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# LandSFACTS v2.0 – TUTORIAL
# Land Use

## Landscape Scale Functional Allocation of Crops Temporally and Spatially


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# LandSFACTS v2.0 Tutorial

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# 1. User tips

This tutorial only aims at providing a quick practical overview of the main functions of the software. For further information please refer to the Help file.

• Tutorial data inputs are in the “Tutorial_DataInputs” folder

• An example of the completed tutorial project is in “Tutorial_FullProject” folder

**General tips:**

- Project folder: holds all information relating to a project. Inputs data are organised & stored within the project database. 

- The availability of menus and options are dependent upon the information held within the database.
- Completed options are identifiable by their green tick. 
- Most windows are expendable by dragging the corners.
- Tables to import are in DBF IV format
- PlgID refers to polygon ID, and CID to final crop ID [i.e. land use ID]
- Help file

# 2. Install Software

a. Install software:

- Unzip

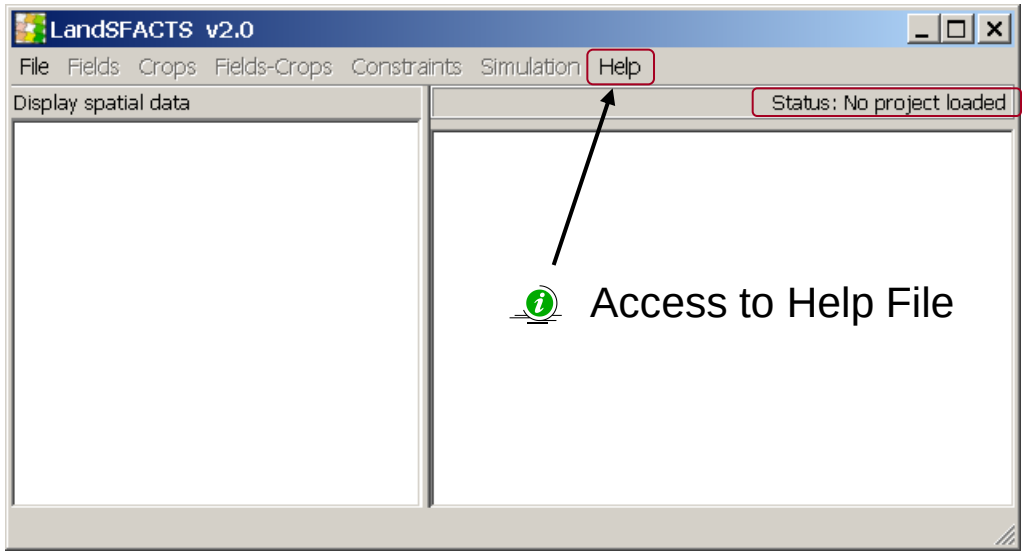

- Place the shortcut on the desktop


- Move the shortcut to the desktop

# 3. Open Software

a. Open software, by double-clicking shortcut

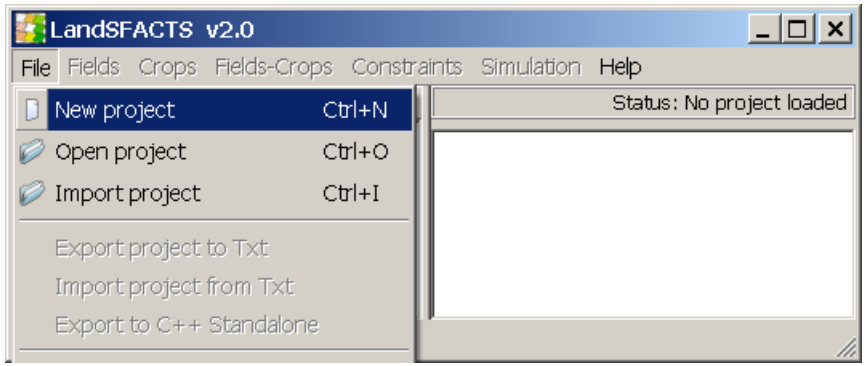

b. LandSFACTS main interface is displayed



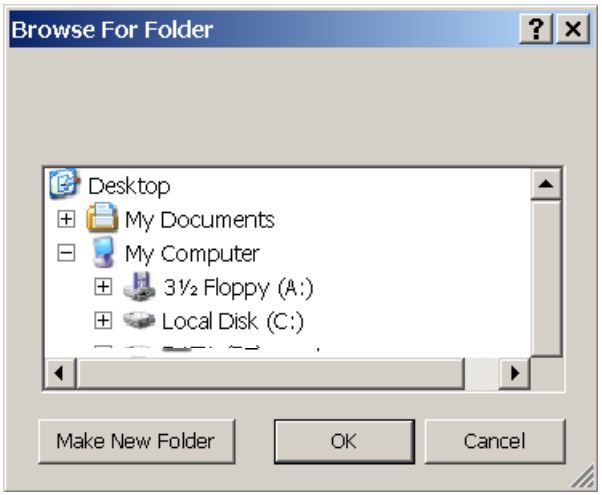
# 4. Tutorial project overview

| Tools Names | Uses for Land Use scenario | Tutorial data |
|---|---|---|
| Fields | Land use units (polygons) | BigLandSCAPE_LandUses<br>228 polygons |
| Group of fields | Group of units | Zone 1 (afforestation), Zone 2 (no limited afforestation) |
| Crops | Land uses | Cereals, Vegetables, Fallow, Forestry, Build up, Others |
| Years | Time steps | 2<br>[step 0: current land uses;<br>step 1: simulated land uses (2050) |
| Land capability | Land capability | Fields < 5,000m2 : no cereals |
| Yearly crop proportions | Target proportions of land use coverage | Whole landscape: 70% arable,<br>Zone 1: 80% forestry, 0% vegetable |
| Iterations, Crop group | Interchangeable land uses | 500 iterations using group; forestry + cereal + vegetable + fallow |

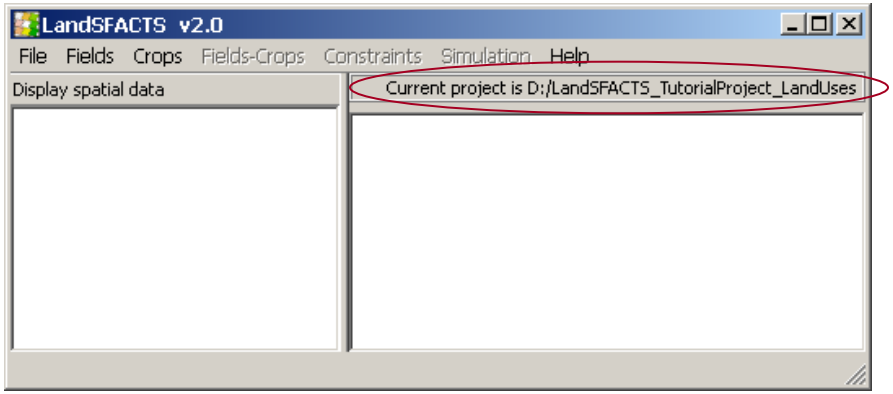
a. Select File / “New project”




b. Create new folder to hold simulation data




c. The project folder is displayed

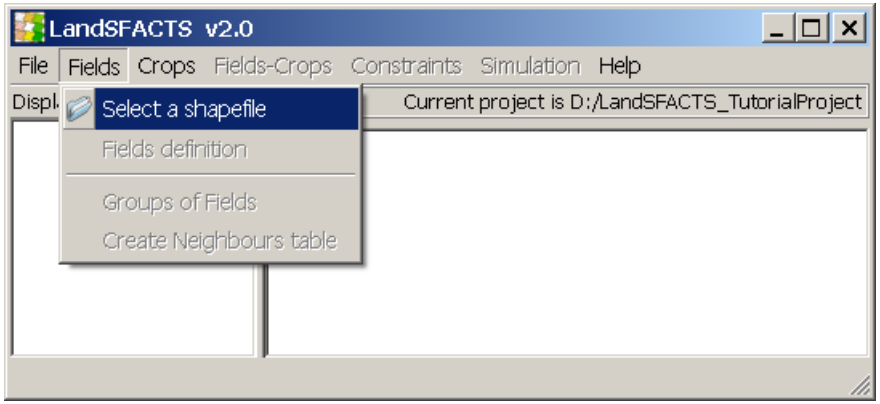


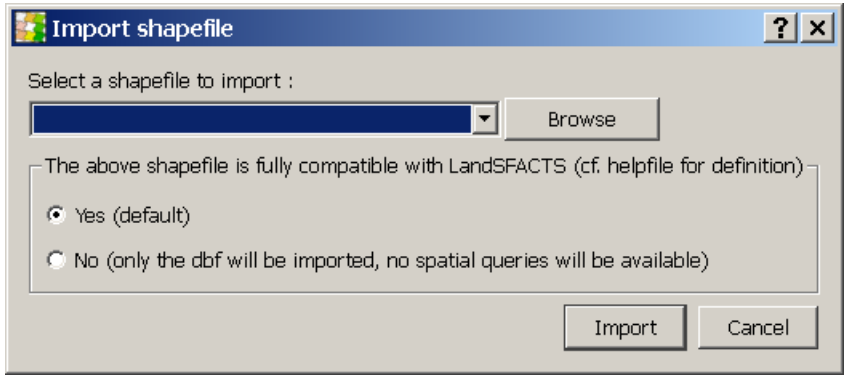

→When a project folder is selected, a blank database of the new project is created within the folder. landscapesim.db

The project folder will hold all information relating to the project.

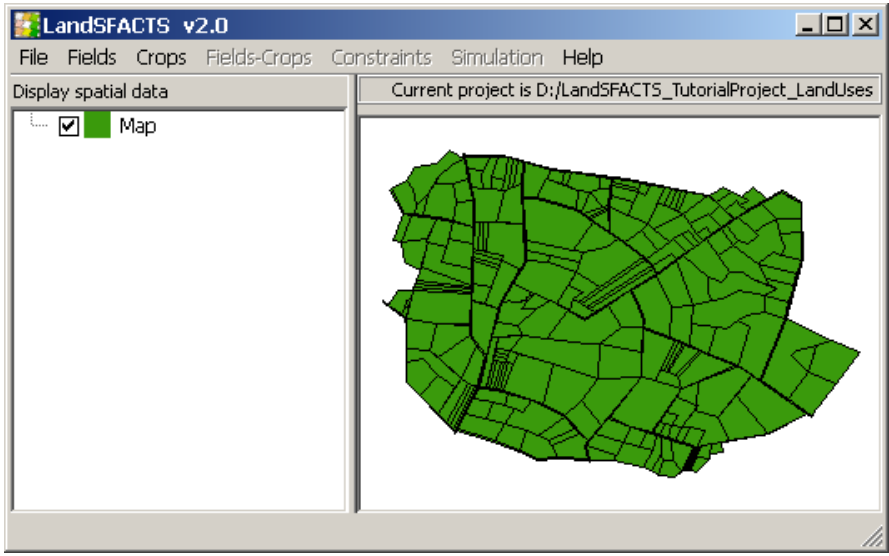
# 1. Select new shapefile

a. Select shapefile: BigLandSCAPE_LandUses.shp (from Tutorial_DataInputs)




b. The shapefile is automatically copied into the project folder, and then displayed



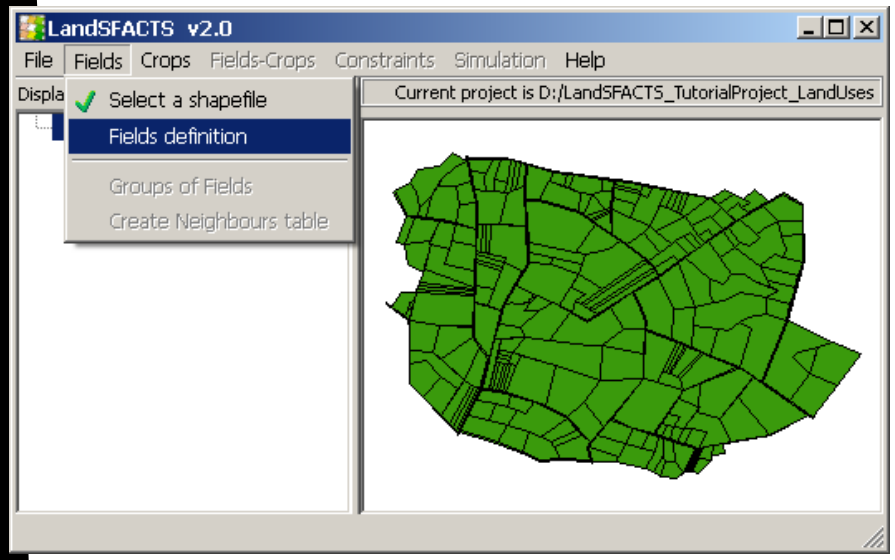
## 2. Fields definition (1/4)

**2 steps process:**

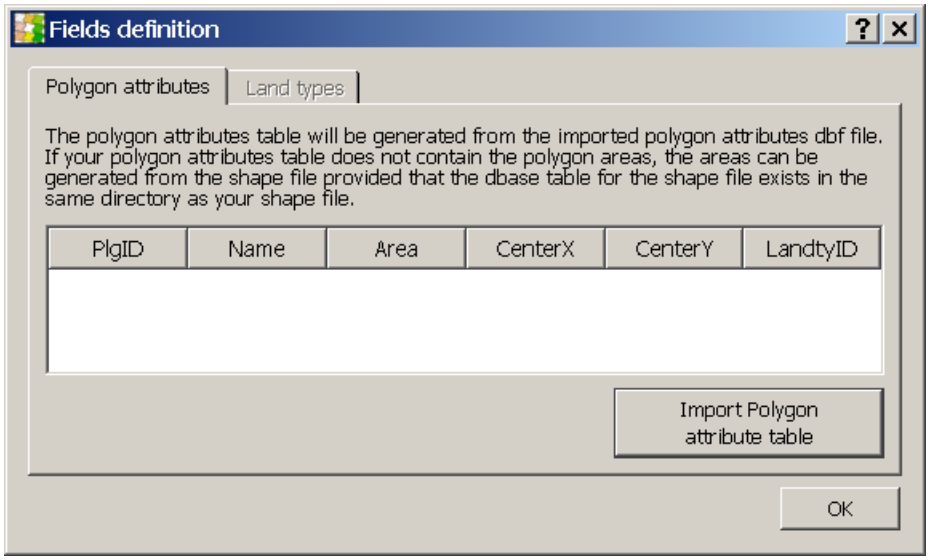
- link to every polygon a landtype ID
  → import polygon attributes table (PlgID, LandTypeID) [BL_PolygonAttributes_LandUses.dbf]

- provide a name/definition for each landtype ID
  → import land type table (LandTypeID, name/definition)

a. Select polygon attributes

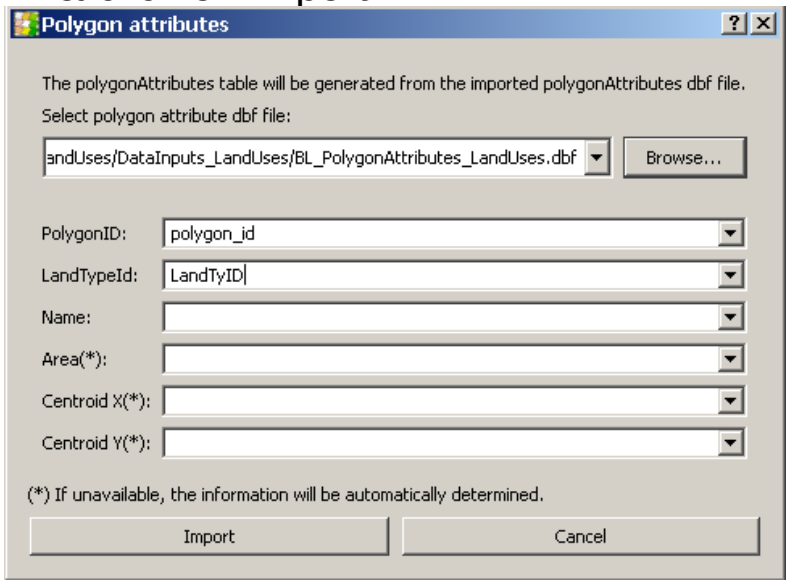



b. Import "BL_PolygonAttributes_LandUses.dbf"



## 2. Fields definition (2/4)

c. Select the correct column names
( PolygonID = PLGID,
LandTypeID = LANDTYPEID )
& click on import.

