

PRODUCTION, PRICE AND INCOME RISK IN EXPECTED GROSS MARGIN IN AGRICULTURE USING ANALYTIC NETWORK PROCESSES MODELLING

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Acknowledgement *Financial support from the Romanian National Authority for Scientific Research, CNCS-UEFISCDI, Project PN-II-ID-PCE-2011-3-0893 is gratefully acknowledged.*

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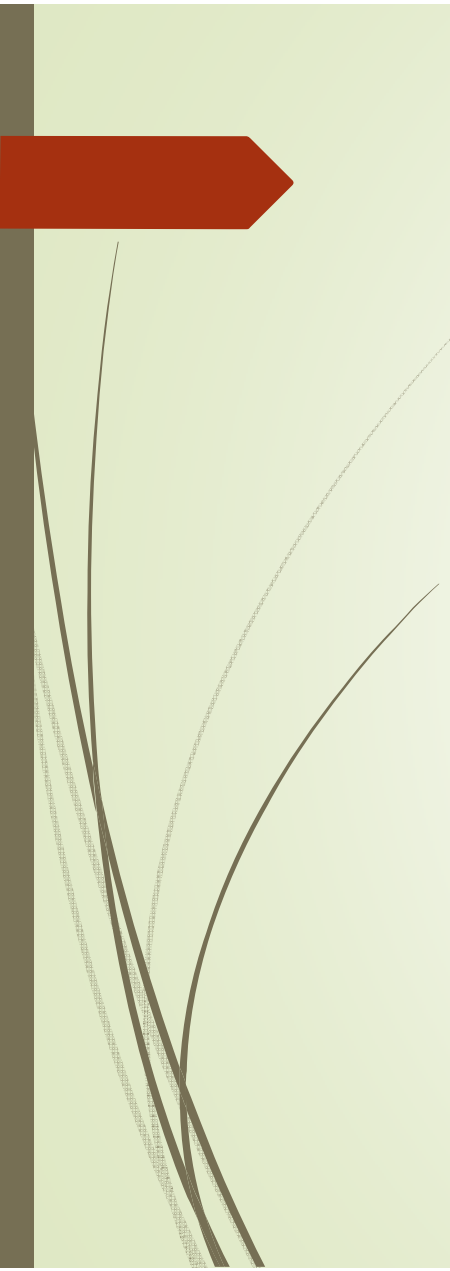
Risks and expectations mutually reinforce in the attempt to improve the farm operational management.

In predicting and planning production, price and income for agricultural farms, both a-priori and a-posteriori Gross Margin's (GM) computation operates as proxy for the profit's dynamics.

Based on the formulation of the expected yield and expected average gross price, the calculus of the expected gross margin is delivered through an ANP model allowing for the inclusion of tacit local knowledge of farmers.

This model constitutes an example of how basic rigid calculations can be enriched with additional information about the particular risks, without the need of extensions and connections of other data bases, like weather or soil conditions, or the state of the machinery.

Using this model every farmer can perform a sensitivity analysis in order to identify the magnitude of variation in the present GM calculations depending on the specific risks considered..



When GM is computed by farmers themselves, this action can yield potential benefits which go beyond the simple result.

Although a-posteriori precise assessments can be done, in principle, by consultancy firms, the simple task of fulfilling such calculation by farmers themselves both in real time and a-posteriori educates the level of self-consciousness over the structure of the variable costs.

Also, a collection of the GM's estimations done by the farmers themselves reveal the perceptions about the specific risk channels induced by the current variable cost estimations.

Moreover, on a timeline framework, comparing the GM calculations done by the farmers a- priori the crop is set, with similar ones done a-posteriori by consultancy companies or by farmers themselves, can offer insights about the distance between the estimation of the potential of a certain farm and its actual earnings.

