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# Combined Argumentation and Simulation to Support Decision

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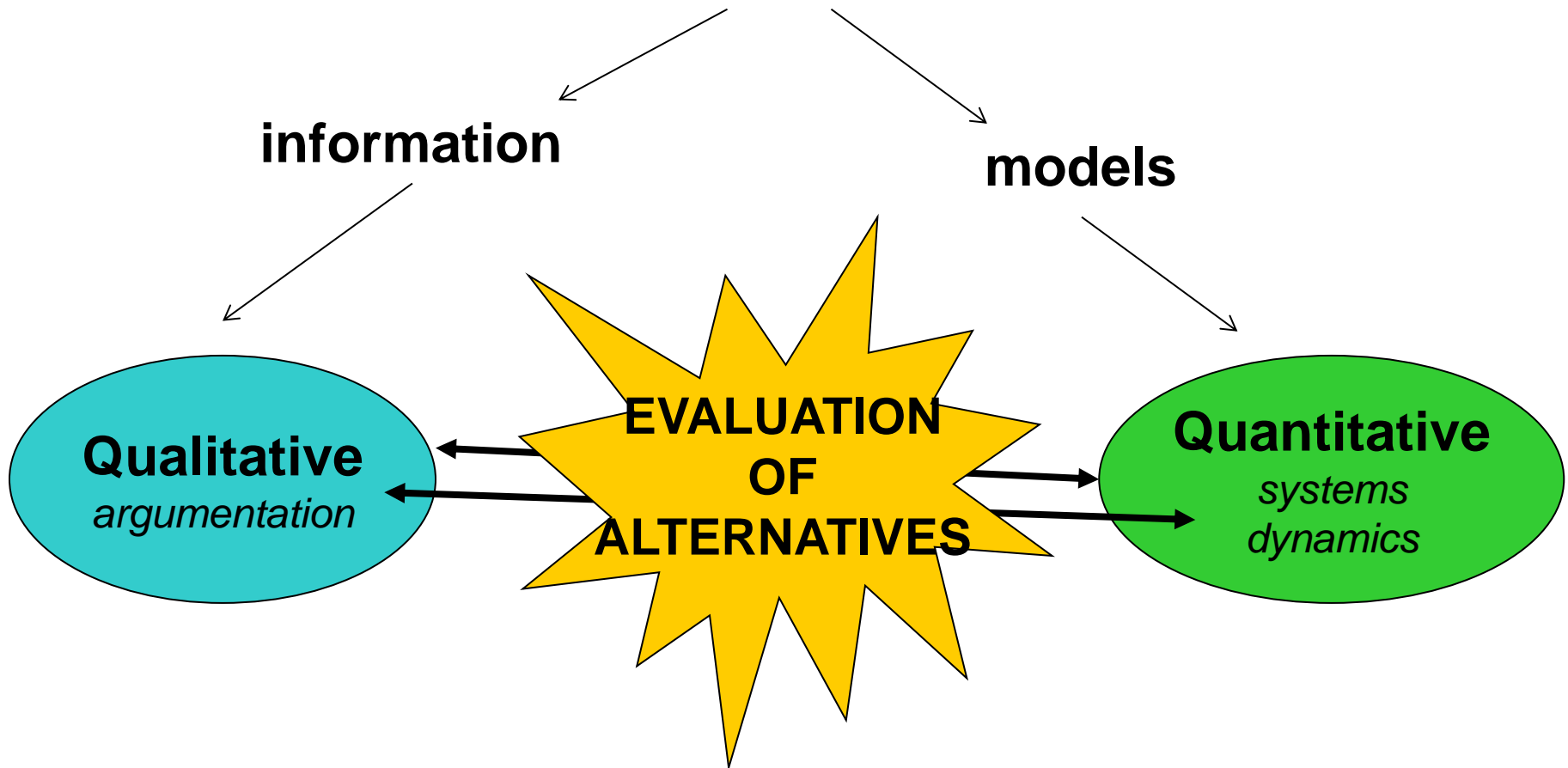
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# **Combined argumentation and simulation to support decision**

