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## Graph theory applied to agroforestry system co-design

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# Graph theory applied to agroforestry system co-design

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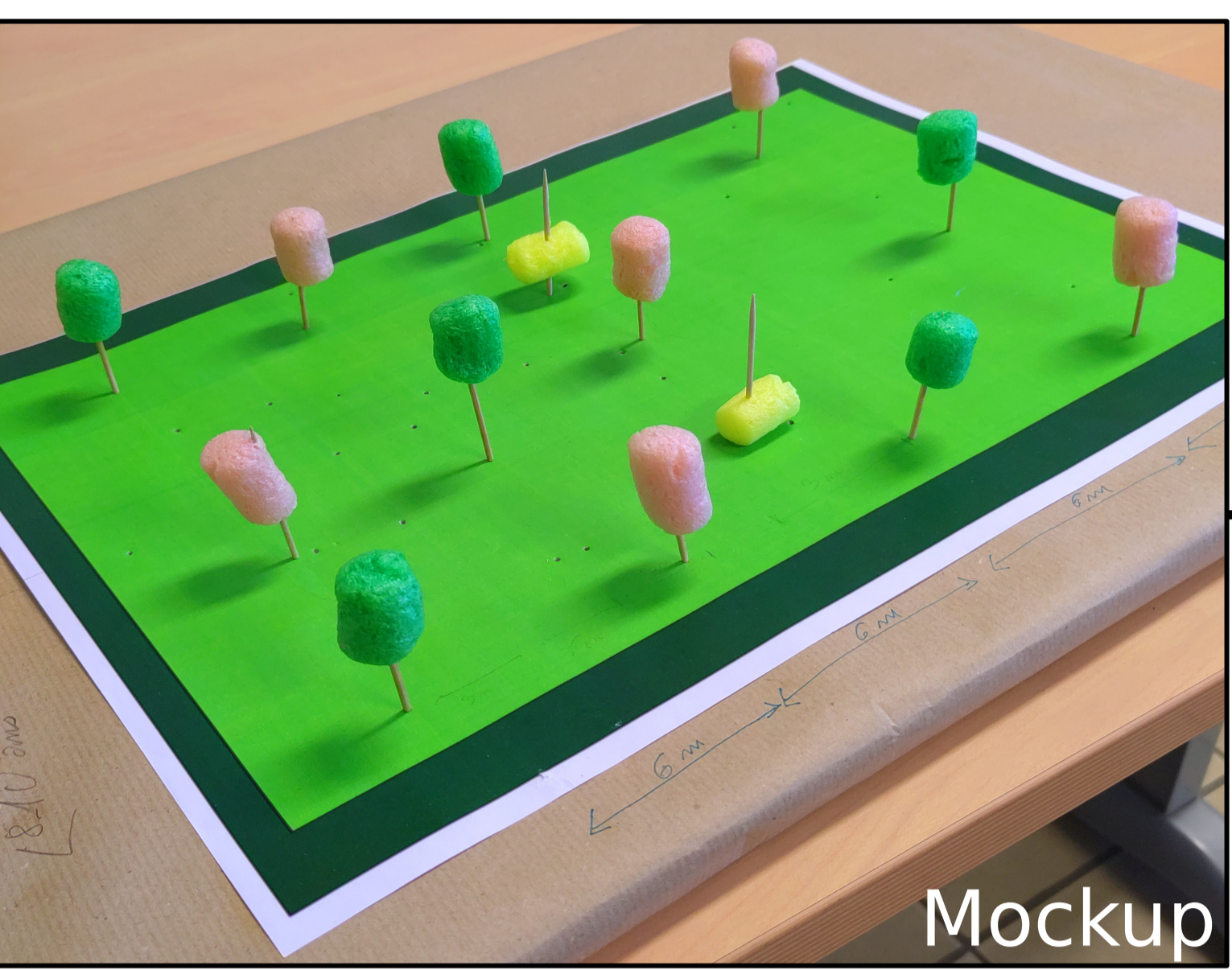
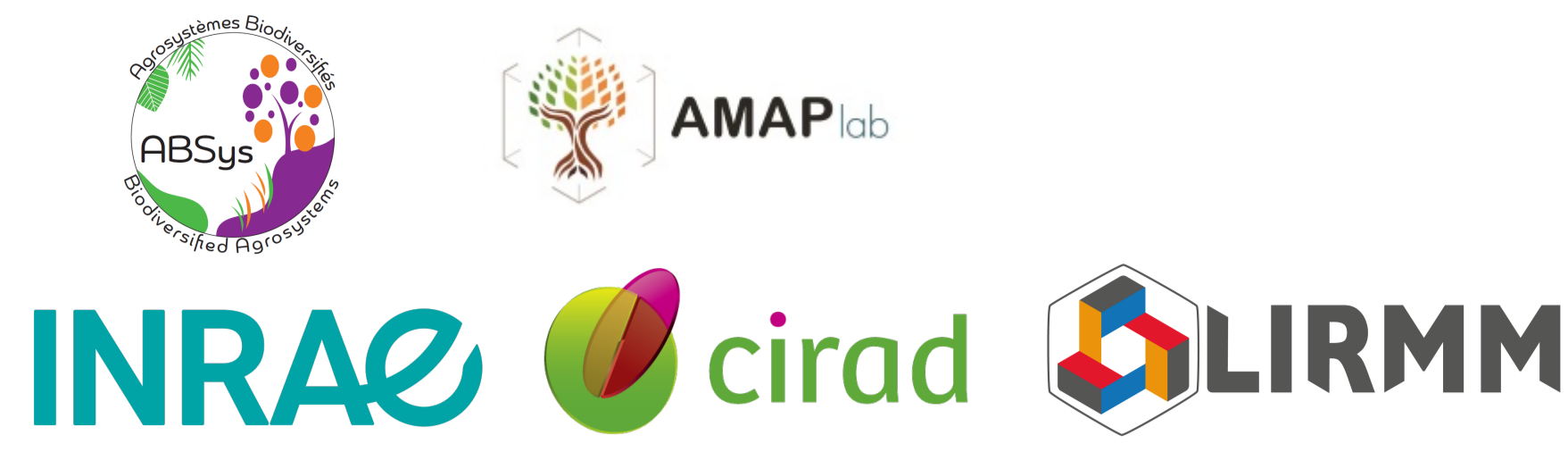
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Mockup