Standard gross margin (GM) calculus (per hectare)- **Wine grapes analysis for profitability**

GROSS INCOME		=	NOMINATED YIELD	X	AVERAGE GROSS PRICE		
	8 (t/ha)				2600 (\$/t)		= 20,800 (\$/ha)
							LESS –
HARVESTING (HAND),	FREIGHT,				LEVIES		
8 (t/ha) X 340 (\$/t)	8 (t/ha) X 70 (\$/t)				8 (t/ha) X 11 (\$/t)		
2720	560				88		3368 (\$/ha)=
NET INCOME	17432 (\$/ha)-						
VARIABLE COSTS:	10370						

- LABOR:** Irrigation, P&D Monitoring, Trellis Maintenance
- NUTRITION:** NPK (broadcast), Superphosphate, Potassium Sulphate, Lime, Calcium nitrate, Boron spray, Magnesium, Zinc spray, Leaf tests, Soil tests...
- CHEMICALS:** Fungicides, Insecticides, Herbicides, Crop regulators
- CANOPY MANAGEMENT:** Pruning labor (hand pruning), Leaf removal, Crop removal, Desucker/disbud, Wire lifting/dropping, Netting
- MACHINERY (AT CONTRACT RATES):** Mowing and slashing, Pesticide applications, Herbicide applications, Other chemical applications, Fertiliser, Pre-pruning, Trimming, Machine harvesting, Other chemical applications
- IRRIGATION** (Annual water cost+pumping)

= **GROSS MARGIN 7062**

ALTERNATIVES	
10.1. GROSS MARGIN LESS	
10.2. GROSS MARGIN AS CALCULATED	
10.3. GROSS MARGIN MORE	

THE BUILDING BLOCK IN THE DESIGN OF AN INDIVIDUAL ANP MODEL FOR ESTIMATING THE EXPECTED GROSS MARGIN

Set the Nominated Yield

When you think of the **nominated yield** per hectare, please expected one and what are the values less, respectively more, expect to produce?

Alternatively,

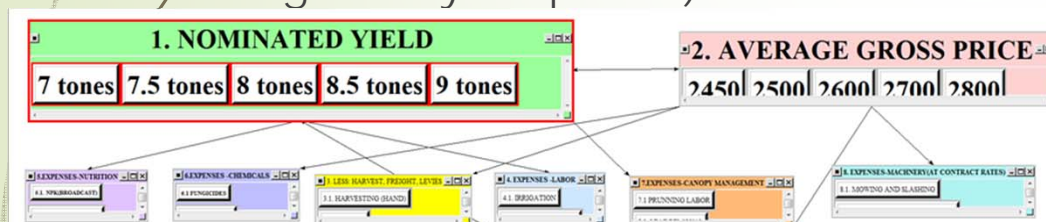
Fill in the blanks, in the following table, your confidence expressed in percentages with respect to the nominated yield to be achieved:

7 tones /ha **7.5** tones/ha **8** tones/ha **8.5** tones/ha **9** tones/ha

Eg: 70%
will get this yield per ha)

Eg: 85%

Eg: 90% (this is like you are almost sure that you



Eg: 90% (obs : there could be
artitude in between two or several

Eg: 80%

ALTERNATIVES	
10.1. GROSS MARGIN LESS	
10.2. GROSS MARGIN AS CALCULATED	
10.3. GROSS MARGIN MORE	

1. Choose	2. Node comparisons with respect to 10.2. GROSS MARGIN A~	3. Results																																																																		
<table border="1"> <tr> <td>Node</td> <td>Cluster</td> <td>Graphical</td> <td>Verbal</td> <td>Matrix</td> <td>Questionnaire</td> <td>Direct</td> </tr> <tr> <td>Choose Node</td> <td>7 tones</td> <td>70</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>7.5 tones</td> <td>85</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>8 tones</td> <td>90</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>8.5 tones</td> <td>90</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>9 tones</td> <td>90</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Cluster: ALTERNATIVES</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Choose Cluster</td> <td>1. NOMINATED Y-</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Node	Cluster	Graphical	Verbal	Matrix	Questionnaire	Direct	Choose Node	7 tones	70						7.5 tones	85						8 tones	90						8.5 tones	90						9 tones	90					Cluster: ALTERNATIVES							Choose Cluster	1. NOMINATED Y-						<p>This is the direct data input area. Type in new direct data here, and/or Click the invert box invert priorities for this direct data.</p> <p>NOTE: Any changes made in direct data take effect immediately and overwrite pre-existing data inputted in the other modes.</p>	<p>Inconsistency: 0.0000</p> <table border="1"> <tr> <td>7 tones</td> <td>0.16867</td> </tr> <tr> <td>7.5 tones</td> <td>0.20462</td> </tr> <tr> <td>8 tones</td> <td>0.21687</td> </tr> <tr> <td>8.5 tones</td> <td>0.21687</td> </tr> <tr> <td>9 tones</td> <td>0.19277</td> </tr> </table>	7 tones	0.16867	7.5 tones	0.20462	8 tones	0.21687	8.5 tones	0.21687	9 tones	0.19277
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THE BUILDING BLOCK IN THE DESIGN OF AN INDIVIDUAL ANP MODEL FOR ESTIMATING THE EXPECTED GROSS MARGIN –continued