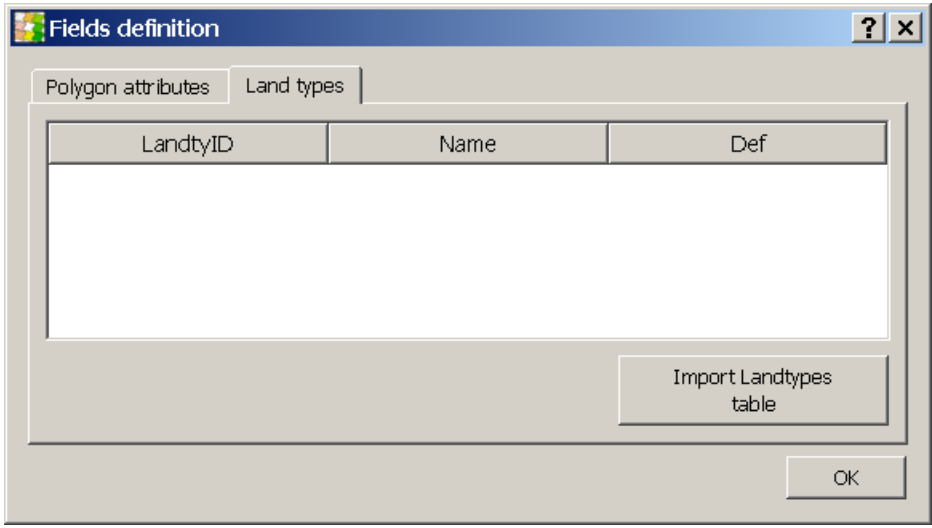



The areas and centroids are automatically calculated.

d. The polygon attributes table is displayed

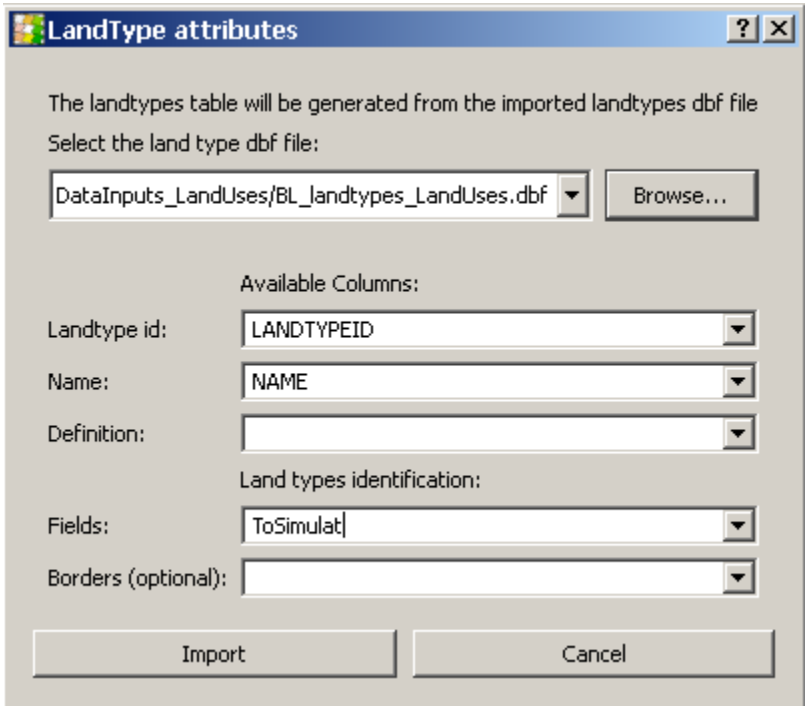
| PlgID | Name | Area | CenterX | CenterY | LandtyID |
|---|---|---|---|---|---|
| 0 | | 59864.9 | 512232 | 213387 | 0 |
| 1 | | 8056.34 | 511960 | 212966 | 0 |
| 2 | | 12759.9 | 512227 | 213255 | 0 |

e. The landtype table is now available, import Land Type: “BL_LandTypes_LandUses.dbf”

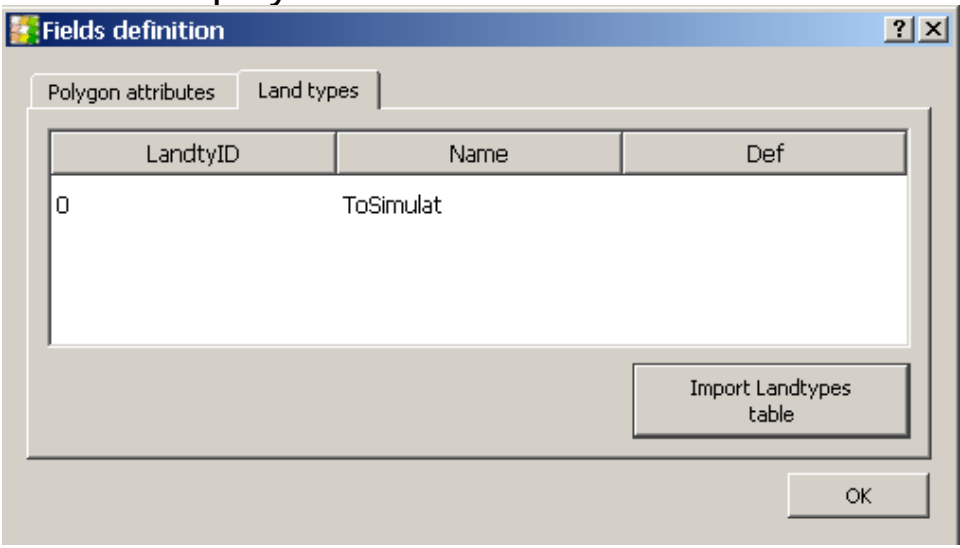


## 2. Fields definition (3/4)

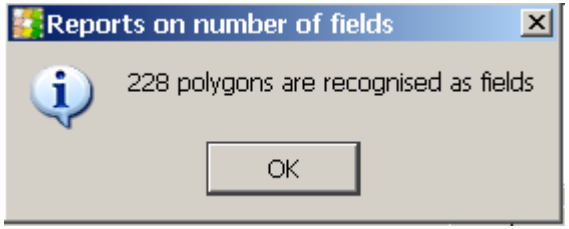
f. Select the correct columns of the table:
landtypeID = LANDTYPEID
Name = NAME
From Name, select the right definitions:
Fields = to simulate




g. Click on “Import” & the table is displayed.

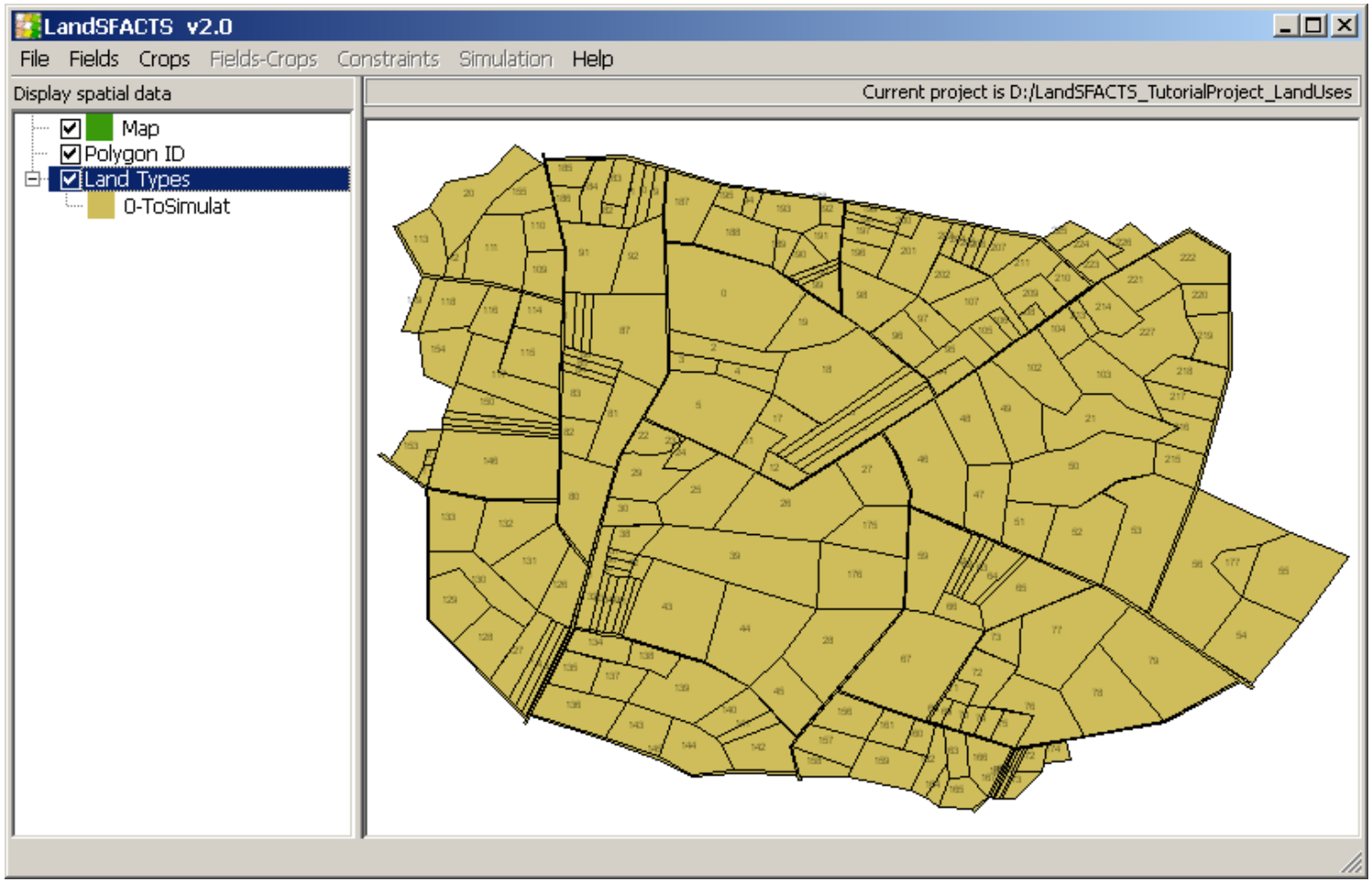



h. Indication on the number of polygons recognised as fields by the software.