*Example to assess the attractiveness of a change in agriculture*

# Research context

Objective: decision support, based on:



# Cultural alternatives

1) Cereals in monoculture



2) Associated with legumes

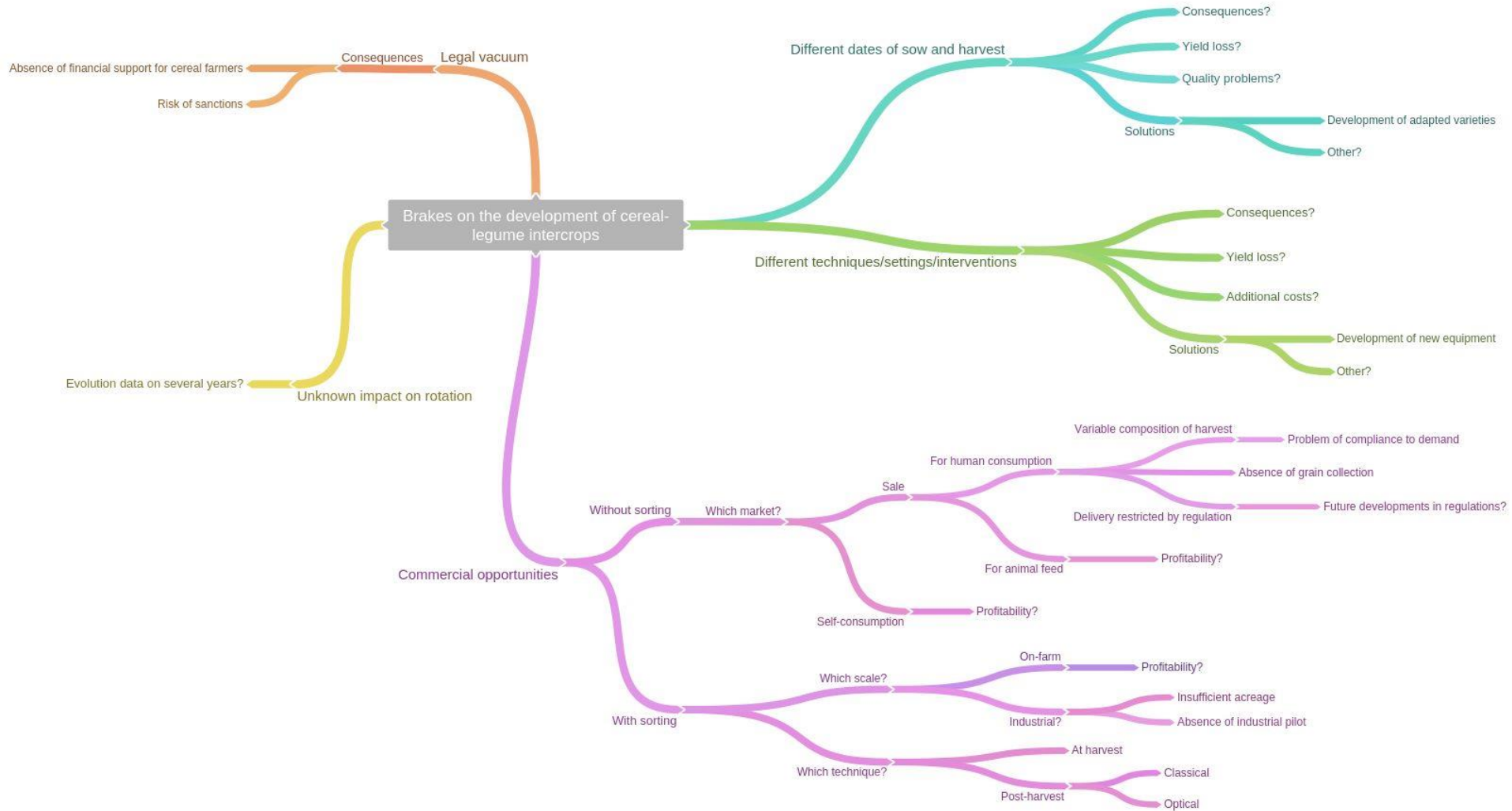


# Arguments (1)

- + improved soil fertility
  - + reduction of organic nitrogen fertilizers, expensive and inefficient
  - + higher protein content of harvested grain, which is a quality criterion for durum wheat
  - + better control of weeds
  - + better resistance against plant aggressors
  - + more stable yields despite climate variability.
- 
- non-synchronized optimal dates for sowing and harvest of the two species
  - variable composition of harvest
  - specific sorting operation required for human consumption
  - lack of distribution and valorization networks
  - restricted marketing possibilities due to the absence of a regulatory state for cereal-legume intercrops
  - discouraging European aid policies.



# Arguments (2)



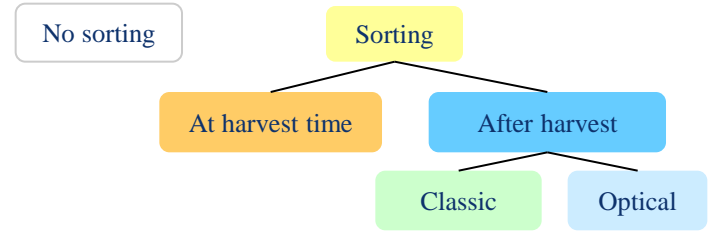
# Arguments (3) – After-harvest sorting

Id	Arg. type	Explanation	Option	Criterion	Intended use
13	+	Optical sorting type effective technology exists	After-harvest optical sorting	Technical	Commercialization of separate grains
14	-	Optical sorting type technology is costly	After-harvest optical sorting	Economic	Commercialization of separate grains
15	+	Prices for optical sorters are trending downwards	After-harvest optical sorting	Economic	Commercialization of separate grains
16	-	100% extraction of wheat and legume during classic sorting is impossible, since some of the broken legume grains have the same size as some of the wheat grains	After-harvest classic sorting	Technical	Commercialization of separate grains
17	+	A 3-batch sorting is possible: easily separable wheat, easily separable pea, non-separable wheat and pea mix	After-harvest classic sorting	Technical	Commercialization of separate grains
18	-	In case of 3 batches, the question of the use of the non-separable wheat and pea mix still remains	After-harvest classic sorting	Economic	Commercialization of separate grains
19	+	The non-separable batch may be used for own consumption or for commercialization in animal feed	After-harvest classic sorting	Economic	Commercialization of separate grains
20	-	The 3-batch solution is still costly, since it requires handling, several repetitions, and leads to a lower financial benefit of the non-separable batch	After-harvest classic sorting	Economic	Commercialization of separate grains