Set the Average Gross Price

When you think of the gross price- leva/tone- please write the most expected one and what are the values less, respectively more, which you expect to produce? (in other words, fill in the blanks in the next table the prices, with confidence levels associated)

And the output of this question should be a table li

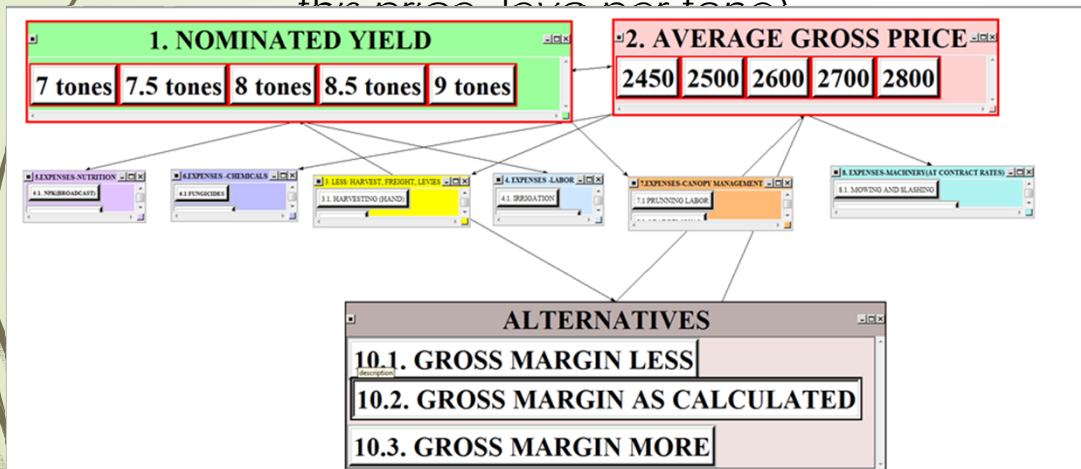
2. AVERAGE GROSS PRICE				
2450	2500	2600	2700	2800