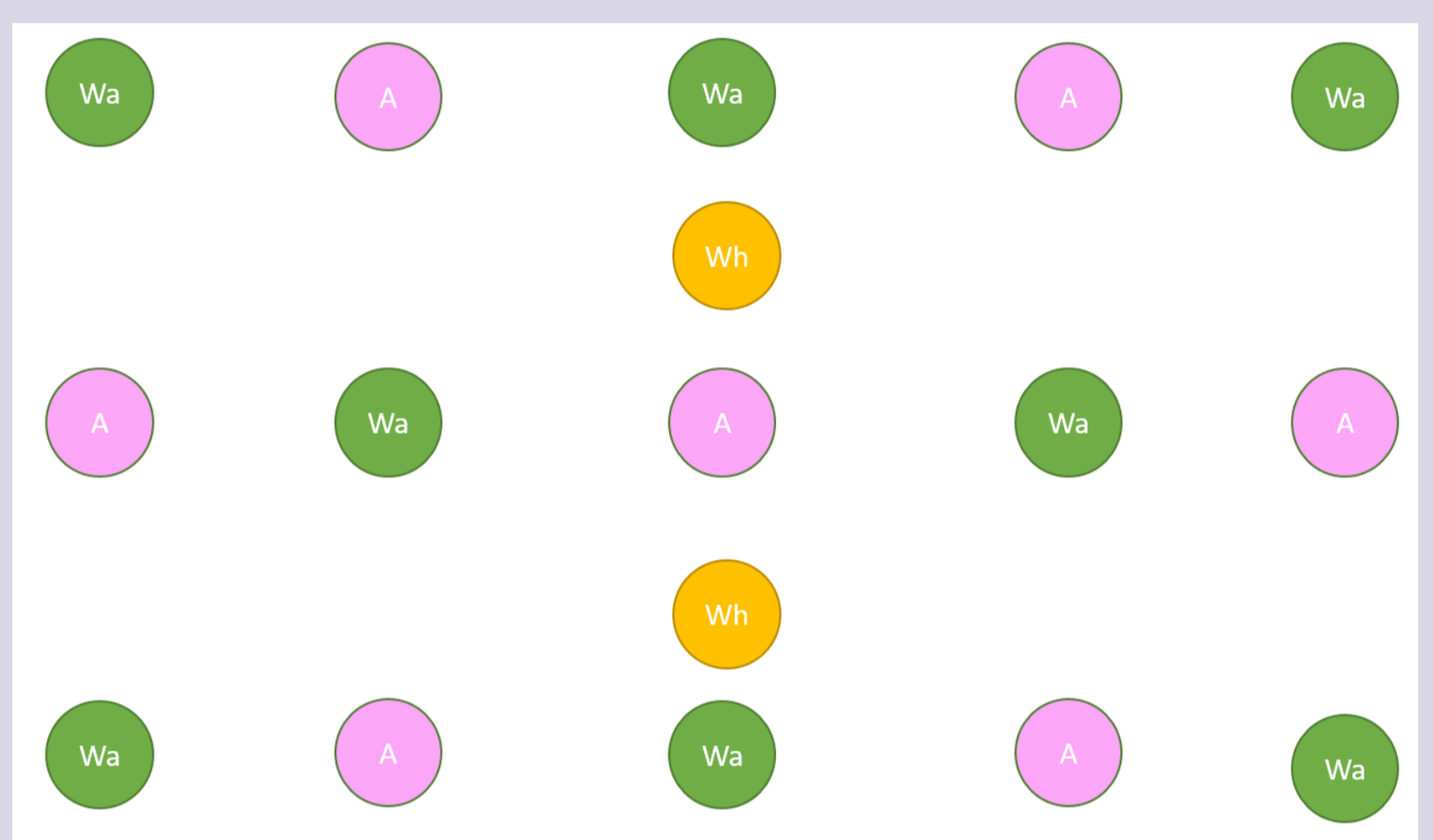


## Traditional way