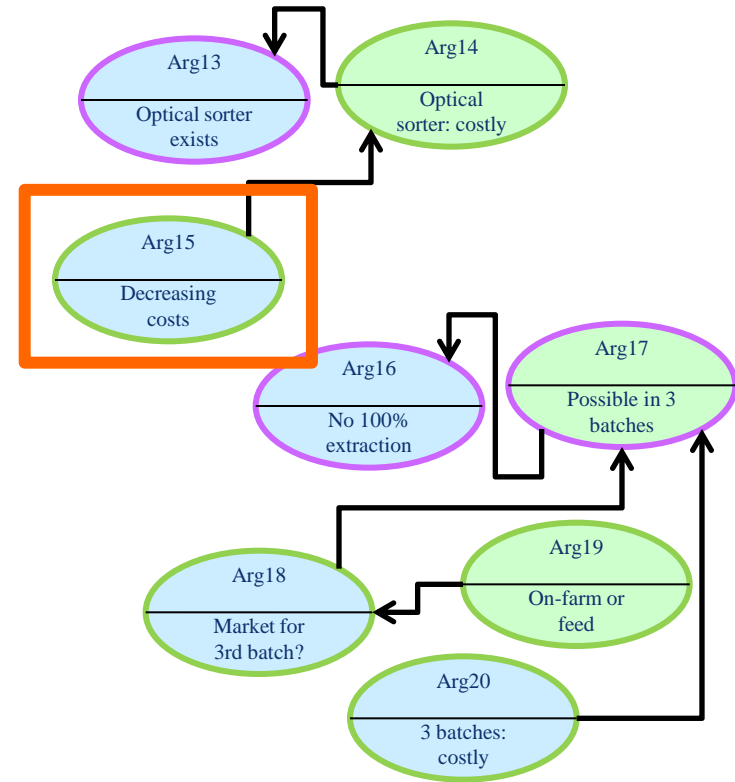
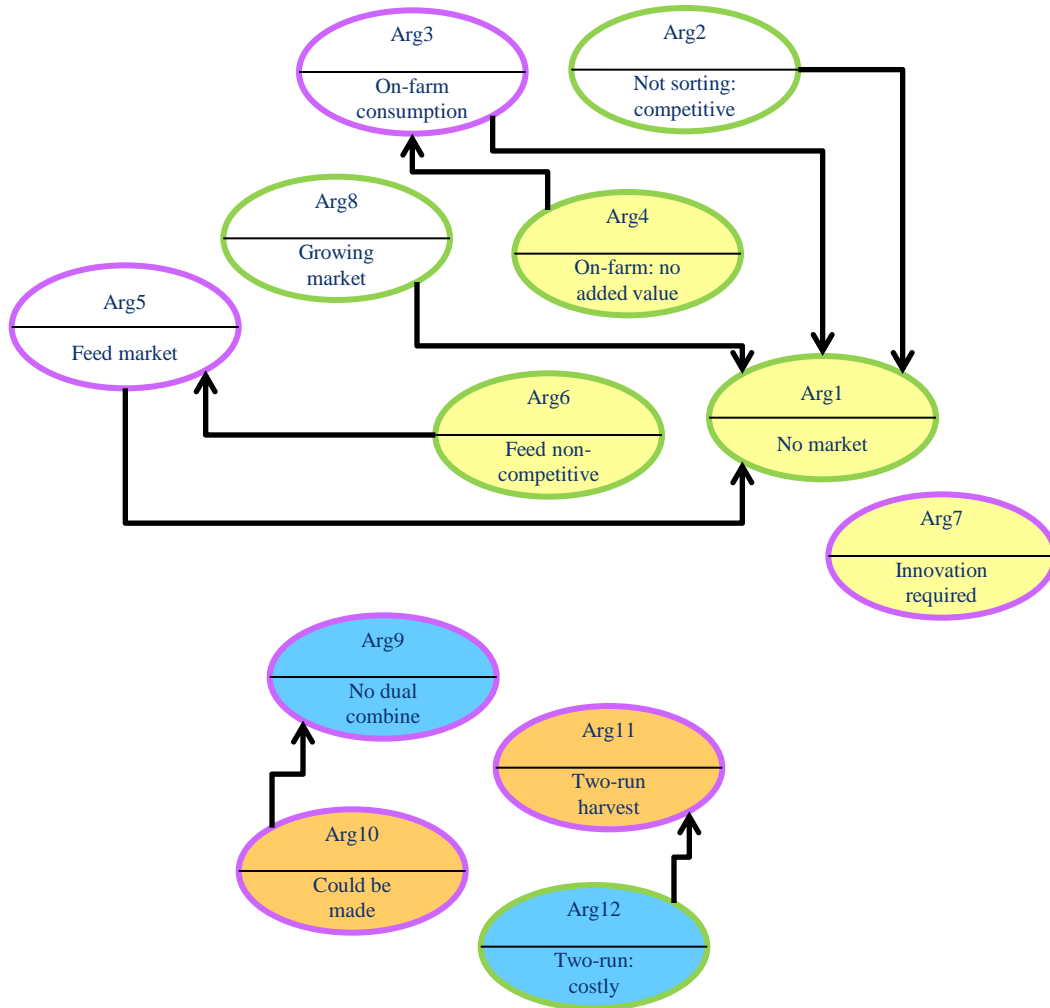
Criterion