## 2. Fields definition (4/4)

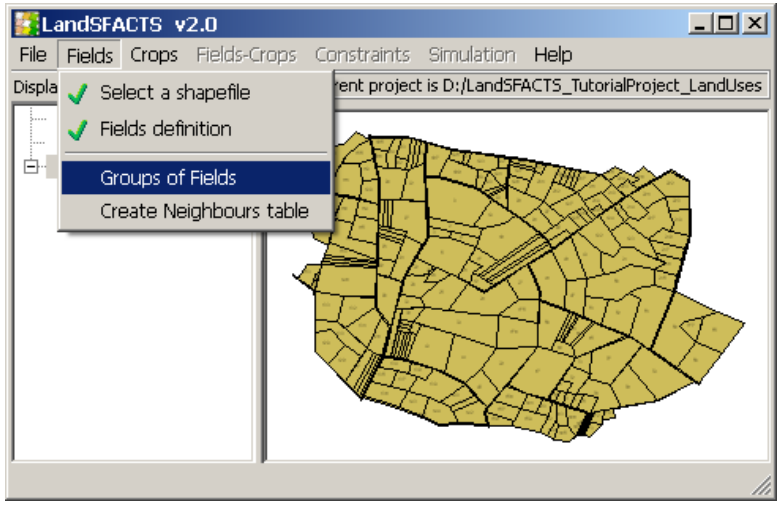
i. The ID and land type of each polygons can now be displayed.
(double click the colours on the left pan, to change them)



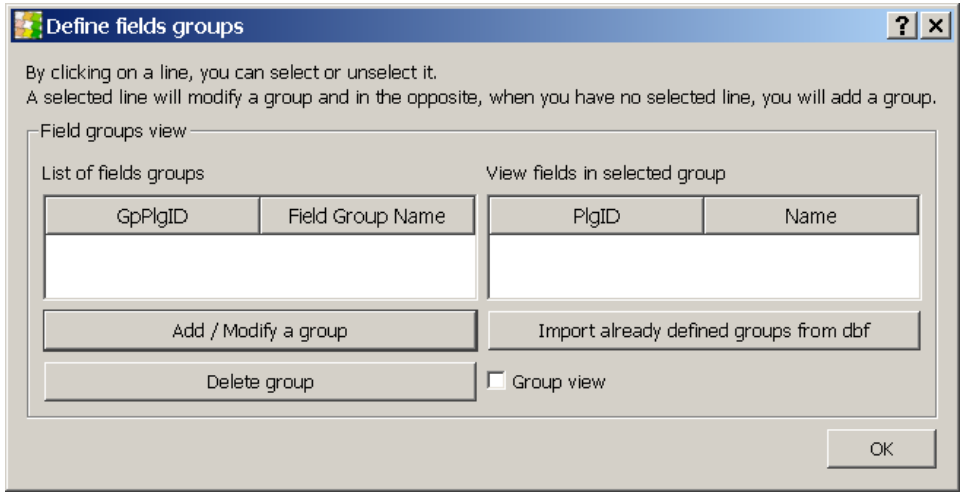

The “Map” tick is an on-off button controlling the map display

# 3. Groups of fields (1/2)

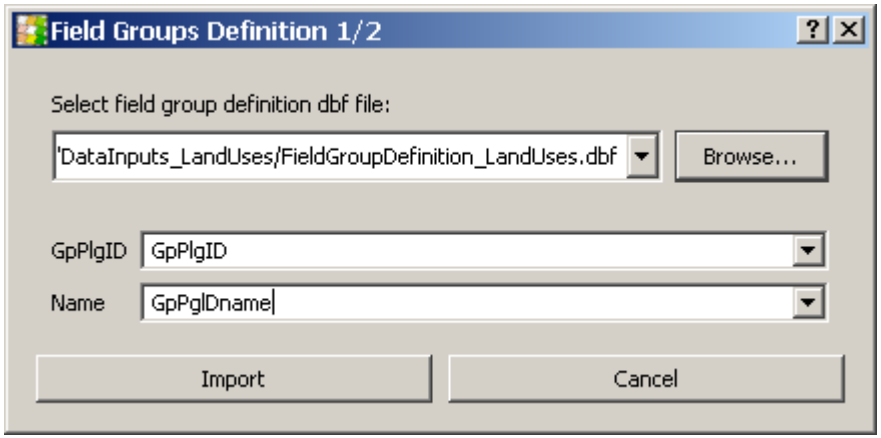
a. Select “groups of fields”



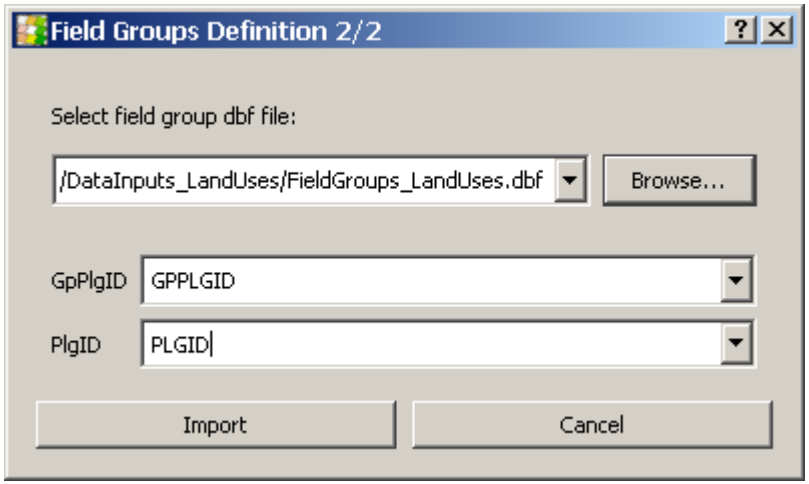

b. “Groups of fields” is displayed, the groups are already prepared in dbf file (from GIS).



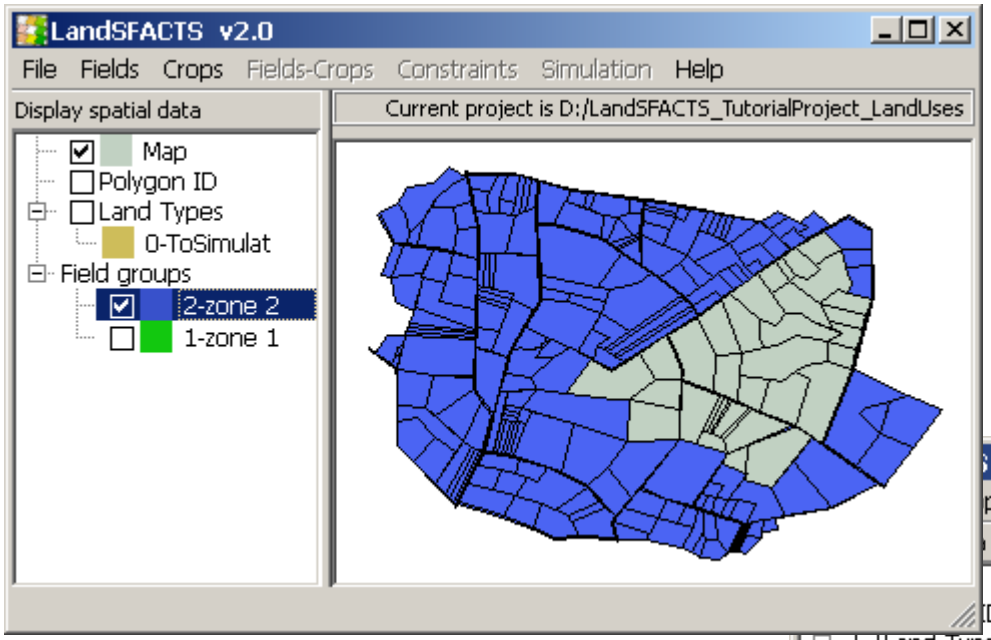

c. In “Import” interface, import the definition of the groups (group ID and names):



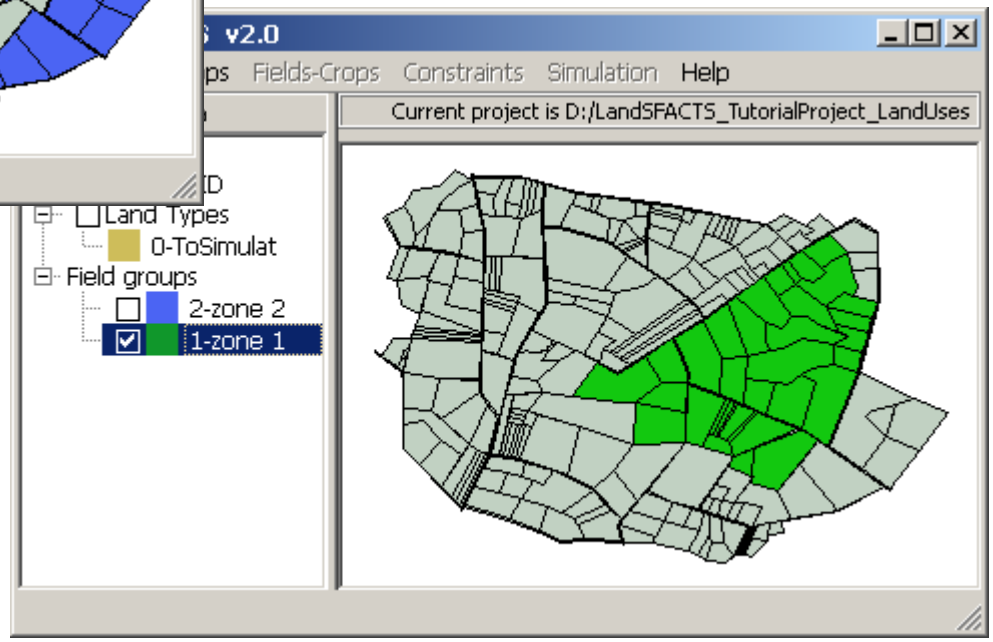

d. then, import the groups (group ID and polygon ID):



# 3. Groups of fields (2/2)

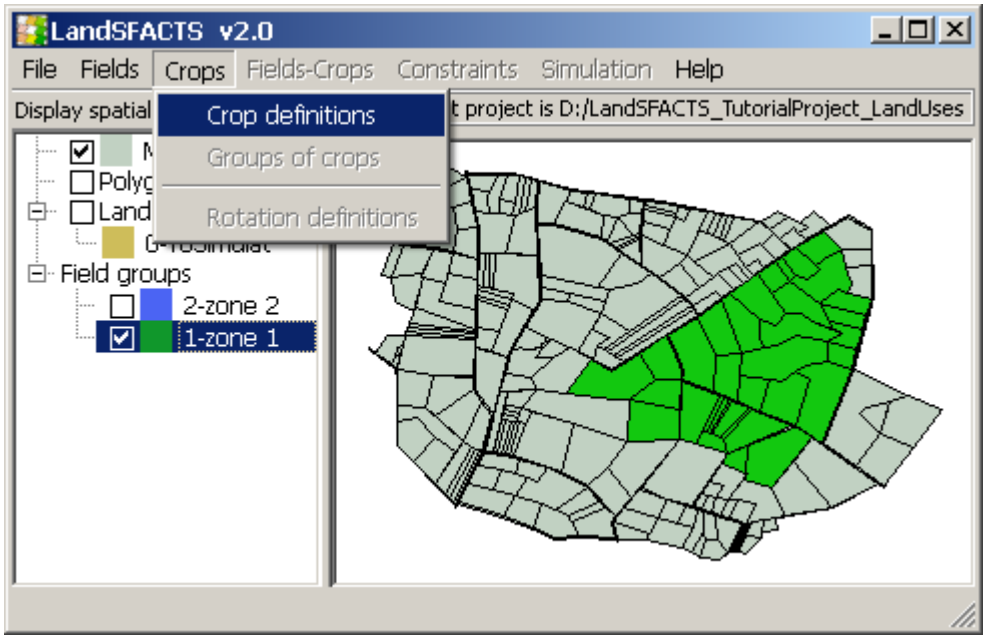



d. Both groups can be displayed



# 1. Crop definition (1/3)

a. Select crop definition




Crop definition is made up of three tables:

**Final crops**: defines the individual land uses to model (CID).

| CID | CBankID | CTypeID |
|---|---|---|
| 1 | 1 | 1 |
| 2 | 2 | 1 |
| 3 | 2 | 1 |
| 4 | 4 | 1 |
| | … | |

**Crop bank**: list the land uses

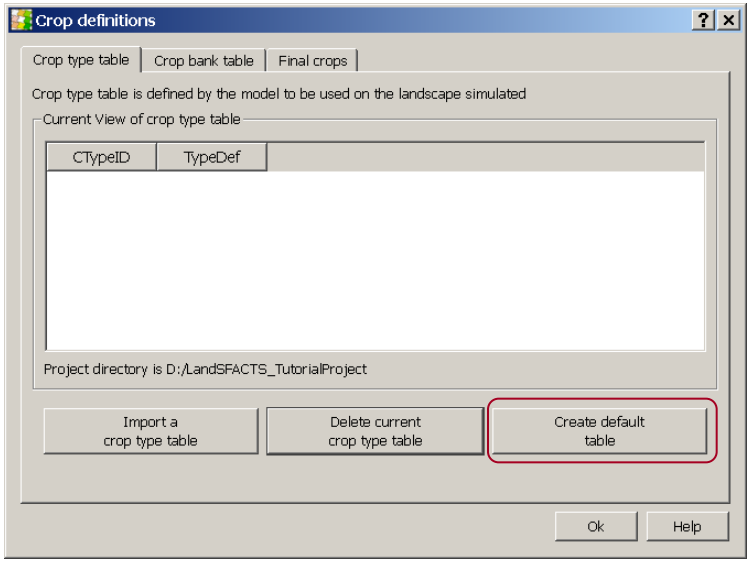
| CBankID | | Cname | |
|---|---|---|---|
| 1 | | Cereals | |
| 2 | | Vegetables | |
| 3 | | Fallow | |

**Crop type**: default

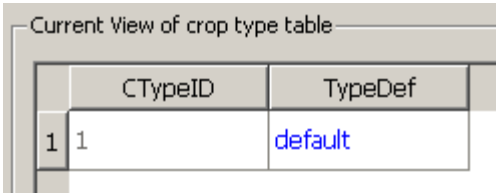
| CTypeID | TypeDef |
|---|---|
| 1 | default |

# 1. Crop definition (2/3)

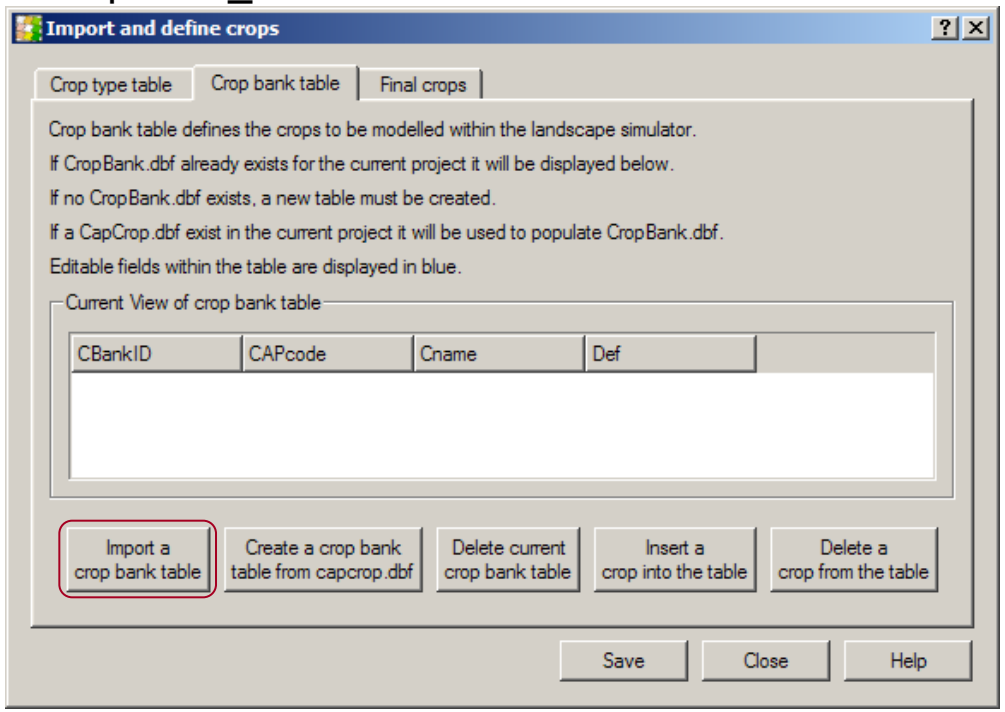
b. Create default default



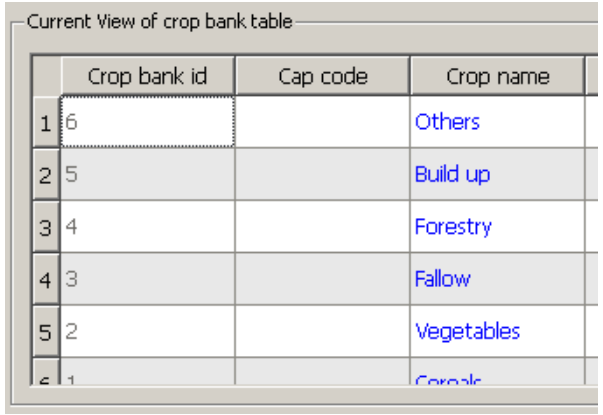

c. The crop type table is displayed




d. Next tab, “Import a crop bank table” called “CropBank_LandUse.dbf”