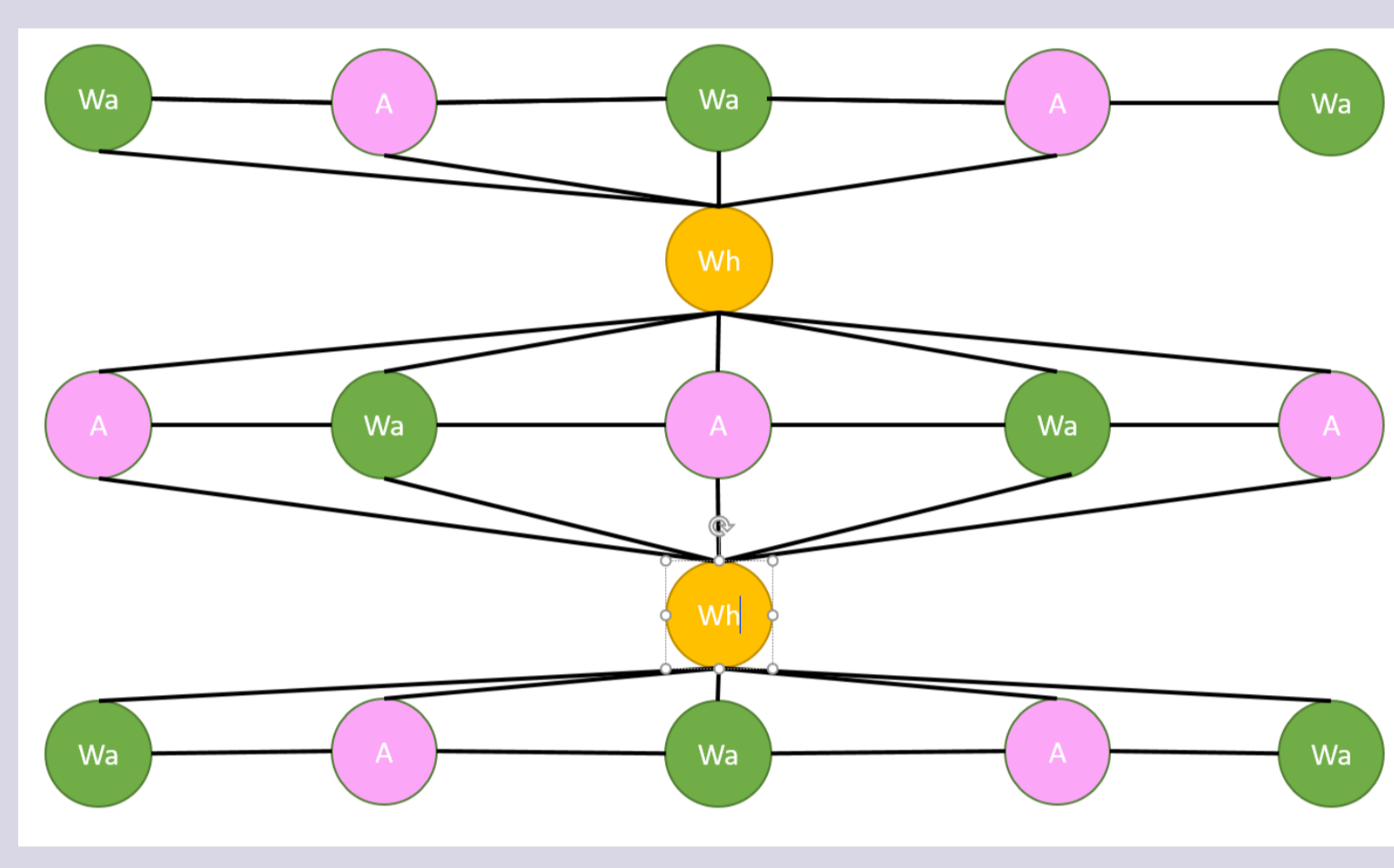
(Space and time) Designs are not easy to share