Action



# Arguments (4)





# Systems dynamics translation?

## **The system:**

a set  $X = \{t, x_1, \dots, x_n\}$  of variables

Distinguished variables (option/goal, controlled/imposed)

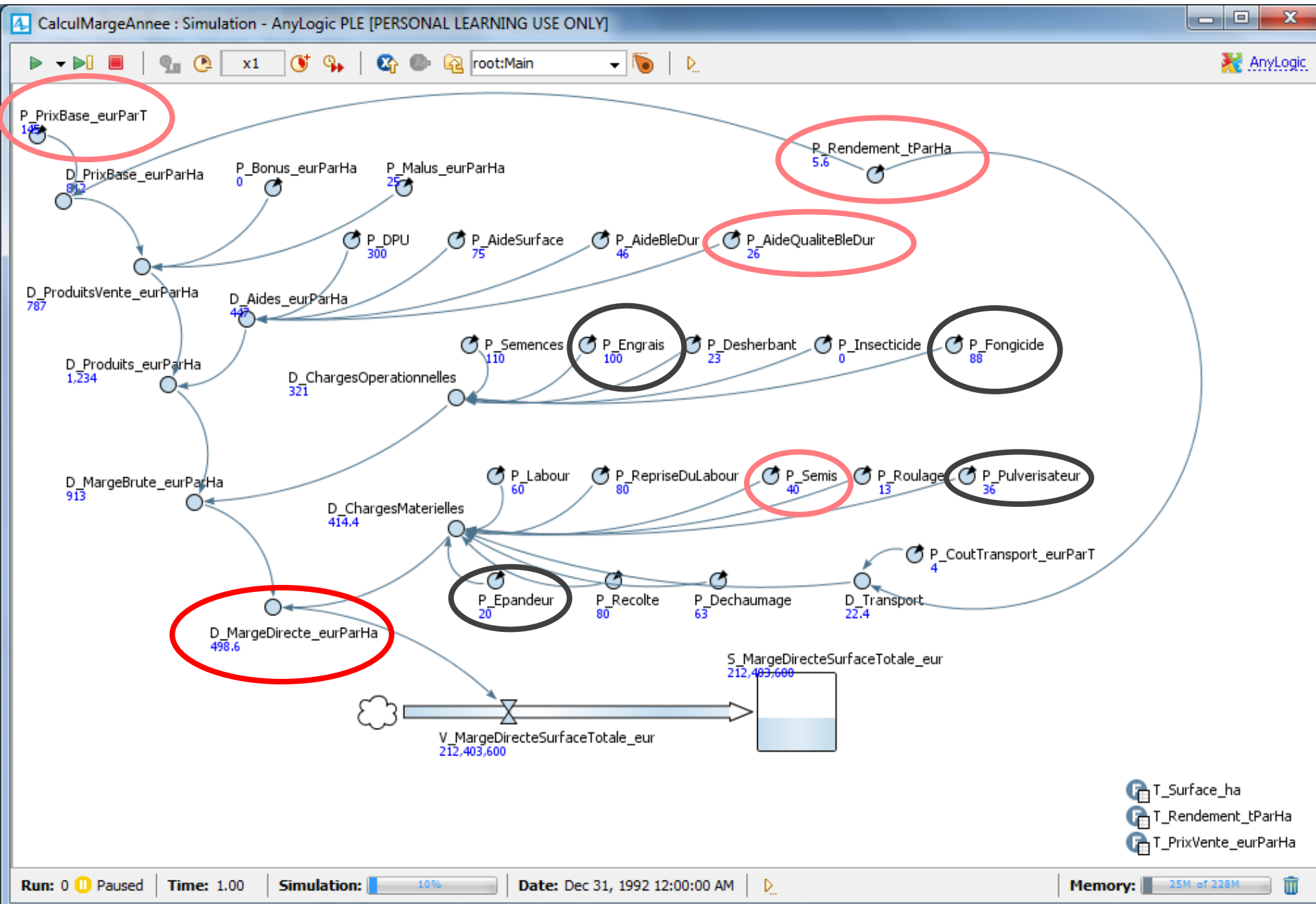