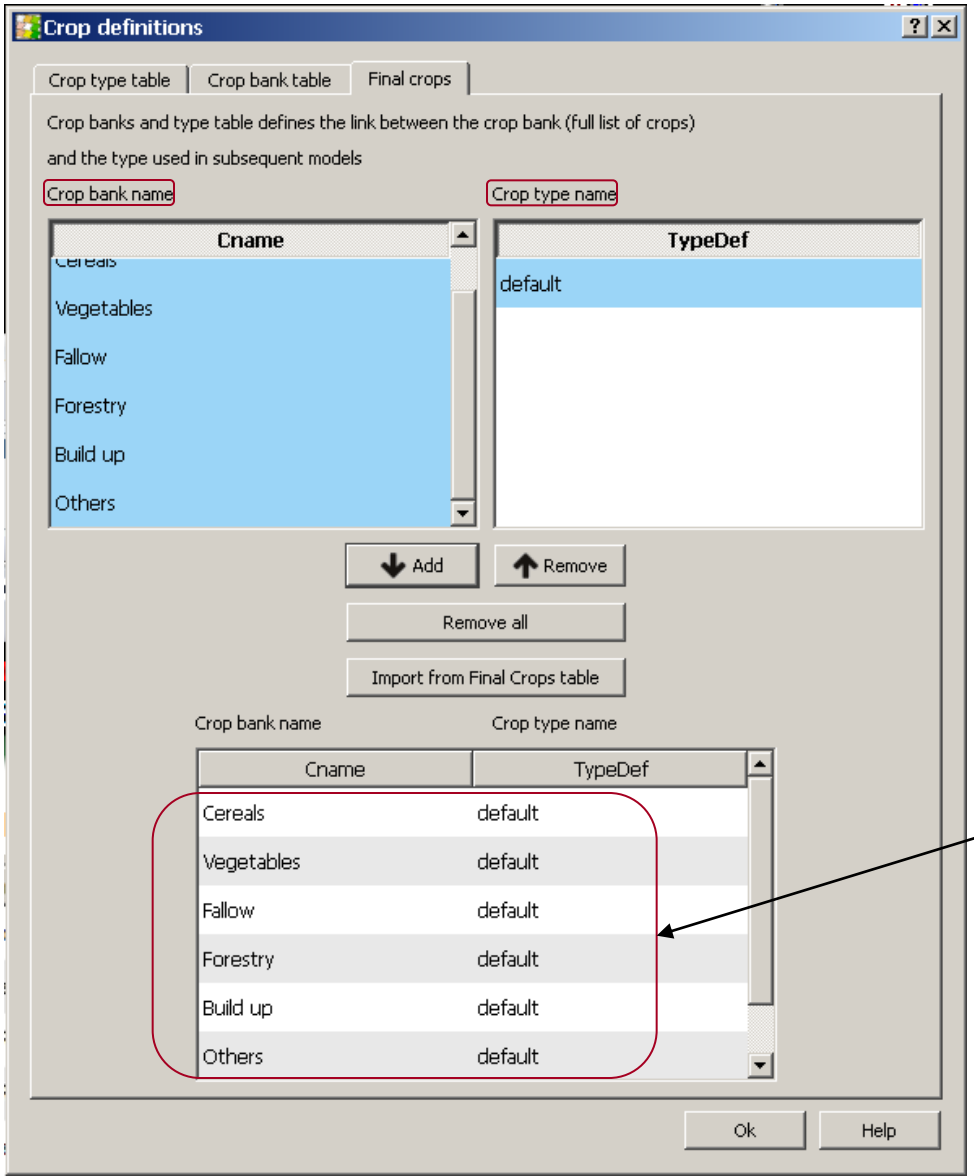



e. Crop bank table is displayed



# 1. Crop definition (3/3)

f. Next tab: Final crops



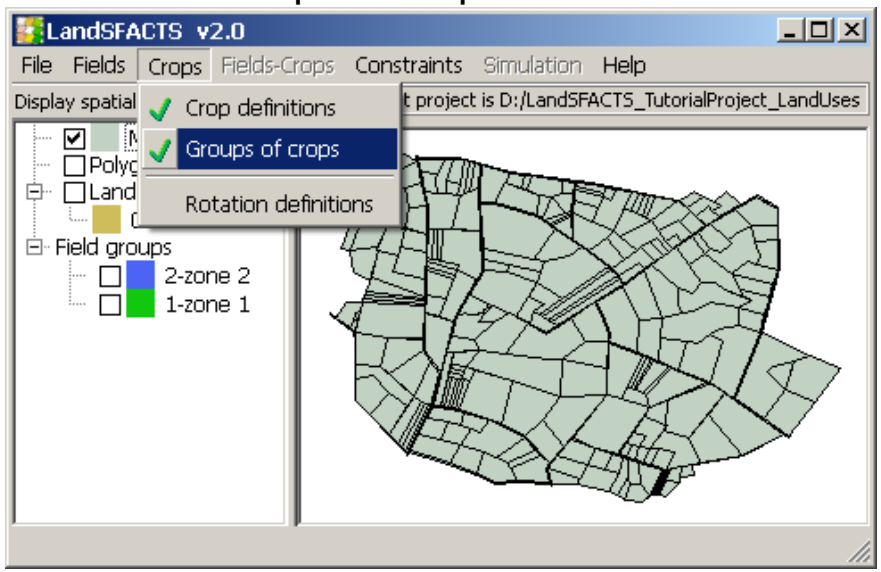

g. Link crop names with crop types, by selecting rows on the left and right boxes & down arrow.

All the crops to be used within the project must be listed here.

Final crop table

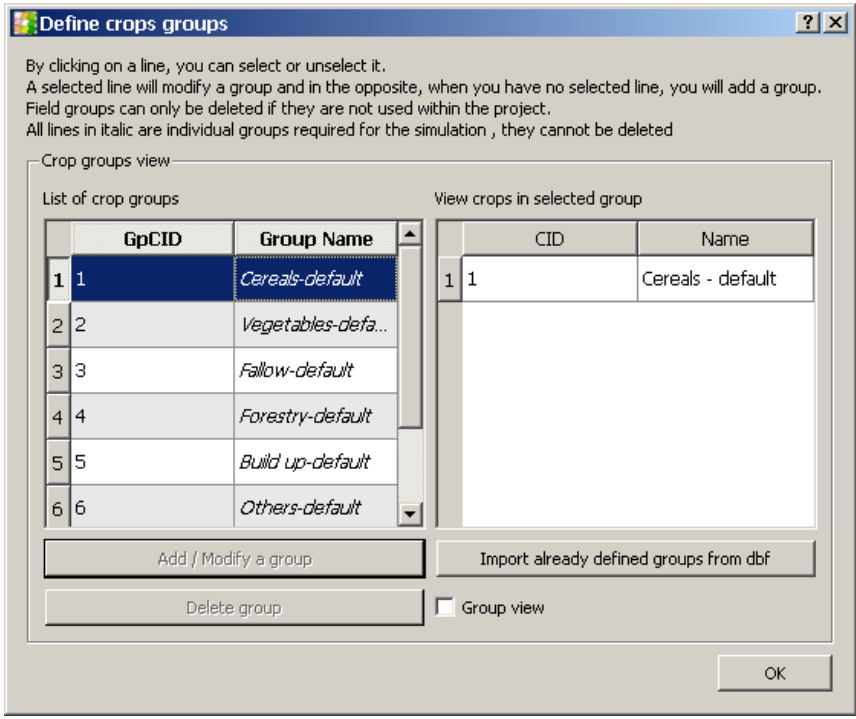
# 2. Groups of crops

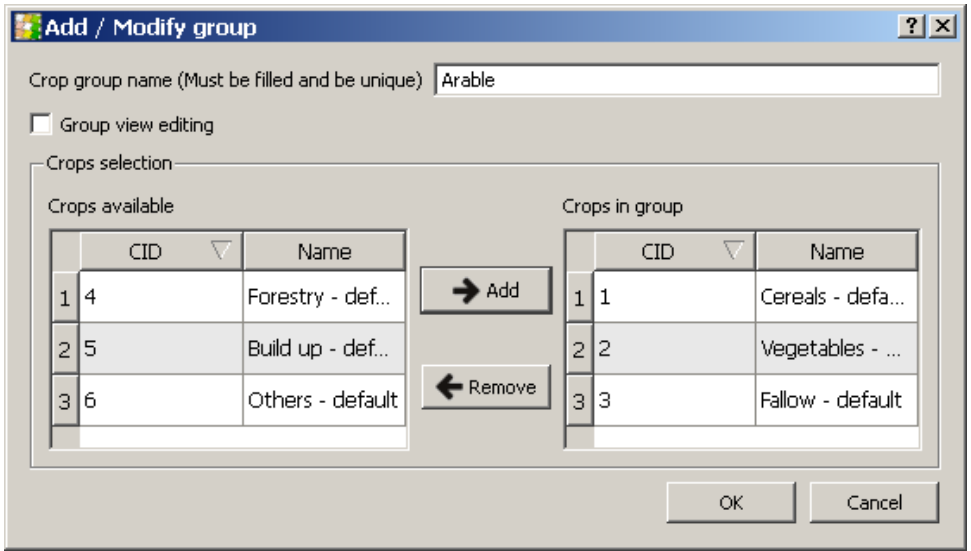
a. Select “Groups of crops”




“Add/Modify a group” is only available if no group in italic are highlighted.

b. By default, each crop individual is a group

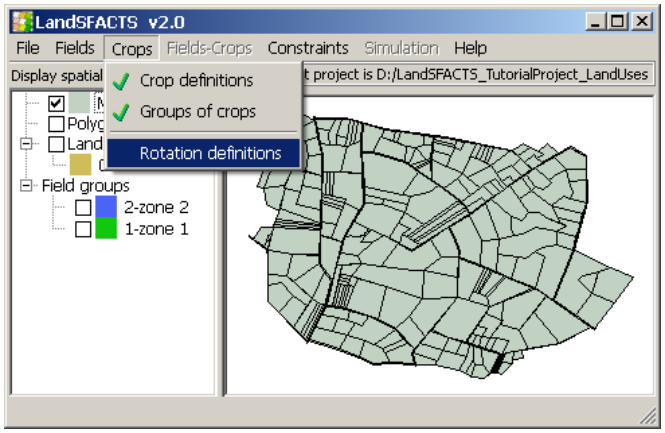


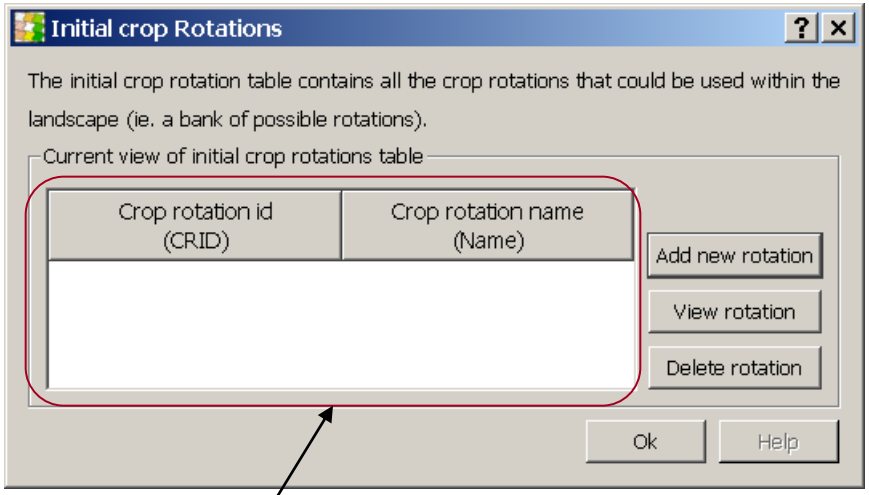

c. Click on “Add / Modify a group”, and create 1 group:
- “Arable” with Cereals + Vegetables + Fallow

# 3. Rotation definitions (1/2)

a. Select rotations definition



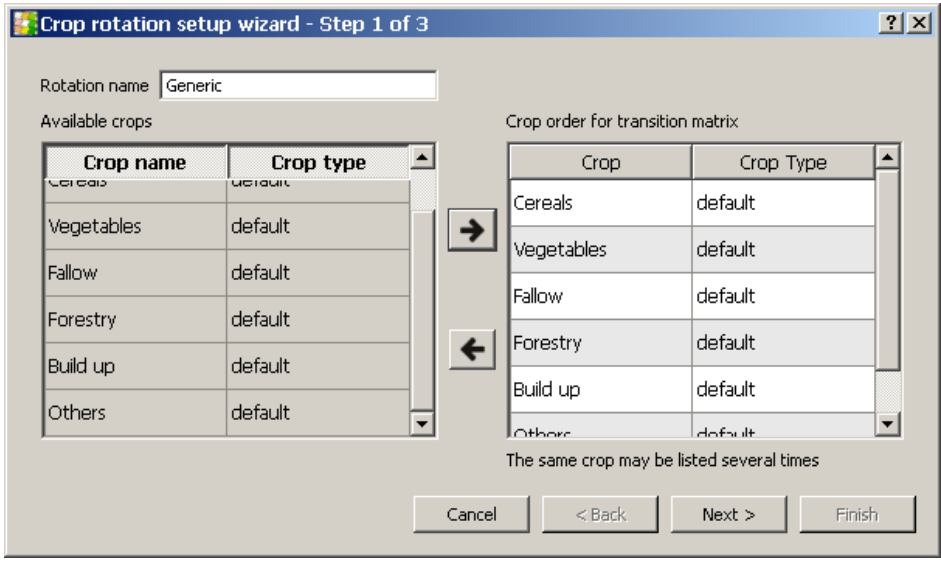

b. “Add new rotation”