2450 2500 **2600** leva /tone 2700 2800

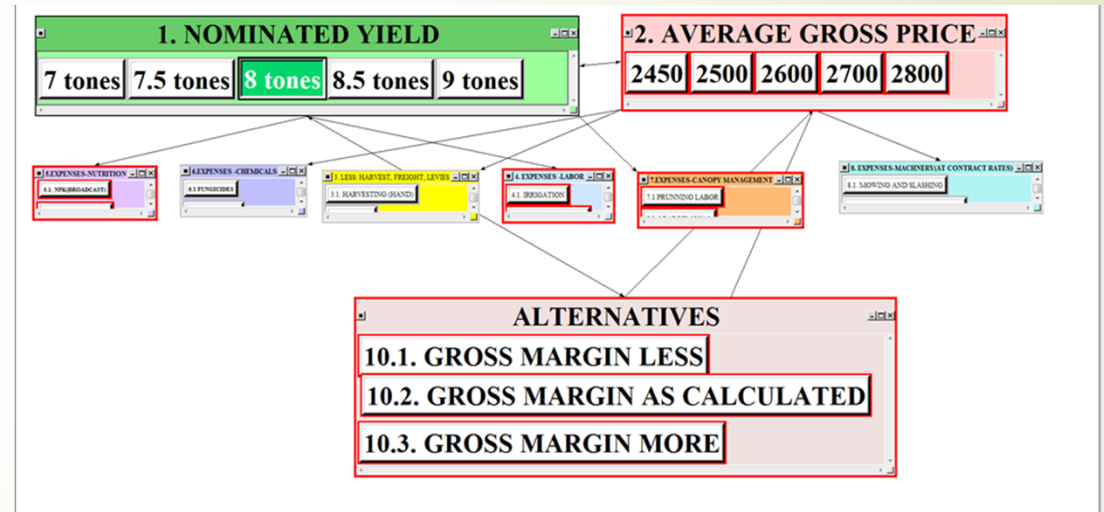
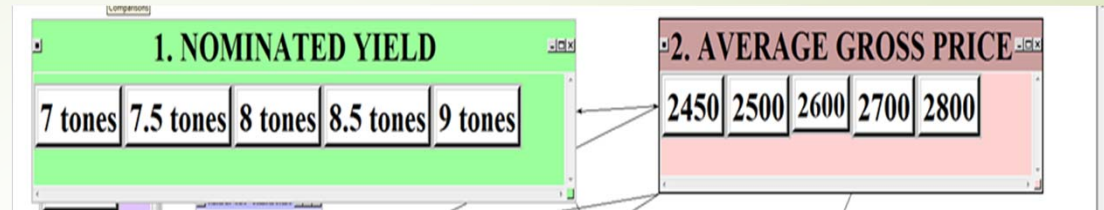
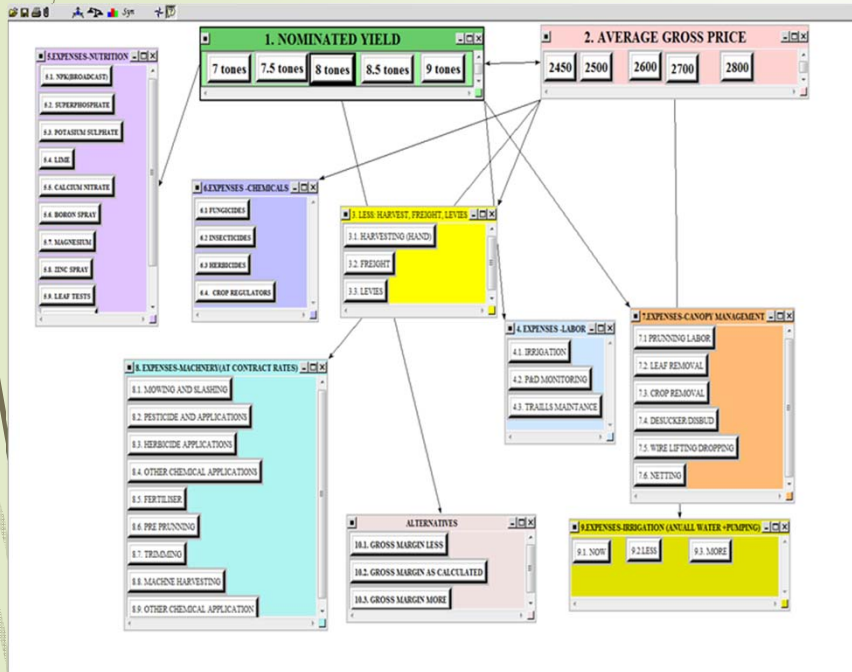
Eg: 70% Eg: 85% Eg: 90% (this is like you are almost sure that you will get this price-leva per tone)

Eg: 90% (obs : there could be certitude in between two or several

Eg: 80%



The implicit connections between the EXPECTED nominated yield and the EXPECTED average gross price



Comparisons for Super Decisions Main Window (M Grapes Wine .smd)

1. Choose		2. Node comparisons with respect to 8 tones		3. Results	
Node Cluster	Graphical Verbal Matrix Questionnaire Direct	Graphical Verbal Matrix Questionnaire Direct	Normal	Hybrid	
Choose Node	2450 2500 2600 2700 2800	This is the direct data input area. Type in new direct data here, and/or click the invert box invert priorities for this direct data.	2450	2500	0.18774
Cluster: 1. NOMINATED Y-	8 tones	NOTE: Any changes made in direct data take effect immediately and overwrite pre-existing data inputted in the other modes.	2600	2700	0.19157
Choose Cluster			2800	2800	0.19923
					0.20090
					0.21456

Variable costs as clusters in the ANP model

GROSS INCOME = NOMINATED YIELD X AVERAGE GROSS PRICE

8 (t/ha)	2600 (\$/t)	=20,800 (\$/ha)	
LESS -			
HARVESTING (HAND),	FREIGHT,	LEVIES	
8 (t/ha) X 340 (\$/t)	8 (t/ha) X 70 (\$/t)	8 (t/ha) X 11 (\$/t)	
2720	560	88	3368
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NET INCOME	17432 (\$/ha)		