## Our method

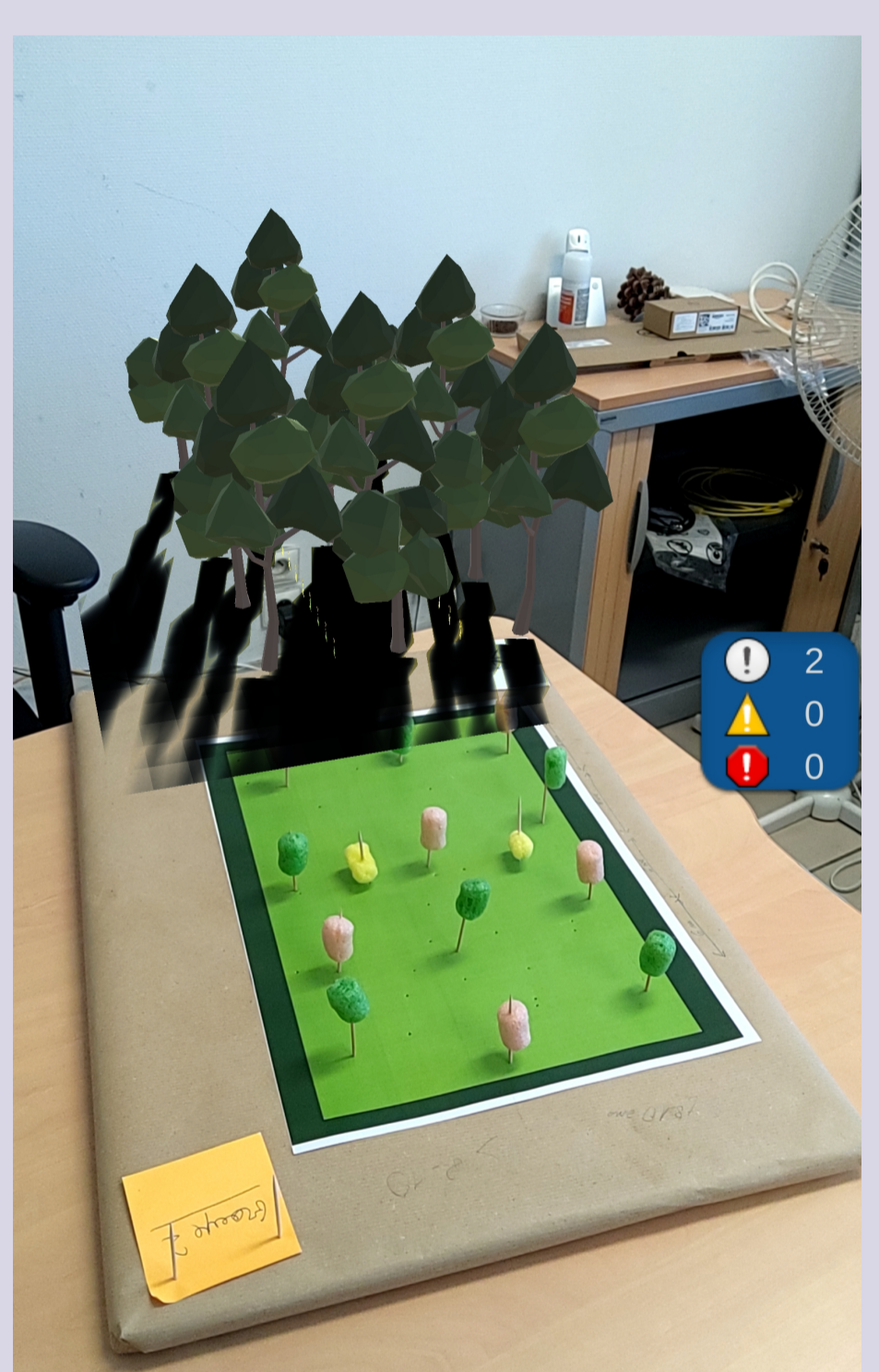


Processed digital twin of the mockup