List of all rotations

**1 Crop rotations to implement: all land uses with constant transition (i.e. no changes)**

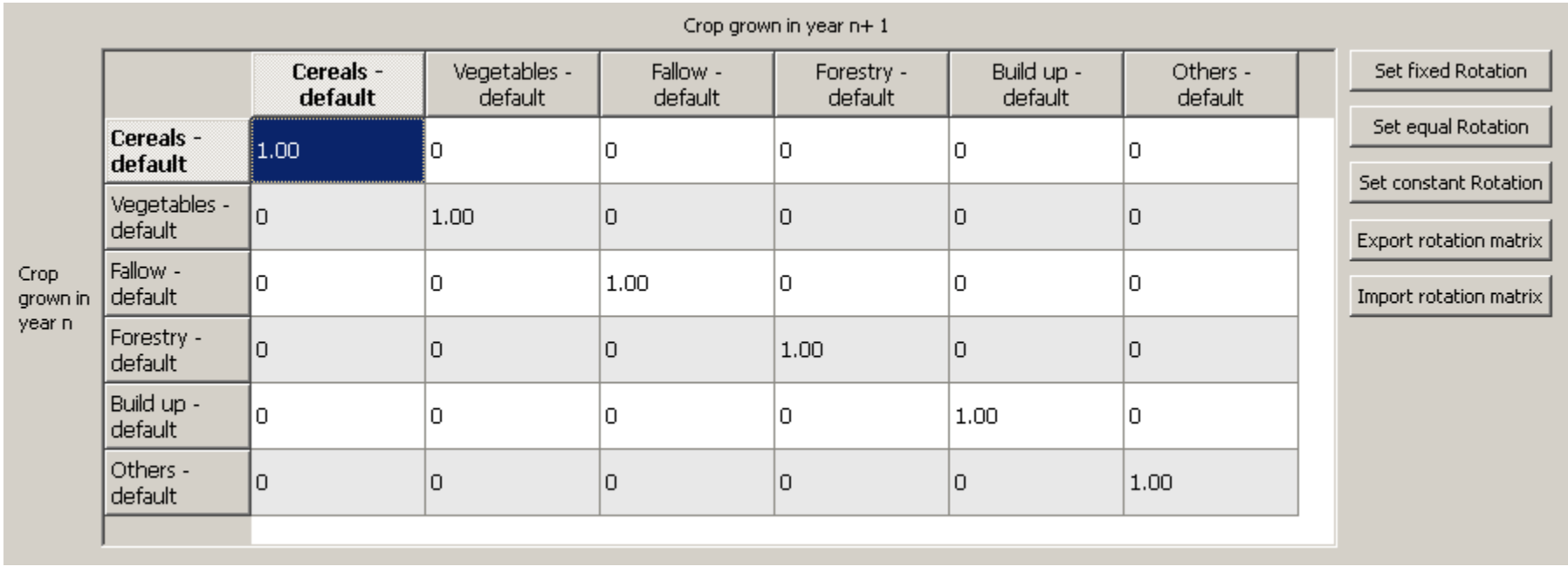
c. Rotation name: “Generic”, list all land uses




Each row must sum to 1 exactly
Cf. Helpfile for further information.

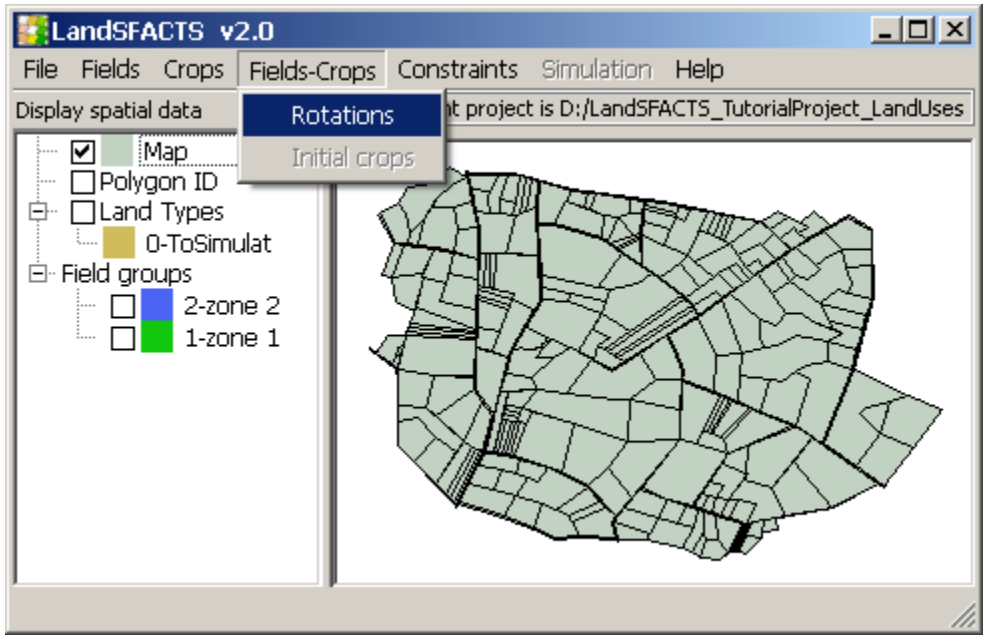
# 3. Rotation definitions (2/2)

d. “Set constant rotations”

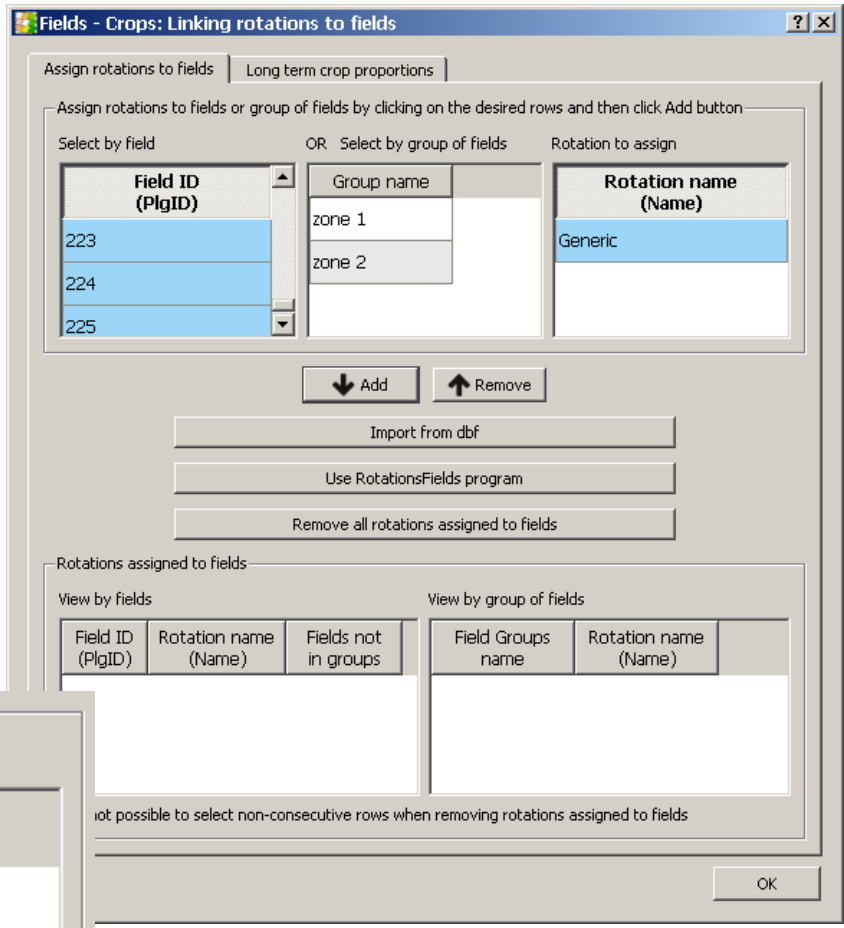


# 1. Linking rotations to fields

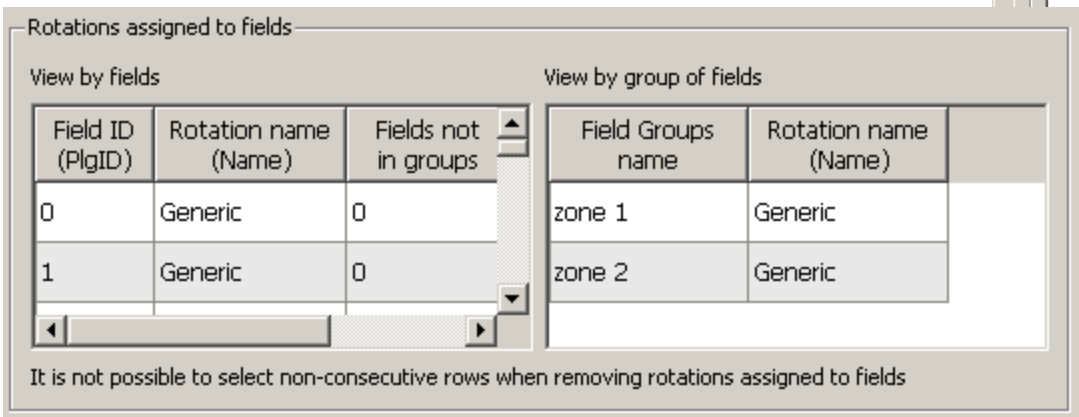
a. Select Rotations within Fields - Crops




b. Assign “generic” rotation to all fields using the “add” button

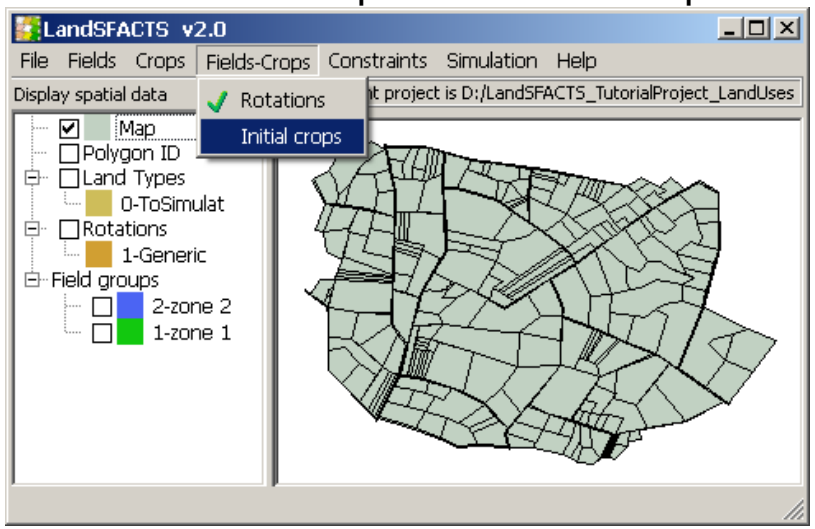



c. The allocation of the rotation to fields is displayed



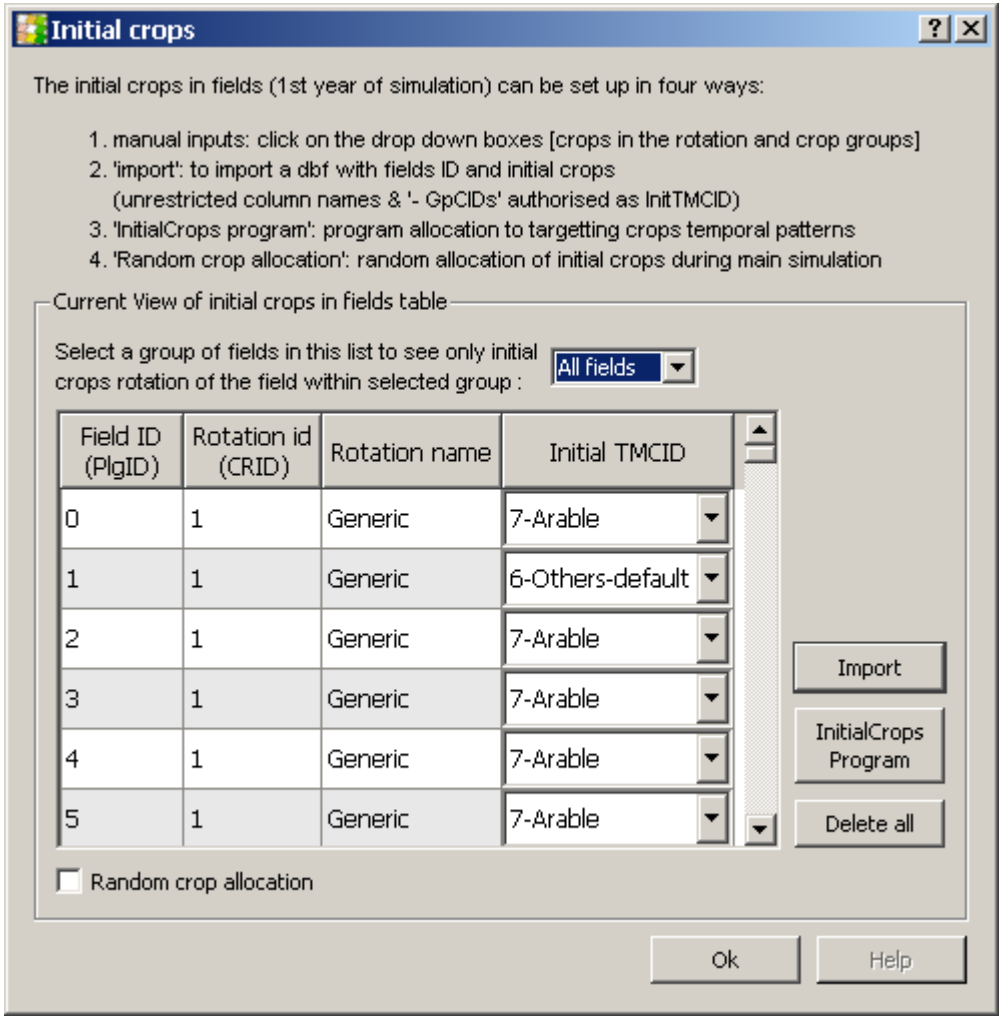
# 2. Initial crops

a.Select “Initial crops” in “Fields-Crops”