## **Argument:**

a triplet  $\langle o, x_g, J \rangle$

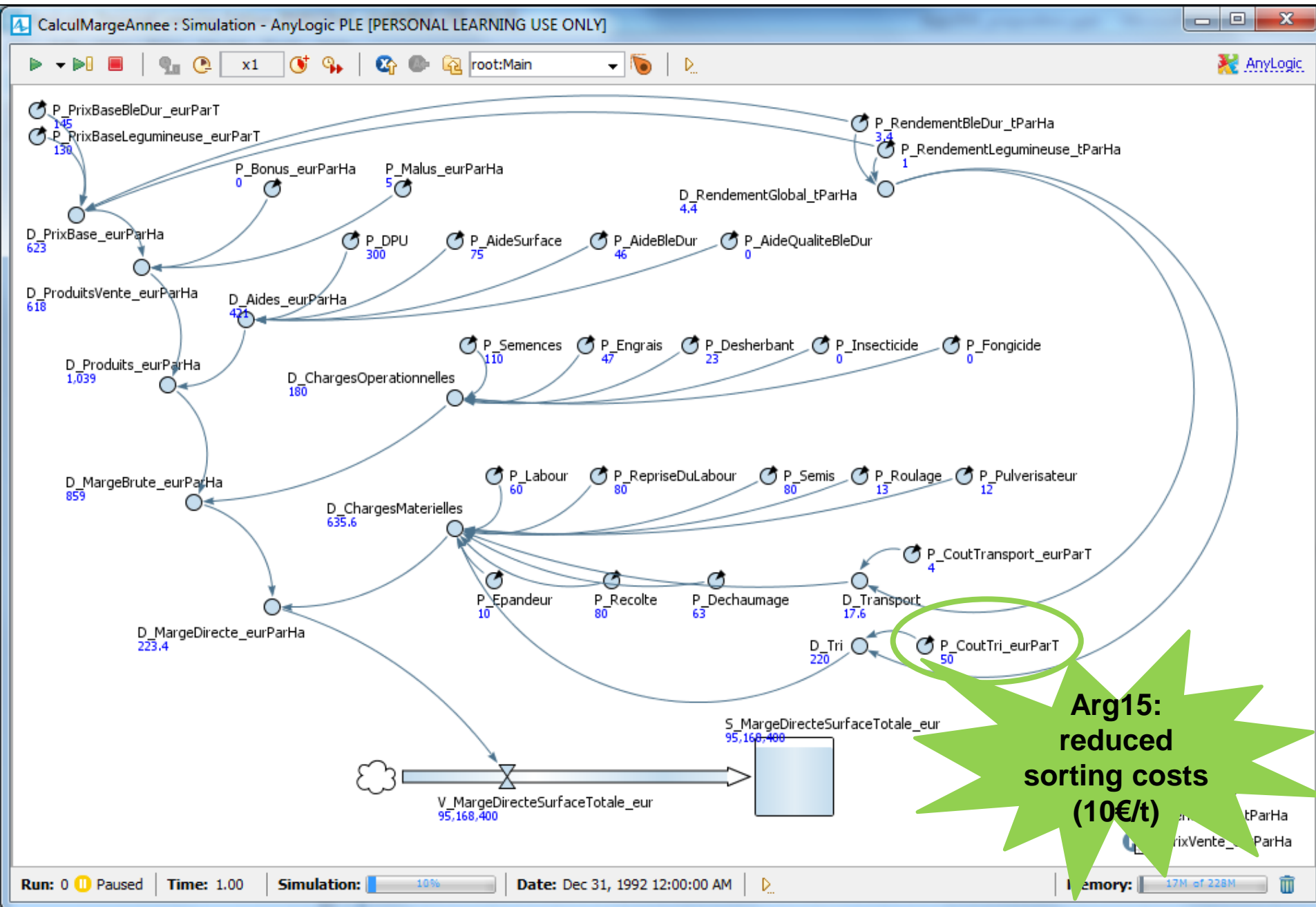
## **Test Argument 15:**

$\langle$  Intercrops with post-harvest sorting,  
half-net margin,  
reduced sorting costs  $\rangle$

