTS

Machinery costs

Investment costs
(Euros)



Annual costs
(Euros/ha)

- Depreciation
- Interest
- Maintenance
- Insurance



Let's take a
pragmatic
approach !

Contractor cost by operation



- labour
- machinery
- fuel

Table 4: Contractor costs (including costs of machine, labour and fuel) for winter-wheat based rotations

DE (€/ha)	MA: maize	WB: winter barley	WW: winter wheat
Ploughing and pressing	135	132	97
Seed bed preparation	45	45	31
Sowing	64	43	37
Spraying	15	15	12
N fertilisation	10	9	8
Mechanical weeding			13
Combining	450	186	155



- Impact of IPM on yields
- Farm gate price received for IPM products

When the harvested crop are sold to different market segments (local, exports, cooperatives...), the price is calculated as the weighted average of prices in the different markets, where the weight corresponds to the share of each market in total sales.

- Impact of IPM on crop quality

Ex of criteria to classify the products: fruit category, residue level, sugar and acidity level (grapes), animal versus human feed (maize)

Microsoft Excel window showing the 'INSTRUCTIONS' tab. The instructions are for the 'CBA_PUREWP2_2013_FR_OnStation_Arvalis_final.xlsx' file. The instructions cover the purpose of the template, the data to be collected, and the format of the data. The instructions are as follows:

INSTRUCTIONS (also available in pdf)

version 2013-September_WP6

We hope the instructions cover all the possible questions you may have. If the instructions and examples provided are not sufficiently clear and if you have questions concerning how to fill-in this template, do not hesitate to contact Marianne.Lefebvre@ec.europa.eu.

WHAT? The objective of this template is to collect economic data for the Cost Benefit Analysis (CBA) of IPM solutions -task 1.4-.

Results of the CBA will mainly be used in the deliverables of ex-post assessment within each WP, as well as potential articles produced by each WP/team.

On top of that, according to data quality, IPTS may also use these data to produce an article covering the CBA of all crops in the project. In this case, credit will be given to the person who contributed to the collection of economic data in each WP (authorship).

WHO? The ex-post assessment leader of each WP is responsible for collecting the data each year and send it to JRC IPTS (Marianne.Lefebvre@ec.europa.eu). For WP 6, Ilaria for FR and DE and David for FR.

HOW? One excel file corresponds to one country in WP6 (FR, DE or IT). Each sheet corresponds to one experimental site and includes the different strategies tested (Reference, IPM intermediate, IPM advanced) in 3 columns.

WHEN? One excel file with the information of all trials will be sent each year.

There are two possible approaches

Complete: In order to perform a full Cost Benefit Analysis, information on costs will be collected for ALL operations. This approach is relevant when the tested IPM solution corresponds to an important change in the system, i.e. impacting various operations.

Partial: When the tested IPM solution corresponds only to a marginal change (impacting only 1 or 2 operations for example), a partial budget approach can be used, i.e. data will only be collected ONLY for these operations and the economic analysis will be limited to these operations.

Complete chosen for FR WP6

Microsoft Excel window showing the 'GENERAL DATA' and 'BENEFITS' tabs. The 'GENERAL DATA' tab contains the following information:

GENERAL DATA

exp_WP	number	Number of the working package
exp_year	yyyy	year of the harvest
exp_country	list	country of the experiment
exp_site	text	site or region
exp_plot	list	"Reference" corresponds to the
exp_crop	list	the crop can be different for the
exp_solutiondescription	text	short description of the IPM solution
exp_farmstation	list	specify on-farm / on-station
exp_surface	ha	surface of the plot in ha

BENEFITS

output_category	list	In most cases, there will be one
output_description	text	Specify the criteria you use to calculate
output_yield	ton/ha	yield achieved per ha
output_price	€/ton	output farm-gate price. Calculation
output_pricecomment	text	indicate the reference used for the
output_revenue	€/ha	calculated automatically from output

VARIABLE COSTS

The variable costs will be collected for all operations.

operation_description	text	describe the type of operation (e.g. sowing, weeding, etc.)
operation_category	list	specify the category of operation (e.g. Pre-planting and planting, Rk: In the case of perennial crops, * Husbandry (fertilization, etc.), * Harvest (crop or fruit harvest)
operation_date	date yyyy-mm-dd	yyyy-mm-dd
labour_quantity	hours/ha	Estimate the required labour demand
machinery_type	text	If the operation requires machinery, specify machine type and characteristics
contractor cost	€/ha	specify the cost of the operation