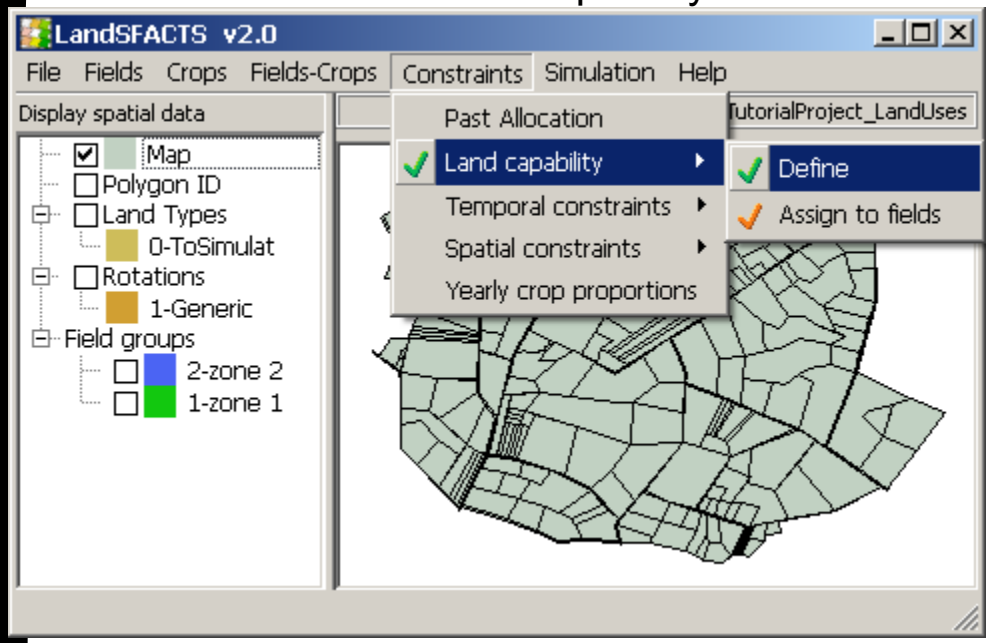

InitialTMCID refers to the initial land use or group of land use (e.g. 7-Arable) in each polygon.

b. Select “Import”, “InitialCrops_LandUses.dbf”

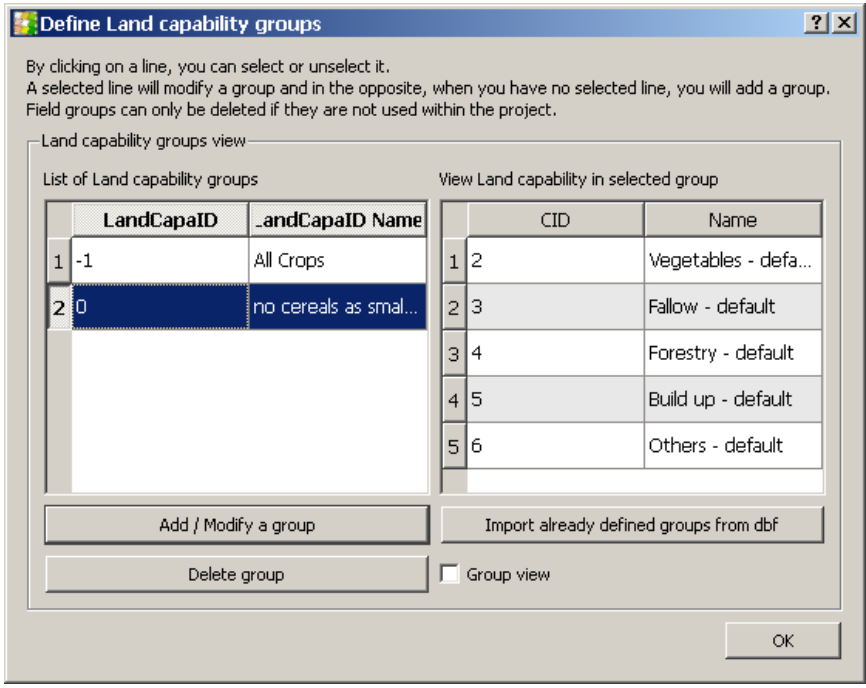


# 1. Land capability definition

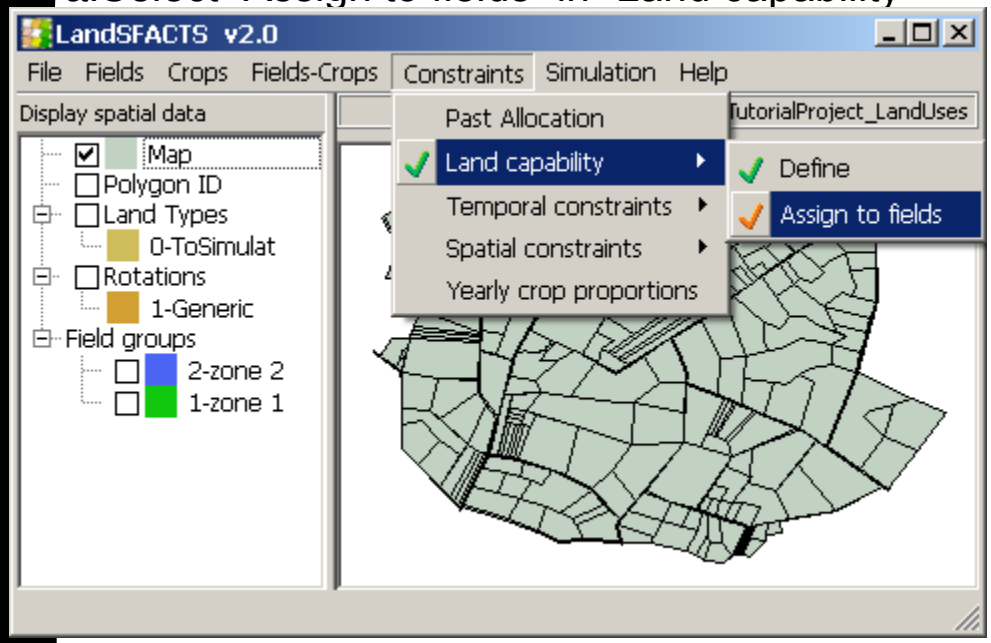
a.Select “Define” in “Land capability”



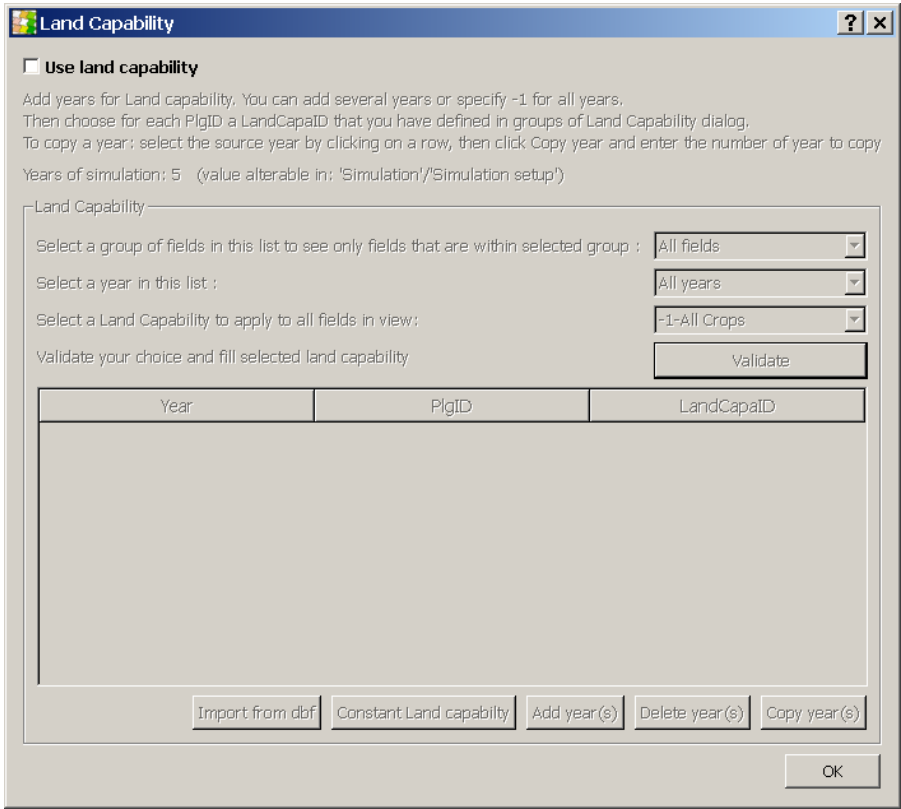

b. By default a class is created for all the crops,
add one more group “no cereals as small fields”, it comprises all land uses



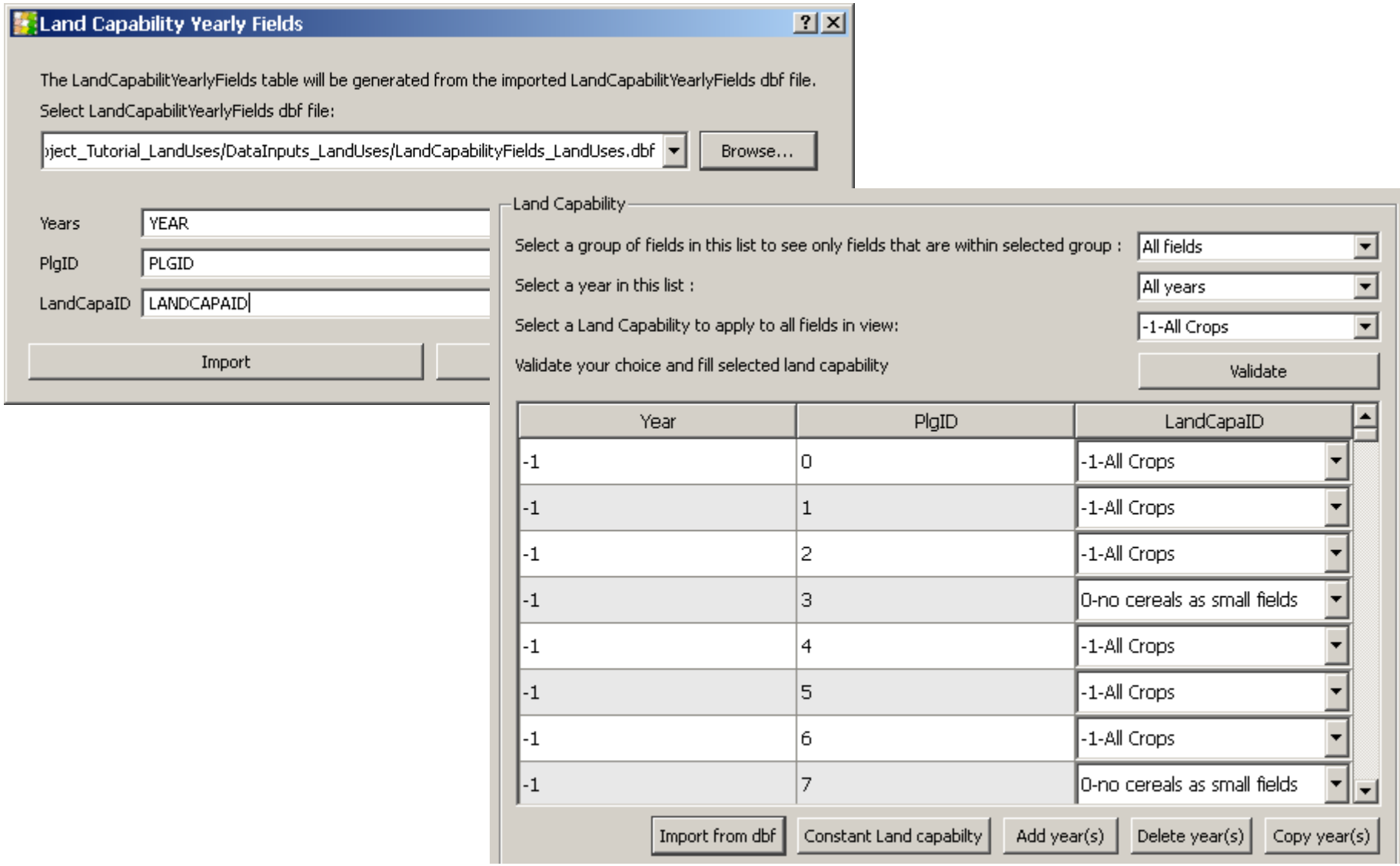
a.Select “Assign to fields” in “Land capability”




b. By default, no land capability are used, click on “Use land capability” to enable it.

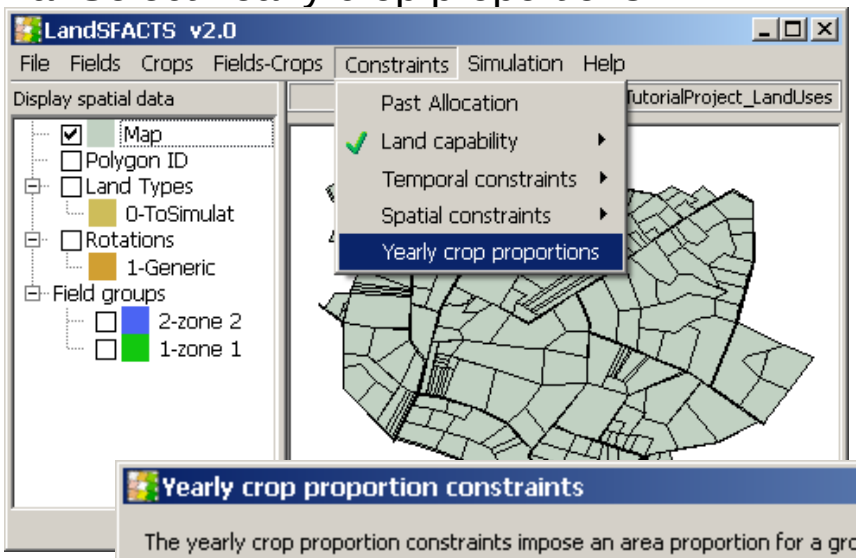


c. Import from dbf “LandCapabilityFields_LandUses.dbf”



# 4. Yearly crop proportions

a. Select Yearly crop proportions




b. Click “Add constraints”, add 3, cf. below

**Yearly crop proportion constraints**

The yearly crop proportion constraints impose an area proportion for a group of crops, over a group of fields.
Specify: constraint name, year the constraint applies to ('-1' indicates all years), group of fields, group of crops, minimum and maximum proportions with values between 0.00 and 1.00.