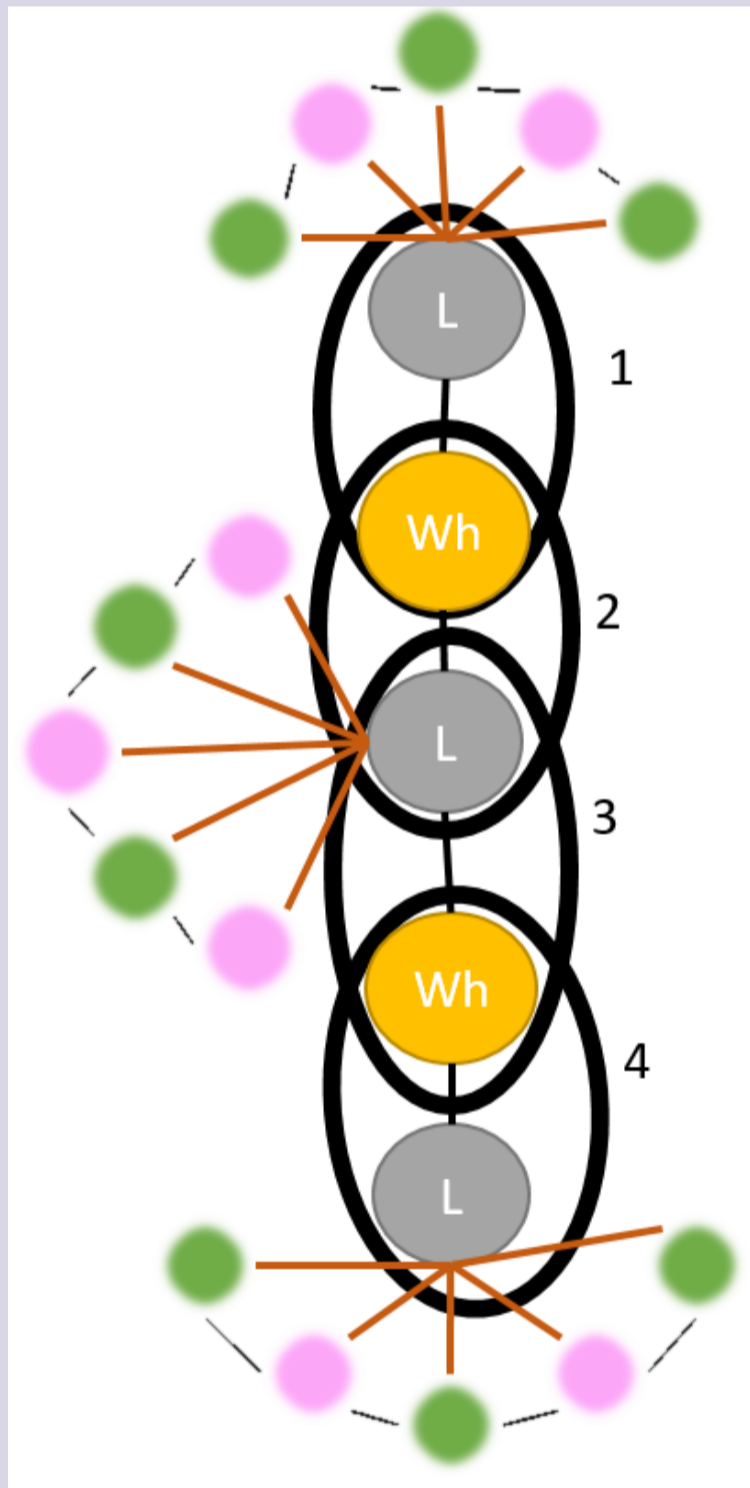
Each element is transformed into a node  
 = Apple tree  
 = Walnut  
 = Wheat