VARIABLE COSTS: 10370

LABOR: Irrigation, P&D Monitoring, Trellis Maintenance

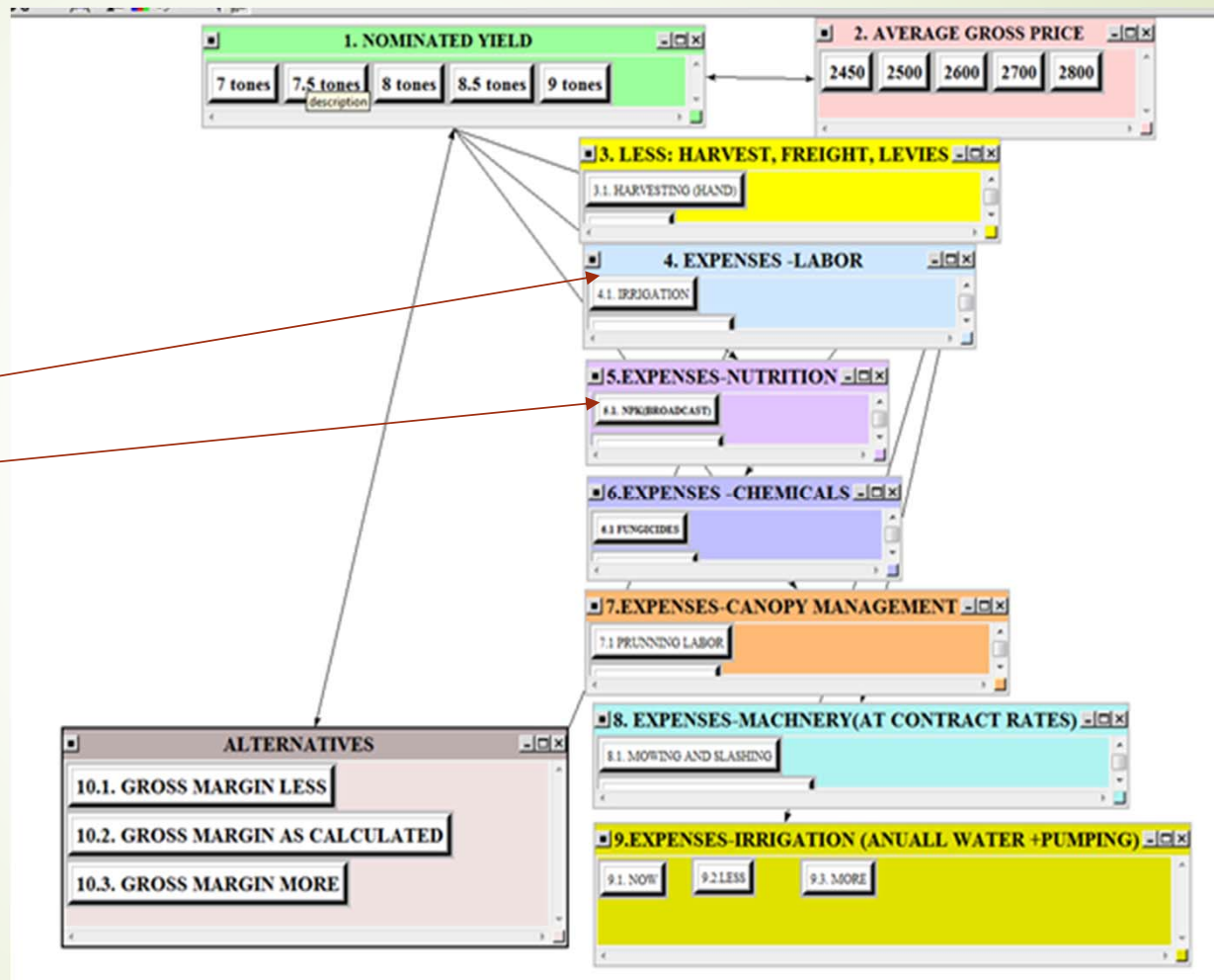
NUTRITION: NPK (broadcast), Superphosphate, Potassium Sulphate, Lime, Calcium nitrate, Boron spray, Magnesium, Zinc spray, Leaf tests, Soil tests...