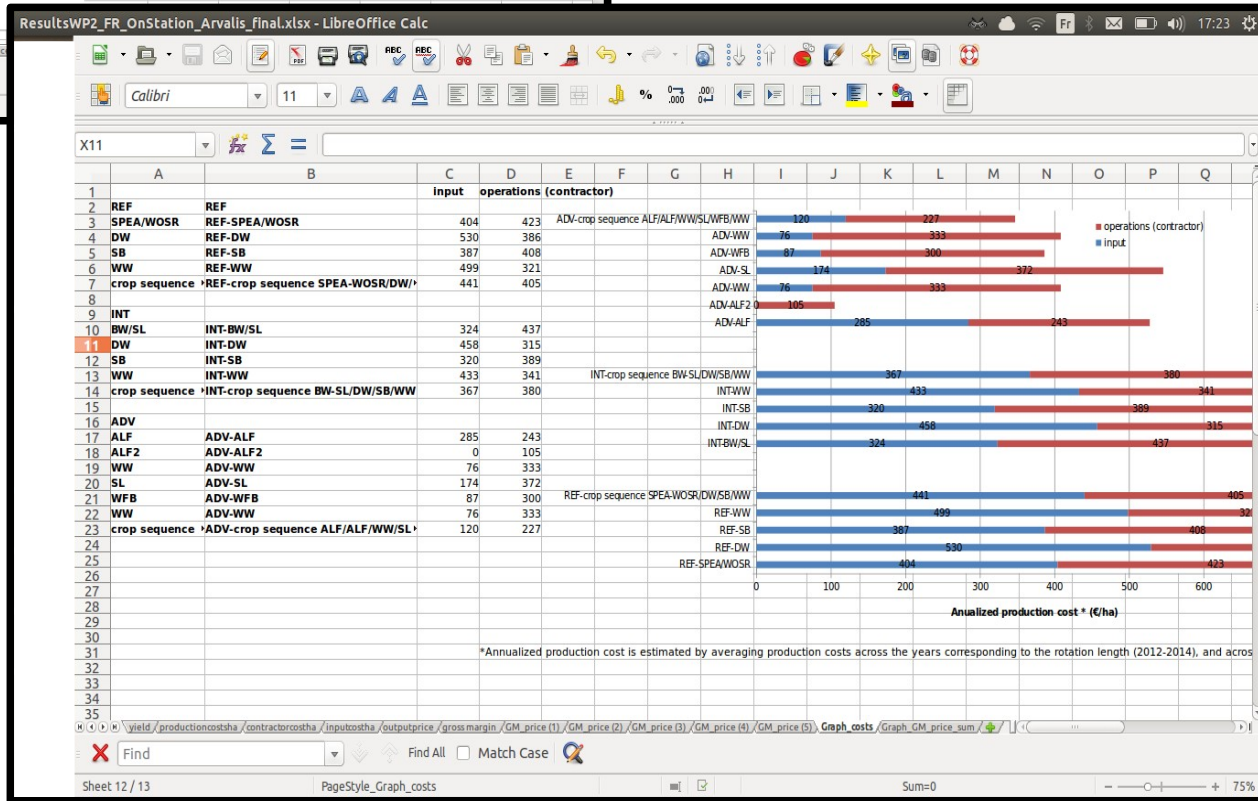
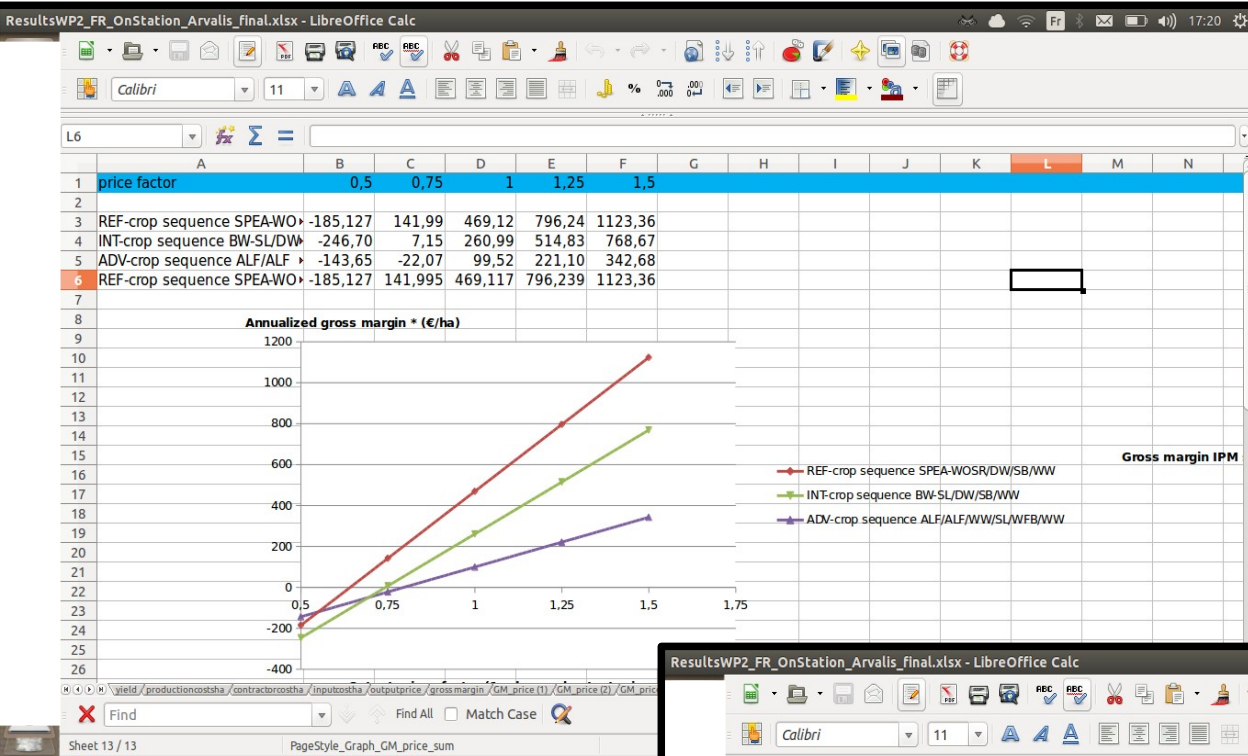
LibreOffice Calc window showing the 'CBA_PUREWP2_2013_FR_OnStation_Arvalis_final.xlsx' file. The spreadsheet displays the 'GENERAL DATA EXPERIMENT' and 'SUMMARY RESULTS EXPERIMENT (DO NOT FILL-IN)' tabs.