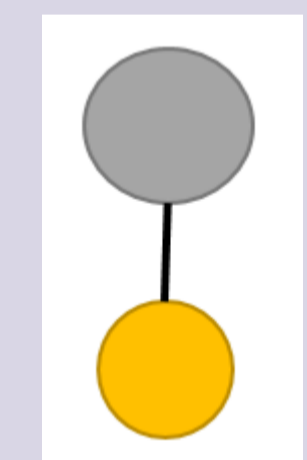
Digital twin is translated into a graph  
 2 elements are neighbors -> an edge



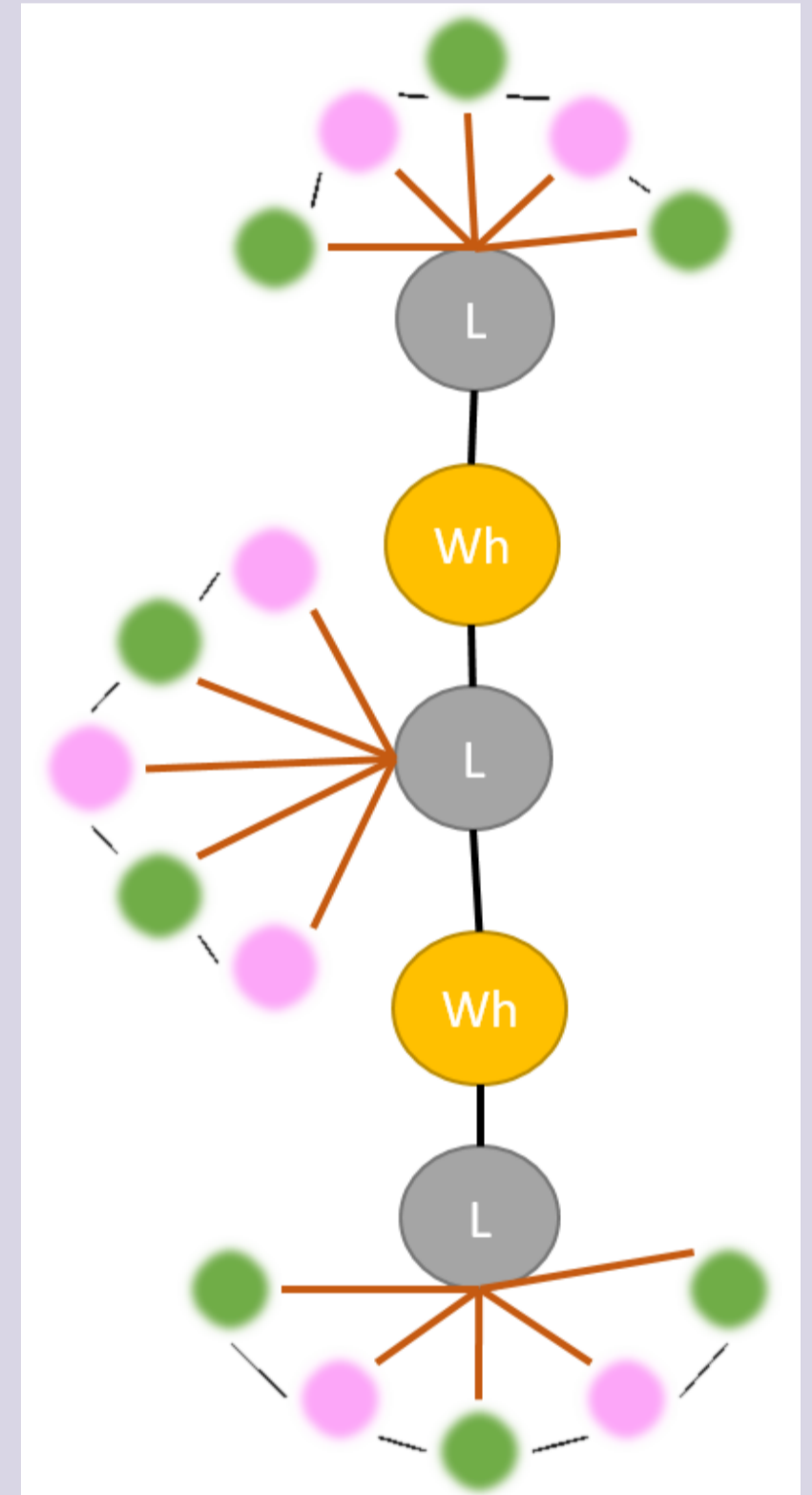
Visualization of the agroforestry system with ecosystem services