Years of simulation: 5 (value alterable in: 'Simulation'/'Simulation setup')

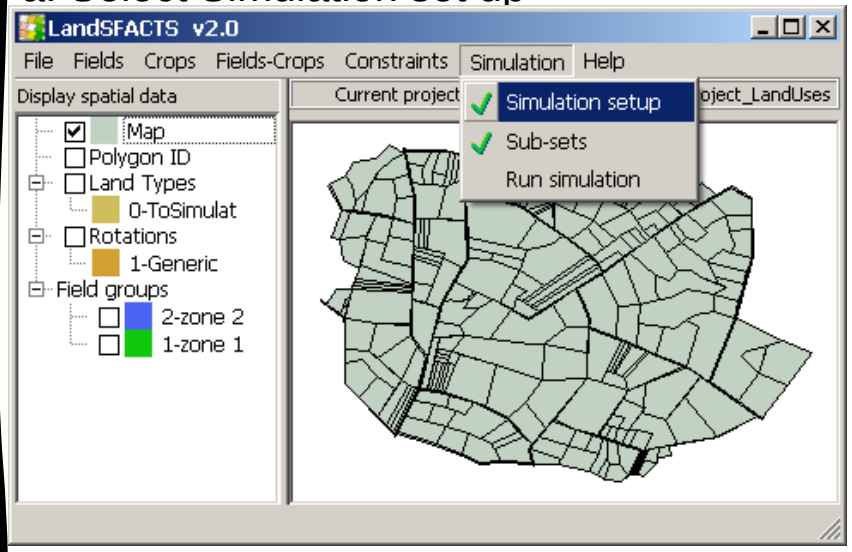
Current table of yearly crop proportions

| ConditionID | Constraint Name | Year | Fields group (GpPlgID) | Crops group (GpCID) | Minimum proportion | Maximum proportion |
|---|---|---|---|---|---|---|
| 2 | y1 - 80% forestry | 1 | 1-zone 1 | 4-Forestry-def | 0.8 | 0.85 |
| 3 | y1 - 0% vegetables | 1 | 1-zone 1 | 2-Vegetables- | 0.0 | 0.0 |
| 4 | y1 - 70% arable | 1 | -1-any field | 7-Arable | 0.70 | 0.75 |

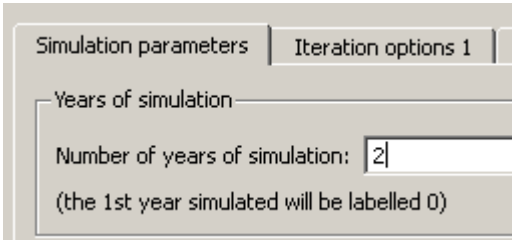
Import dbf | Add constraint(s) | All years (for selected rows) | Copy selected constraint | Delete selected constraint(s)

Ok

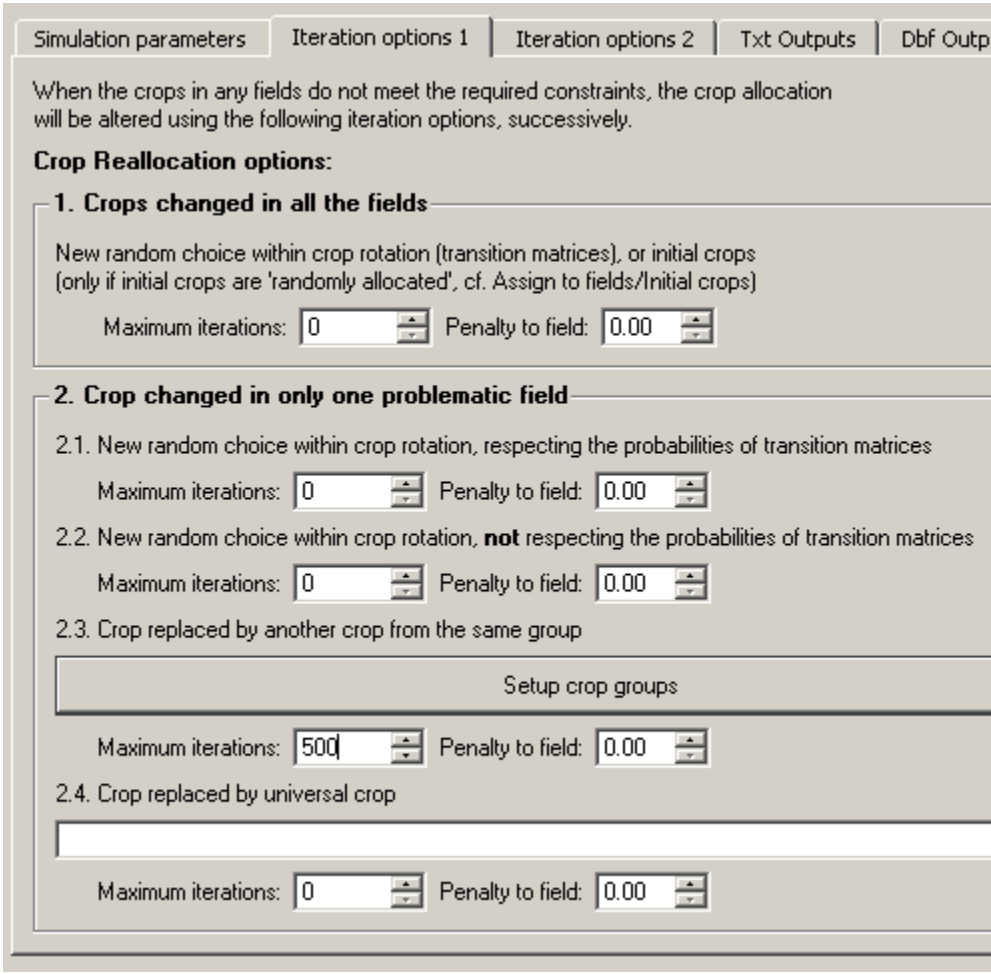
a. Select Simulation set up



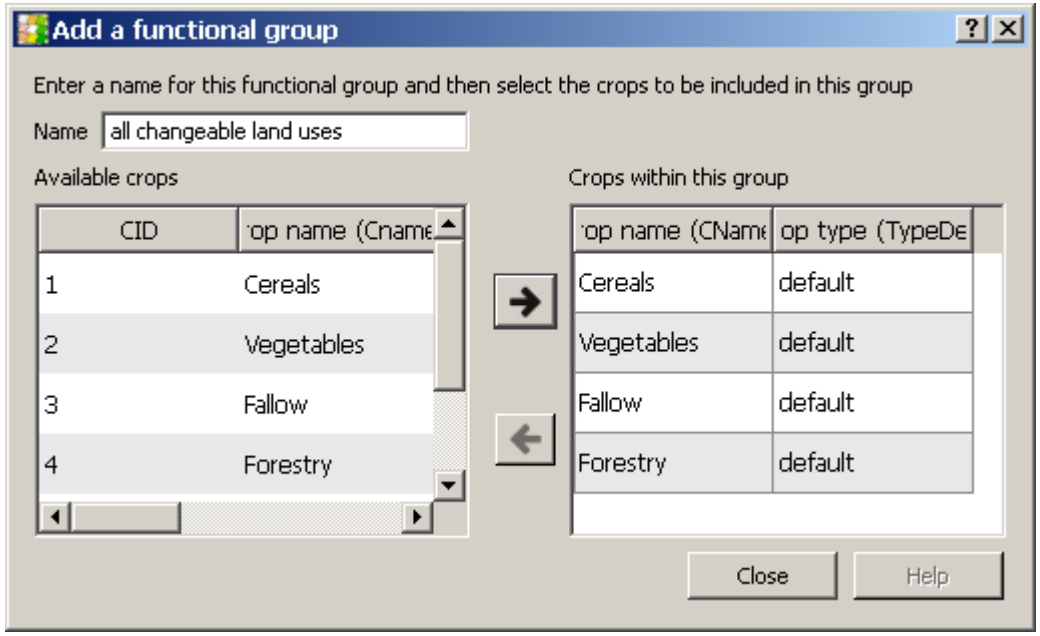

b. Fill up “Simulation parameters”
simulation years : 2



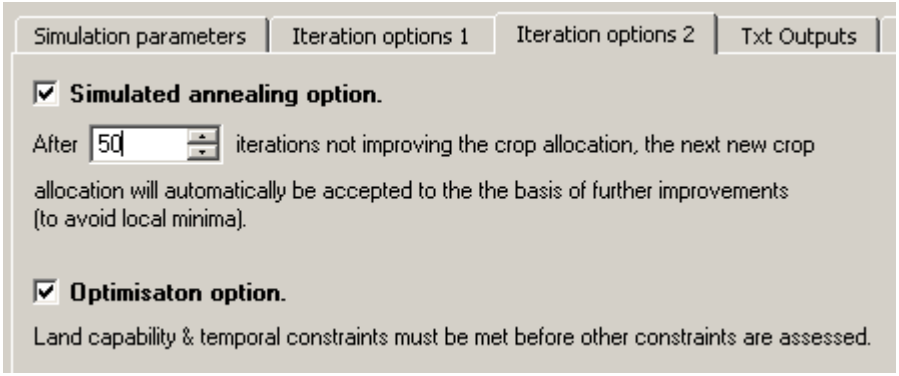

c. Iteration options 2.3 –
500 maximum iterations
“Setup crop groups”



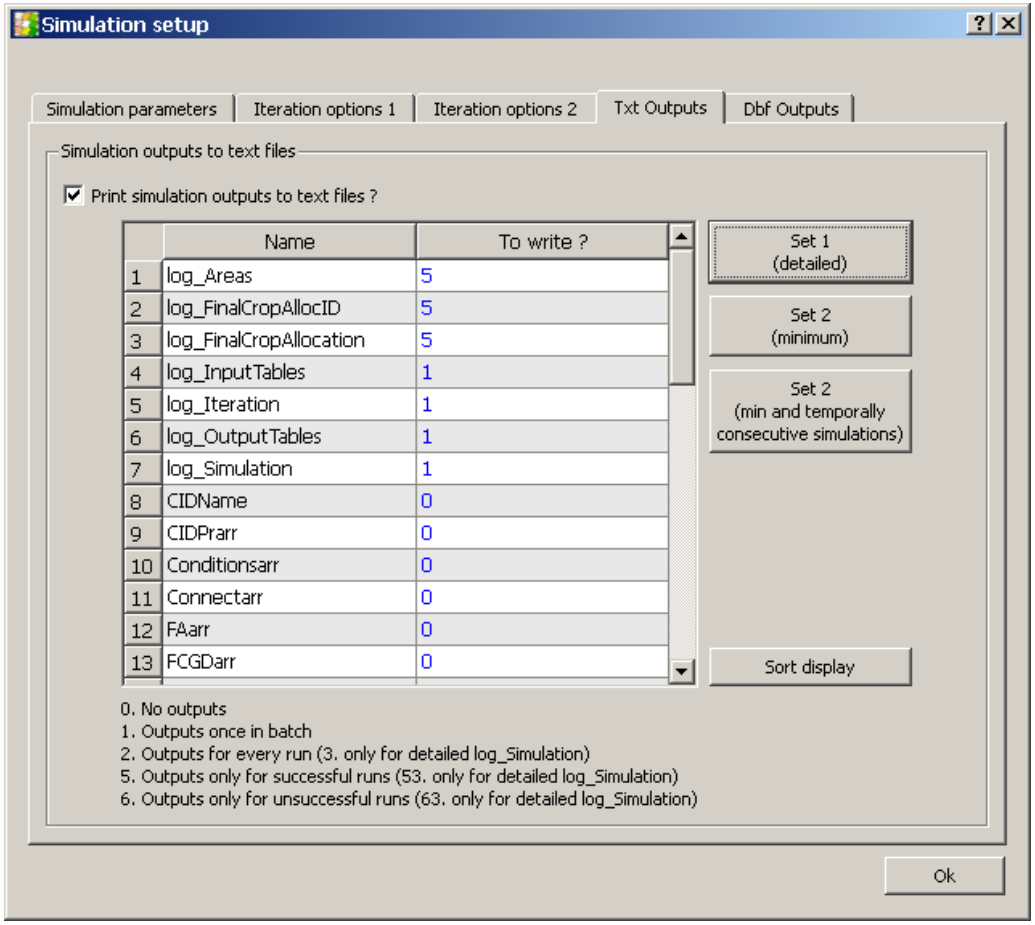
d. name: “all changeable land uses”, list cereals + vegetables + fallow + forestry.