GENERAL DATA EXPERIMENT

exp_WP	number	2	2	2		
exp_year	yyyy	2013	2013	2013		
exp_country	list	France	France	France		
exp_site	text	Boigneville	Boigneville	Boigneville		
exp_plot	list	Reference	Intermediate	Advanced		
exp_crop	list	WW: winter wheat	WW: winter wheat	WW: winter wheat		
exp_cropdetail	text	SPEA/DW/SB/WW	BW/DW/SB/WW	ALF/ALF/WW/SL/WFB/WW		
exp_solutiondescription	text	Current management	Integrated management	Organic management		
exp_farmstation	list	on-station	on-station	on-station		
exp_surface	ha					

SUMMARY RESULTS EXPERIMENT (DO NOT FILL-IN)

Total labour hours/ha		0,00	0,00	0,00		
Total labour cost/ha		0,00	0,00	0,00		
Total contractor cost/ha		348,50	395,00	368,00		
Total input cost/ha		524,74	362,48	84,80		
Total variable costs/ha		873,24	757,48	452,80		
total_cost_mineral fertilizer/ha		315,00	237,10	0,00		
total_cost_organic fertilizer/ha		0,00	0,00	0,00		
total_cost_insecticide/ha		12,00	12,00	0,00		
total_cost_fungicide/ha		67,73	36,07	0,00		
total_cost_herbicide/ha		60,93	6,92	0,00		
total_cost_biological control agents/ha		0,00	0,00	0,00		
total_cost_seed/ha		69,08	70,40	84,80		
total_cost_water/ha		0,00	0,00	0,00		
total_cost_other/ha		0,00	0,00	0,00		
Number of planting operations		5,00	7,00	9,00		
Number of husbandry operations		8,00	7,00	1,00		
Number of harvest operations		1,00	2,00	2,00		
Total physical yield ton/ha		9,76	8,60	4,70		
Total financial yield €/ha		1469,20	1462,00	799,00		
Gross margin/ha		785,96	704,52	346,20		
Production cost €/ton		89,4713114754	88,0790697674	96,3404255319		