Search of known patterns  
 1 pattern = structure supporting ecosystem services



= limiting water stress by tree shadow

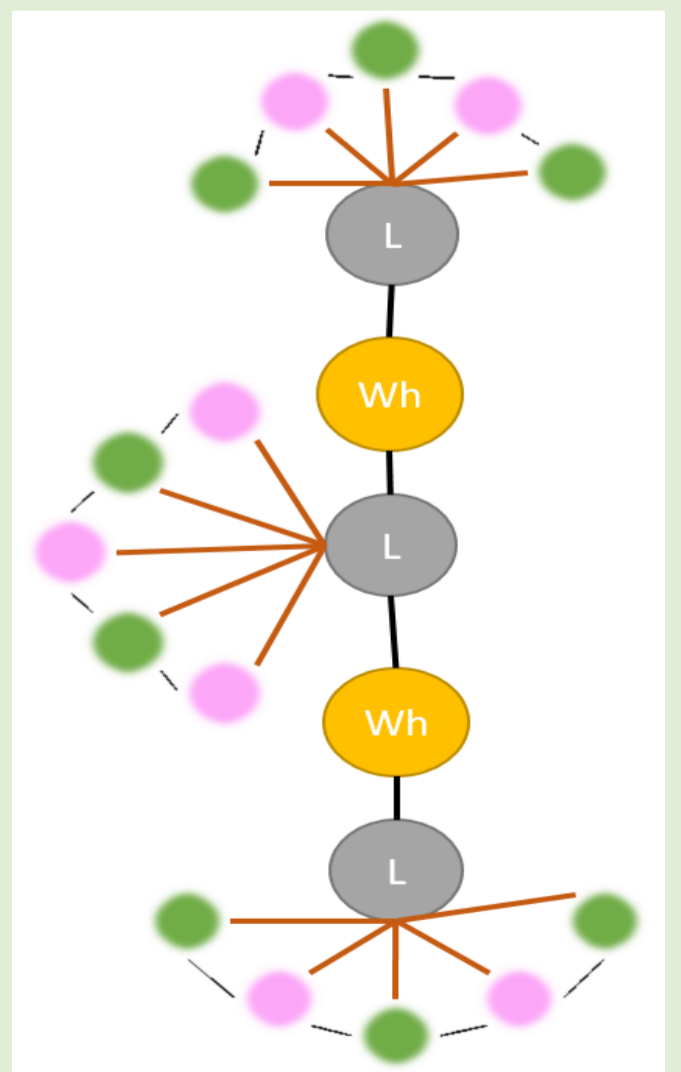


Hierarchical graph  
 Higher level elements are identified

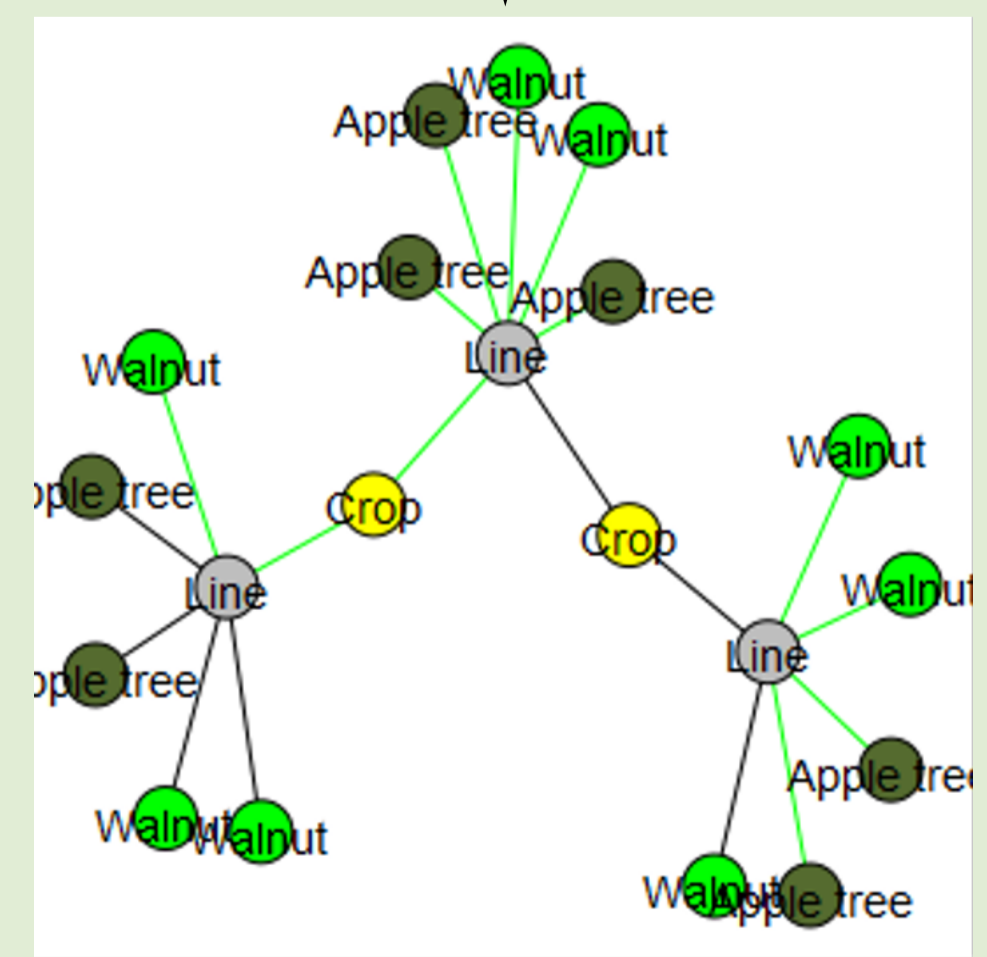
● = vegetal cover