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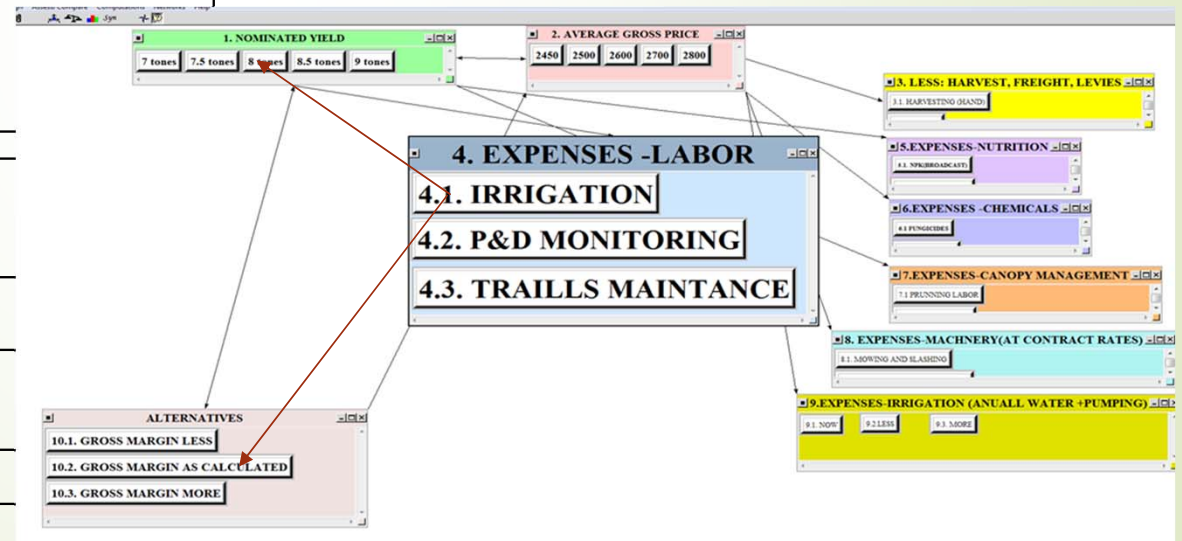
IRRIGATION (Annual water cost+pumping)



The dependence of the variable costs to the expected nominated yield the expected gross margin

When you think of the next categories of the components of the variable costs, how do you evaluate their contribution to the yield and respectively to the gross margin?

VARIABLE COSTS (aggregated) as in the reference table for the standard GM	CONTRIBUTION TO THE YIELD	CONTRIBUTION TO THE OVERALL GROSS MARGIN
LABOR/труд	Eg: 70% (meaning that labor is contributing with 70% to get the expected yield-in the sense that in the production process, and in the context of all the variable costs, the particular labor contributes with 70% at getting the expected yield)	Eg: 50% (meaning that in the context of all variable cost....)
NUTRITION		
CHEMICALS		
CANOPY		
MANAGEMENT/Съхранение на продукцията		
MACHINERY (AT CONTRACT RATES		
IRRIGATION (ANNUAL WATER COST+PUMPING)/		

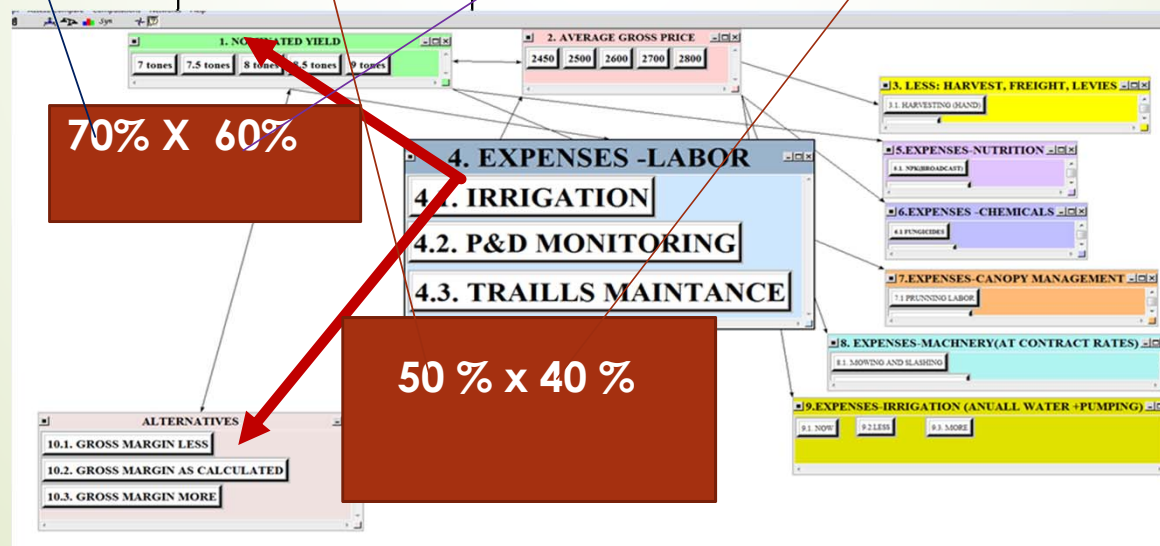


Intensity of connections

When you think of the next categories of the components of the LABOR, how do you evaluate their contribution to the yield and respectively to the gross margin?