2. Some thoughts about how to improve economic evaluation in future IPM research projects





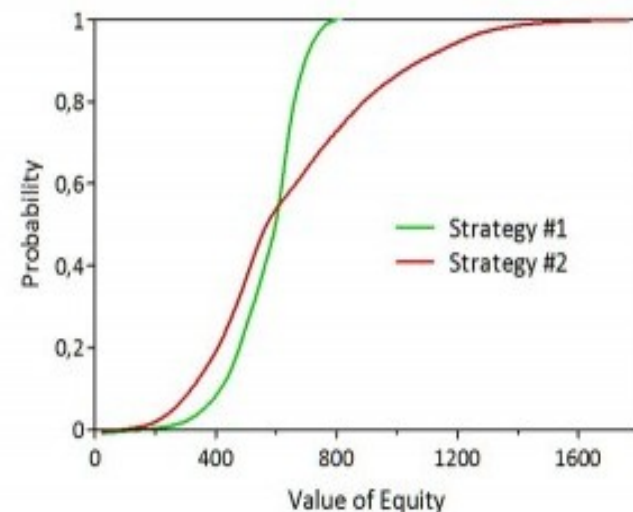
"I had my accounting department run a cost-benefit analysis on you and I have some bad news."

- Integrate economic evaluation to agronomic and environmental evaluation (as in Dexipm...)
- Invest time in careful data collection rather than complex data analysis

Cost-Benefit-Risk analysis

A risk assessment consists of studying the probability that the IPM farming practices will achieve different performance level

- Trade-off Expected profits – Variability of profits for risk-averse farmers (Lu, Watkins et al. 1999; Griffiths, Holland et al. 2008)
- Sensitivity analysis: If the IPM system is more profitable than the reference system only for very specific output prices, then it suggests the solution is rather risky.
- Which risk indicator to capture farmers' perception of and aversion to risk ?



Scaling-up economic analysis

From private to social CBA



Private Cost Benefit Analysis:

Monetary evaluation of profit for the producer

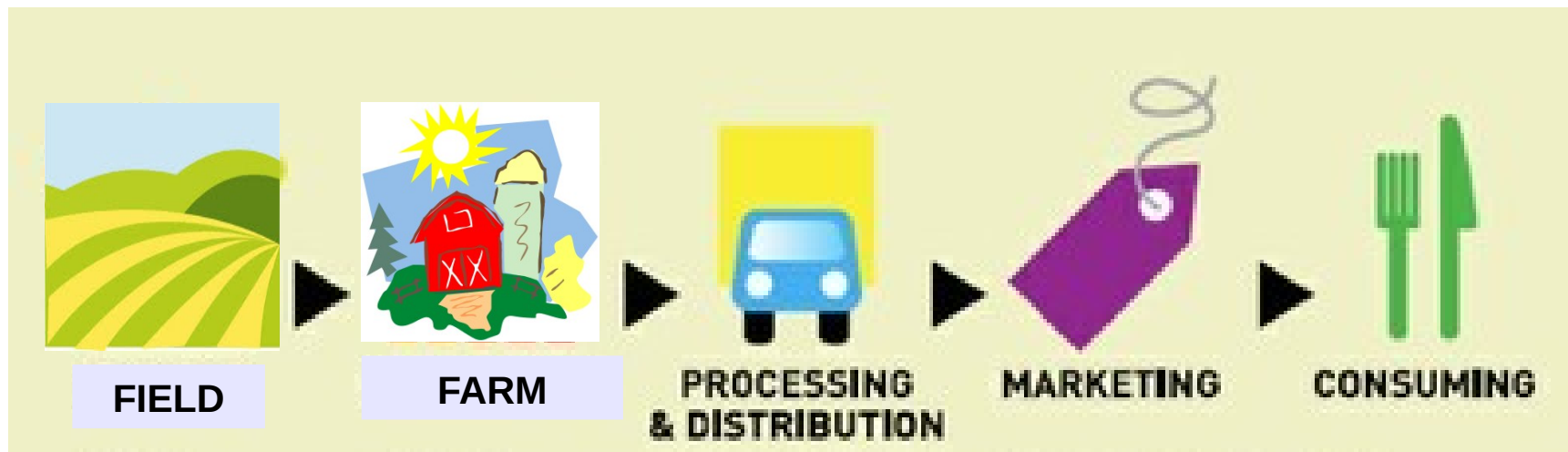


Social Cost Benefit Analysis:

Monetary evaluation of
producer + consumer + taxpayer welfare
including social, economic, environmental
sustainability aspects

Scaling-up economic analysis

From field scale to value chain



Farm
strategy;
Portfolio of
activities

Short-term vs
long-term
profitability at
farm level

Retail sector
organization
regarding
• IPM products
• special crops

How to certify
the compliance
with such
complex
guidelines?

How to
communicate to
end-consumer?

What is
consumers'
understanding
and
willingness to
pay for IPM ?

Thank you for your attention

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