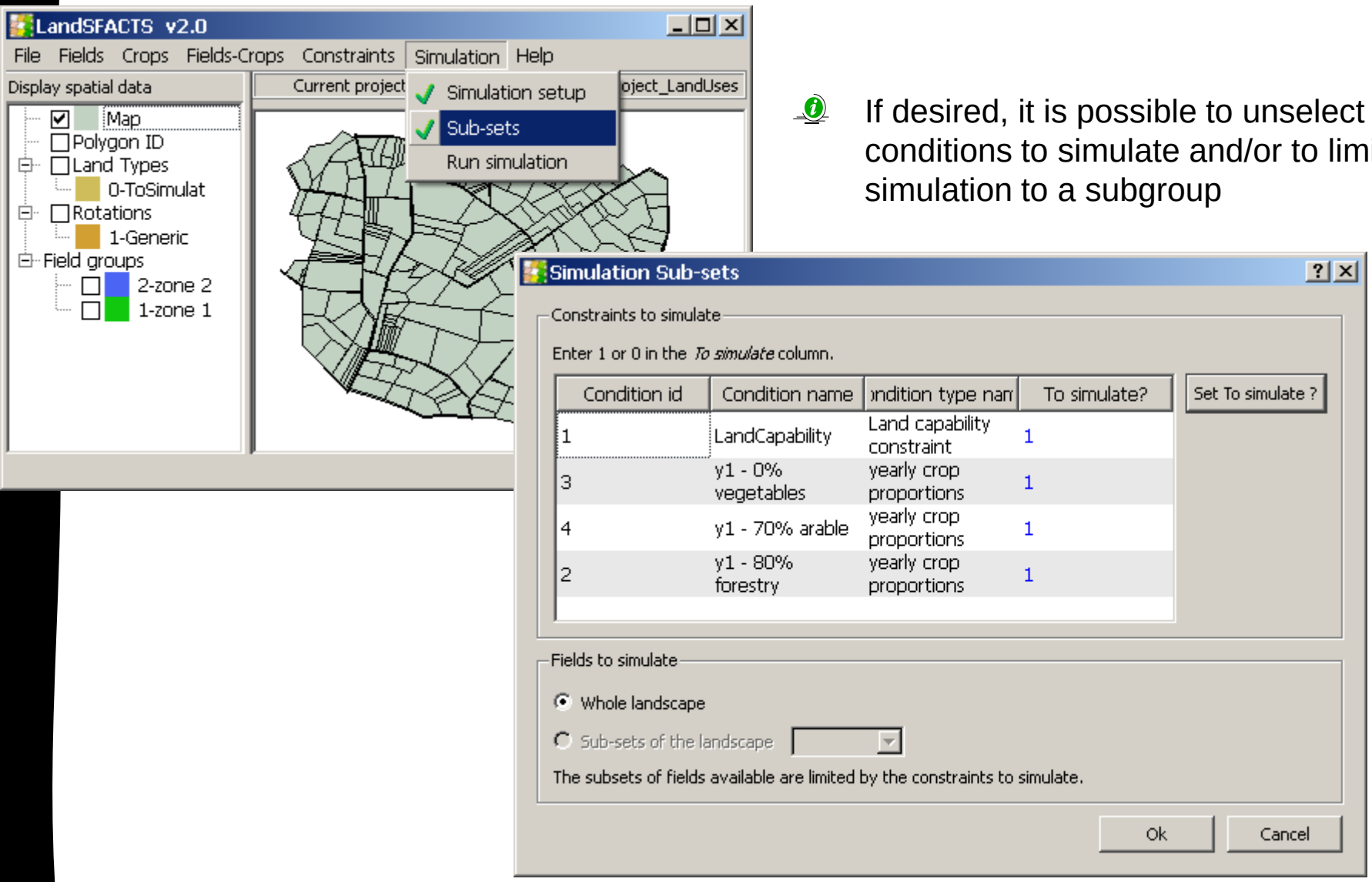

e. Under “Iteration options 2”, simulated annealing = 50 & optimisation option is ticked



g. Select tab: “Txt Outputs”
Select the desired text output files (click on “Set 1 (detailed)”). At the end of the simulation, they will be saved within the “simulatorOutputs” folder within the project folder.

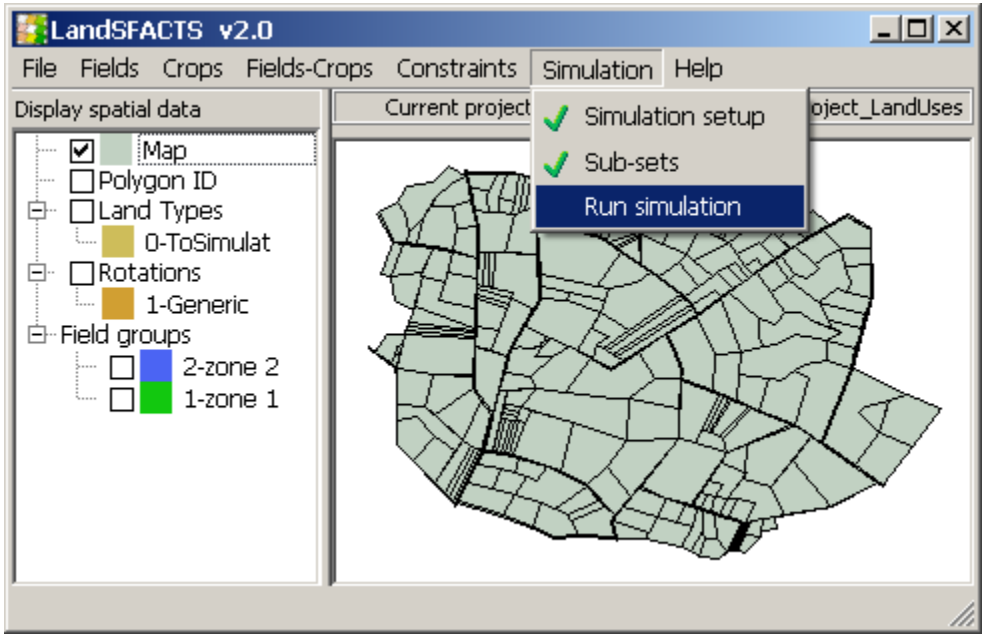


## a. Select Sub-sets

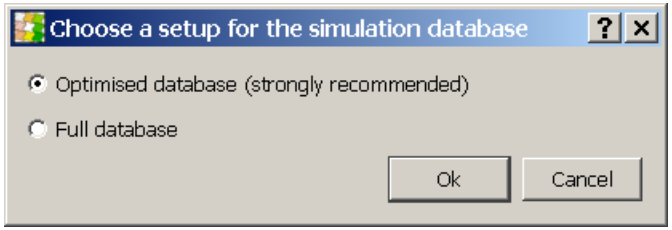



If desired, it is possible to unselect any conditions to simulate and/or to limit the simulation to a subgroup

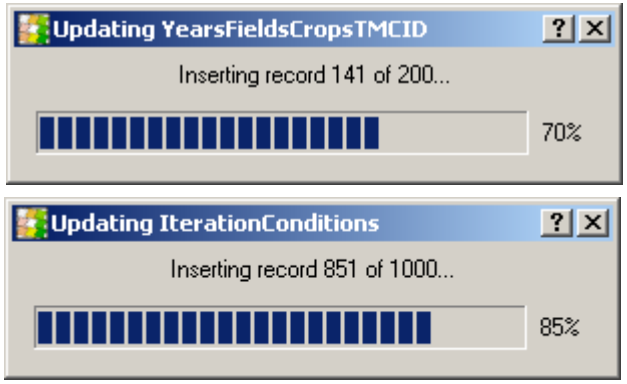
a. Select “Run simulation”



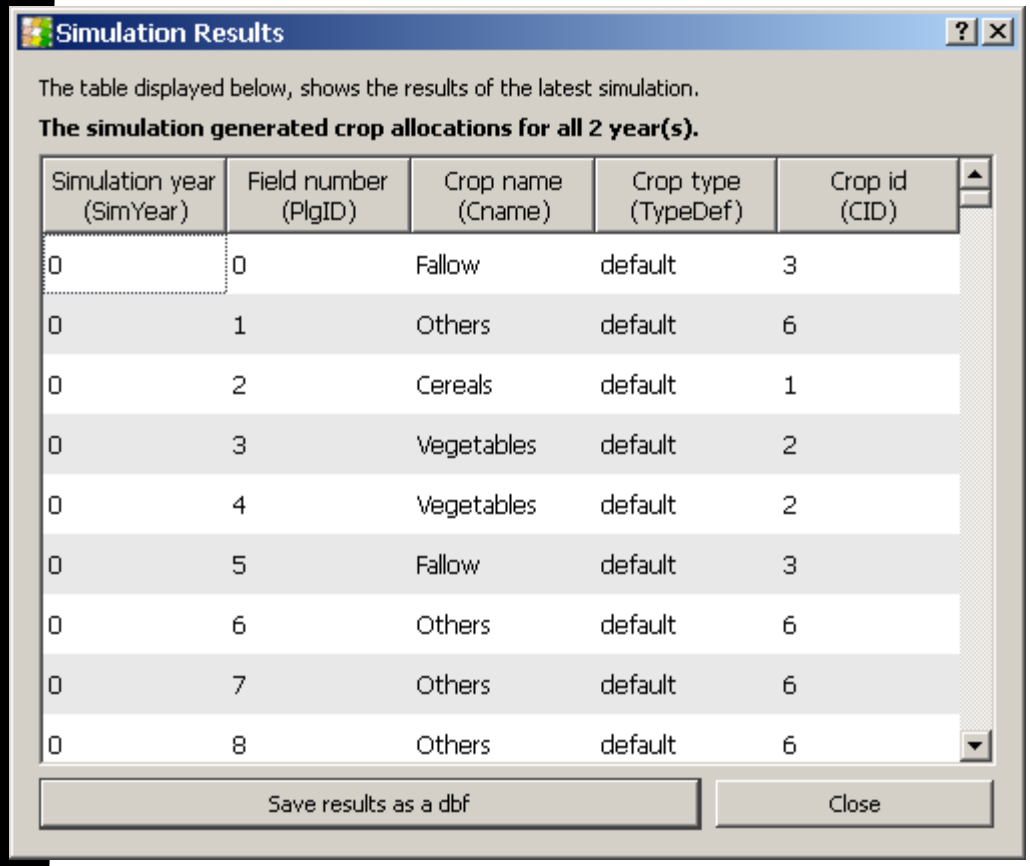

b. Confirm for “optimised database”, and click ok.




c. The simulation may take several minutes

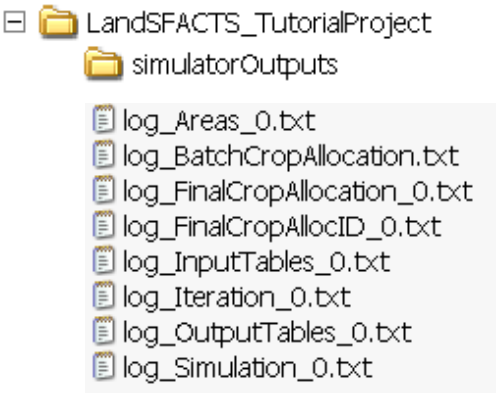


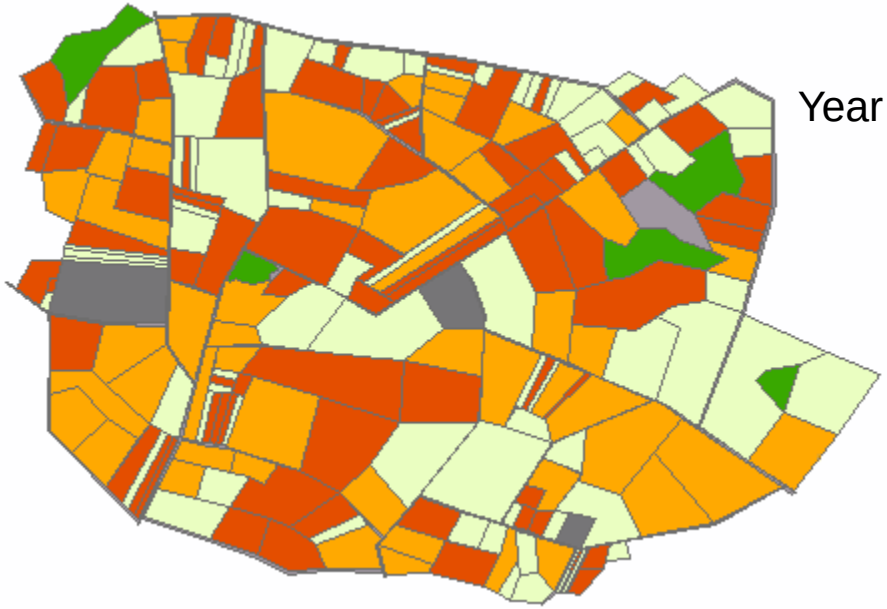
c. At the end of the simulation, the following table is displayed:



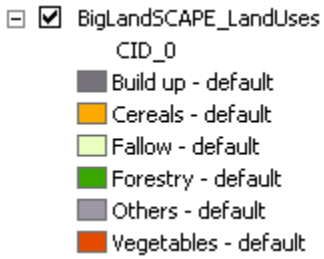

| Simulation year (SimYear) | Field number (PlgID) | Crop name (Cname) | Crop type (TypeDef) | Crop id (CID) |
|---|---|---|---|---|
| 0 | 0 | Fallow | default | 3 |
| 0 | 1 | Others | default | 6 |
| 0 | 2 | Cereals | default | 1 |
| 0 | 3 | Vegetables | default | 2 |
| 0 | 4 | Vegetables | default | 2 |
| 0 | 5 | Fallow | default | 3 |
| 0 | 6 | Others | default | 6 |
| 0 | 7 | Others | default | 6 |
| 0 | 8 | Others | default | 6 |

d. The text files results are saved in the “simulatorOutputs” folder within the project folder.

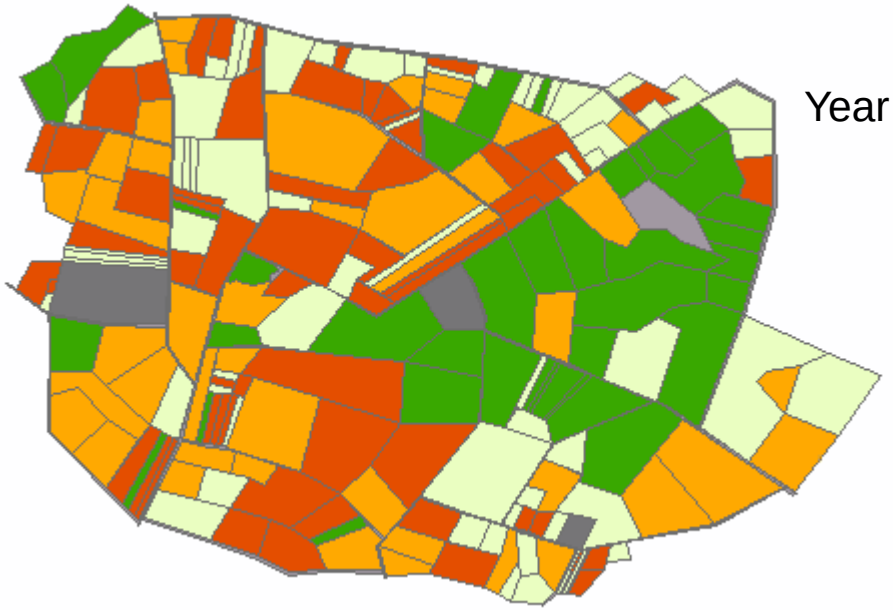




Year 0 (i.e. current)




Resulting land use allocation visualised in a GIS software



Year 1 (i.e. with constraints)