## Results and discussion

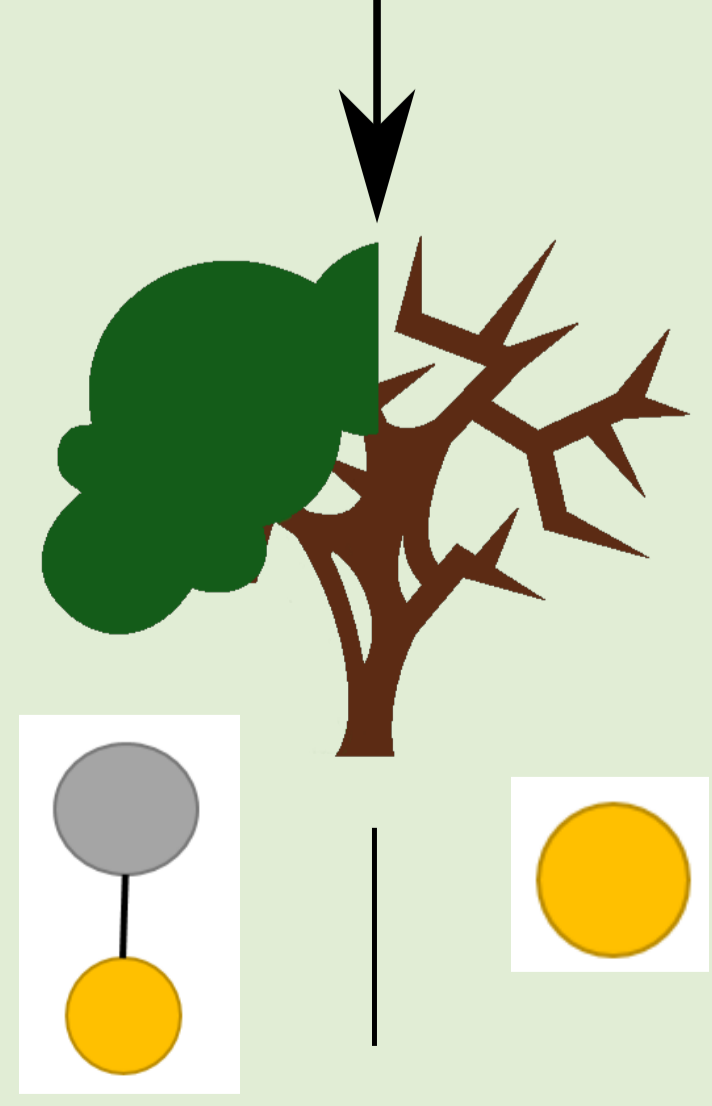
A novel way to describe agroforestry systems based on graphs



To compare agroforestry systems



To model temporal evolution of ecosystem services



To share a more precise common view

Better knowledge of the system