
Economic modelling to evaluate the benefits of precision livestock farming technologies

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Precision Livestock Farming

- Tools that monitor animal production, welfare and health
 - Automatically, continuously, and (near) real-time
- Support farmers
 - Decision-support management
 - Reduce dependency on human labour
- Emerging research field
 - Scientific research



(Inter)national projects



International conferences

Slow uptake of PLF tools by farmers

- Provides a lot of data but no decision-support information^a
- No (perceived) economic benefit^a
- Undesirable / unclear cost-benefit ratio^{a,b}
- Clear data on cost-benefit are lacking
 - Most important limiting factor for commercialisation^c



^a Russel and Bewley, 2013

Strong need for economic models to increase adoption of PLF on farms

- Partial Budget (e.g., Jago *et al.*, 2011)
 - Better informed purchase decisions
 - Only consider cost and benefits that change
 - Straightforward and easy to comprehend

- Bio-economic simulation (e.g., Bewley *et al.*, 2010; Rutten *et al.*, 2014)
 - Accurately estimate economic impact
 - Simulating all biological effects
 - Complex and only applicable for PLF modelled

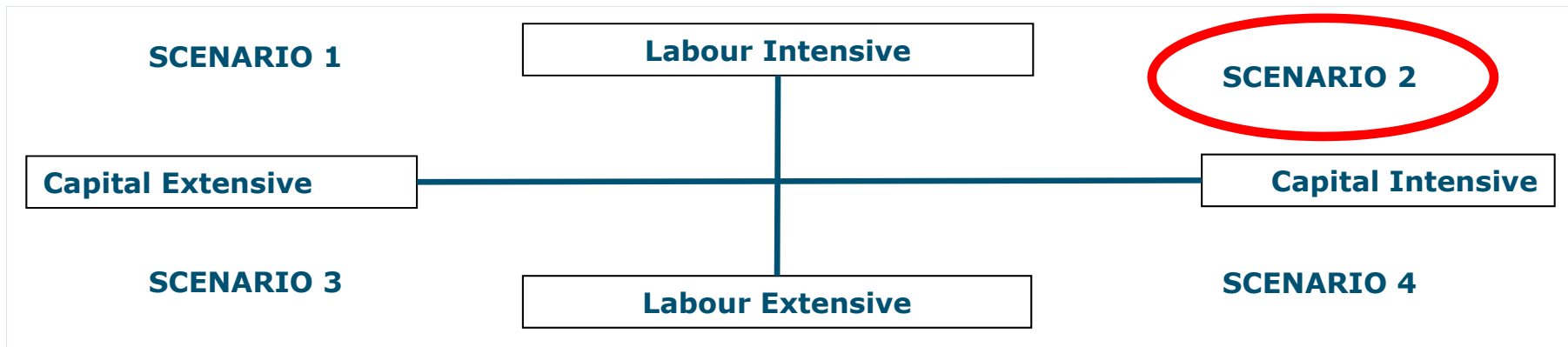
Development of a Value Creation Tool



- To be used by suppliers of PLF technologies
- Estimate economic impact of PLF at farm level
- Generic for any PLF technology
- Generic for any country or region

The Value Creation Tool

- A tool for dairy, fattening pig and broiler farms each
- Four farm scenarios



- Input data include
 - technical parameters
 - data on investments, prices and costs

Input parameters

	Parameter	Unit	€
Technical parameters	Labour	FTE	1
	Labour hours	Hours/year	2,080
	Farm size	Dairy cows	80
	Replacement heifers	% of dairy cows	38
	Mortality Replacement heifers	%	10
	Land	Ha	49
	Milk production	Kg milk/cow/year	8,100

Output parameters

Average Revenues	€ / cow
Milk	3,159
Livestock sales	259
Other revenues	166+
Total revenues	3,584

- Net Farm Income (**NFI**) / cow = revenues – costs = €-121
- Total NFI = €-9,657
- Labour Income (**LI**) = €27,783

Implementing automated heat detection

	Parameter	Unit	€
Technical parameters	Labour	FTE	1
	Labour hours	Hours/year	2,080
	Farm size	Dairy cows	30
	Replacement heifers	% of dairy cows	30
	Mortality Replacement heifers	%	10
	Land	Ha	15
	Milk production	Kg milk/cow/year	8,222

	Parameter	Unit	€
Other revenues	Livestock revenues	€/dairy cow	259
	Miscellaneous revenues	€/dairy cow	166

Investments	Value of Land	€/ha	27,000
	Interest rate Land	%	2
	Nominal interest rate	%	5
	Replacement value of buildings	€	800,000
	Depreciation buildings	%	4
	Maintenance buildings	%	1.5
	Replacement value M&E	€	126,000
Depreciation M&E	%	10	
Maintenance M&E	%	5	

Other costs	Feed	€/dairy cow	690
	Roughage	€/dairy cow	121
	Land lease	€/dairy cow	0
	Fertilizer and pesticides	€/ha	87
	Customer work	€/dairy cow	200
	Health care (preventive)	€/dairy cow	50
	Health care (curative)	€/dairy cow	150
	AI	€/dairy cow	70
	Miscellaneous costs	€/dairy cow	200

Prices	Dairy cow	€/dairy cow	1,200
	Heifer (1-2 years)	€/heifer	835
	Calf	€/calf	100
	Milk	€/kg milk	0.39
	Labour	€/hour	18
	Rearing costs	€/heifer/year	770

Economic benefit automated heat detection

	No PLF
Total NFI	-9,657
Total LI	27,783



**Automated heat detection
(Nedap N.V., Groenlo, the Netherlands)**

The Value Creation Tool for Scenario 1

- Labour intensive, capital extensive farming
- Adapting default values (no PLF)
 - National database
 - Assuming same magnitude of effects



	No PLF	Heat detection (PLF)
Total NFI	3,415	7,230
Total LI	40,855	44,460
Economic benefit		€3,815 / year

Discussion

- A tool for dairy, fattening pig and broiler farms
- Made available by EU-PLF
- The Value Creation Tool is easy to use by suppliers
but...
- Clear view of affected parameters and to what extend
- Not accounting for other areas affected by PLF



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