Components of the LABOR as in the reference table for the standard GM	Contribution to the yield	Contribution to the overall gross margin
IRRIGATION	Eg: 60%	Eg: 40%
P&D MONITORING		
TRAILS MAINTANCE		

VARIABLE COSTS (aggregated) as in the reference table for the standard GM LABOR/труд	CONTRIBUTION TO THE YIELD	CONTRIBUTION TO THE OVERALL GROSS MARGIN
	Eg: 70% (meaning that labor is contributing with 70% to get the expected yield-in the sense that in the production process, and in the context of all the variable costs, the particular labor contributes with 70% at getting the expected yield)	Eg: 50% (meaning that in the context of all variable cost....)



The determination of the Alternative nodes for the EXPECTED GROS MARGIN

What is your most recently gross margin per ha?

How much of your previous expectations were fulfilled by what you got?

Value of the GROSS MARGIN acquired (m.u./ha):

Acquiredpercent of what was expected to acquire at the initial time of setting the crop

When you think now at your future gross margin to achieve (leva/ha) for the same crop, next season, what is are levels you think you can get and with what confidence ?

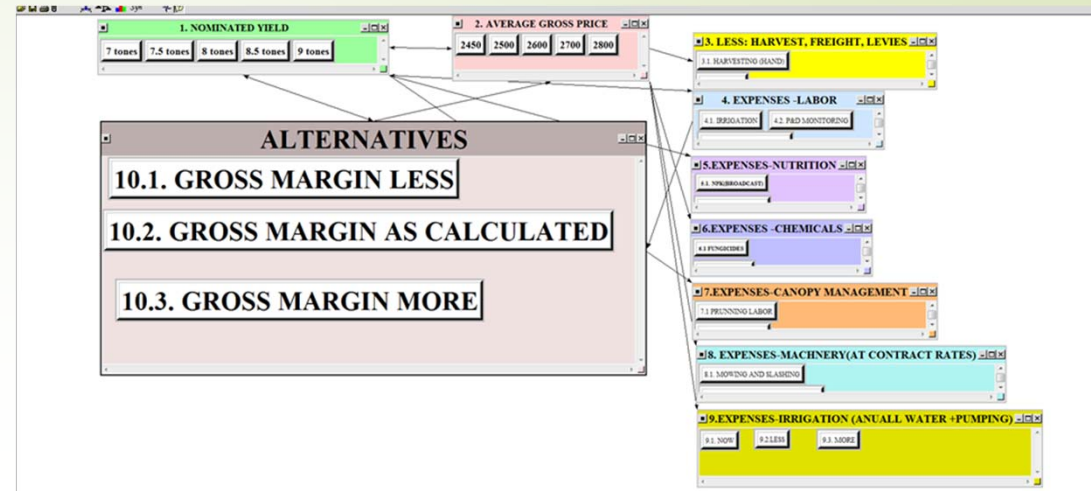
Much less GM.....Less GM..... Expected GM.....More GM..... Much more GM

.....

Percentage of confidence:

.....% % % %

.....%



Sensitivity Analysis as a way of calibrating expectations and concluding remarks

	Normals
GROSS MARGIN LESS (~ 6300)	0.258032
GROSS MARGIN AS CALCULATED (7062)	0.443619
GROSS MARGIN MORE (~ 8000)	0.298349
Expected Gross Margin	$6300 \times 0.258032 + 7062 \times 0.443619 + 8000 \times 0.298349$

- Sensitivity can be performed with respect to every node within the model and rate of change can be derived
- The model can be extended allowing for the inclusion of different types of seeds, fertilizers etc
- Gross margin analysis provides a guide to the relative profitability of different improvement options. It helps to decide whether a potential improvement is worth implementing, or whether one option is better than another option.
- Using a multi-criterial modelling as ANP allows for the transfer of the tacit local knowledge and through the sensitivity analysis option can serve for the design of optimal choices at individual, local and regional levels.