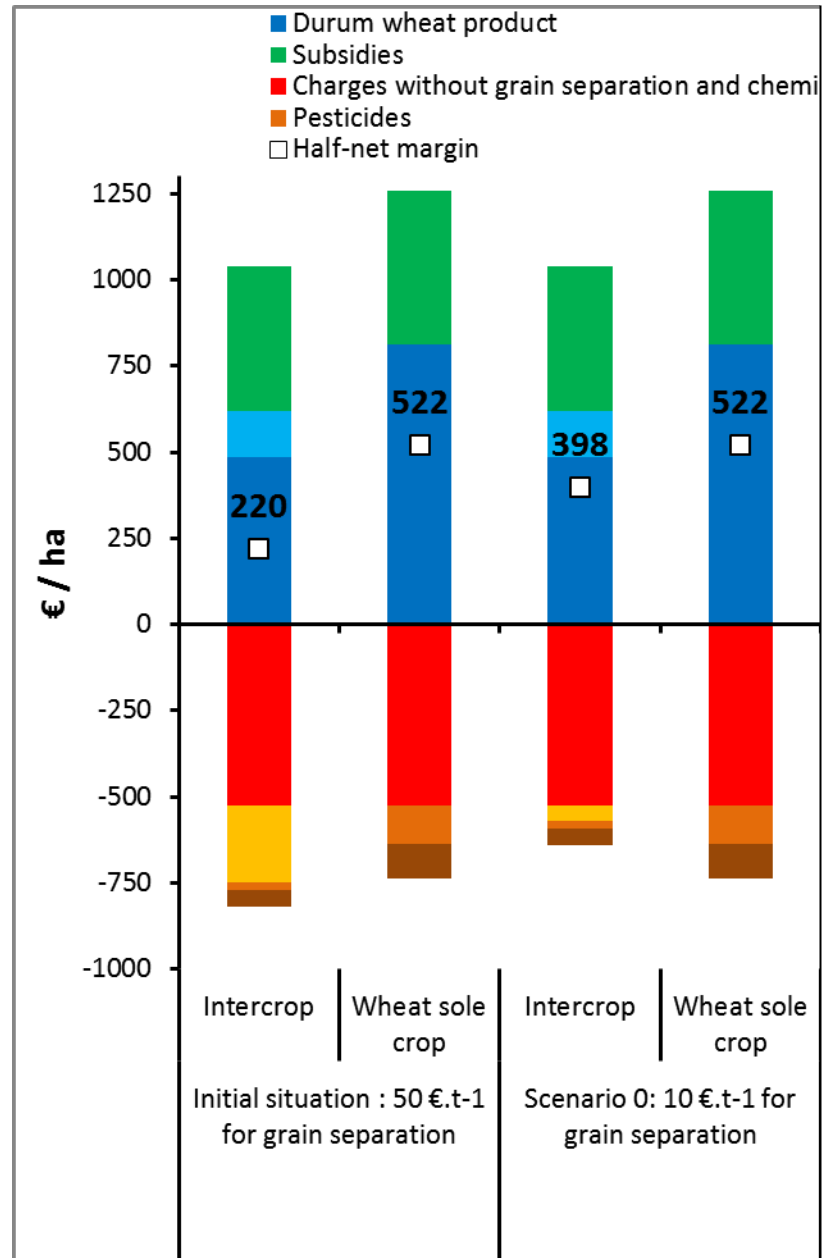
# Initial simulations – sole Durum wheat



# Simulating Argument 15



# Comparison of scenario results



# Conclusion: Towards what-if scenarios

