



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.  landscapesim.db
- 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

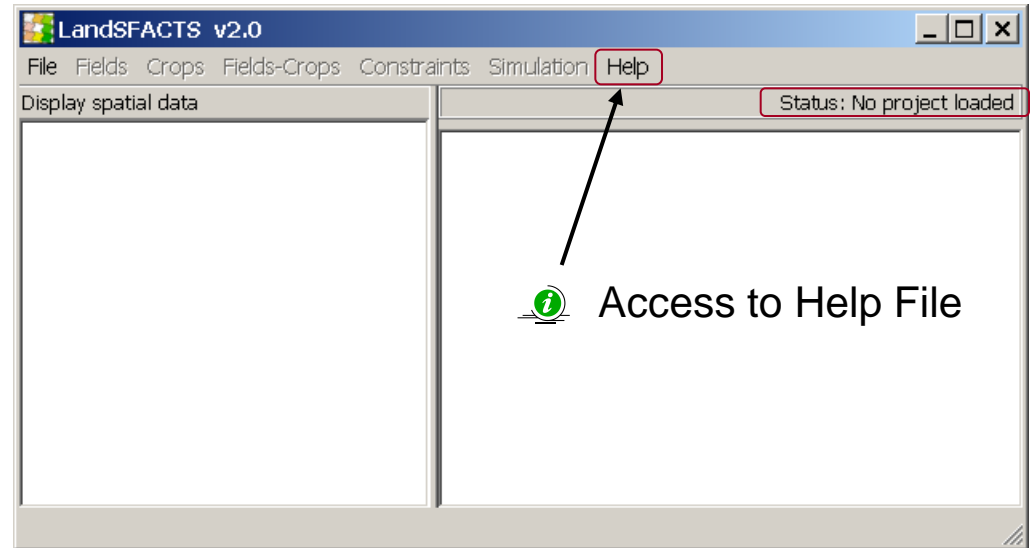


3. Open Software

- a. Open software, by double-clicking shortcut



- b. LandSFACTS main interface is displayed



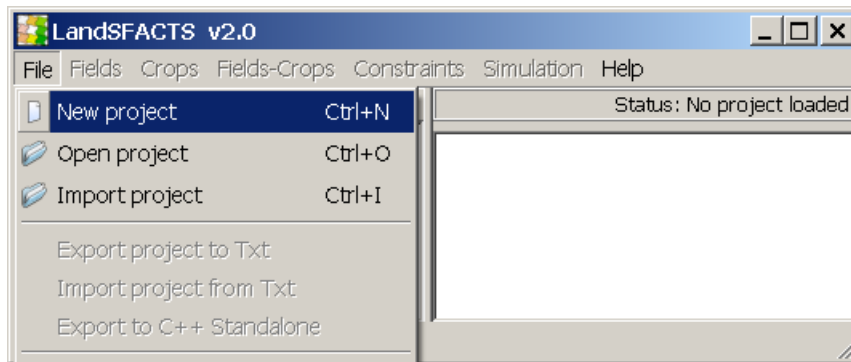
4. Tutorial project overview

Tools Names	Uses for Land Use scenario	Tutorial data
Fields	Land use units (polygons)	BigLandSCAPE_LandUses 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 [step 0: current land uses; step 1: simulated land uses (2050)]
Land capability	Land capability	Fields < 5,000m ² : no cereals
Yearly crop proportions	Target proportions of land use coverage	Whole landscape: 70% arable, Zone 1: 80% forestry, 0% vegetable
Iterations, Crop group	Interchangeable land uses	500 iterations using group; forestry + cereal + vegetable + fallow

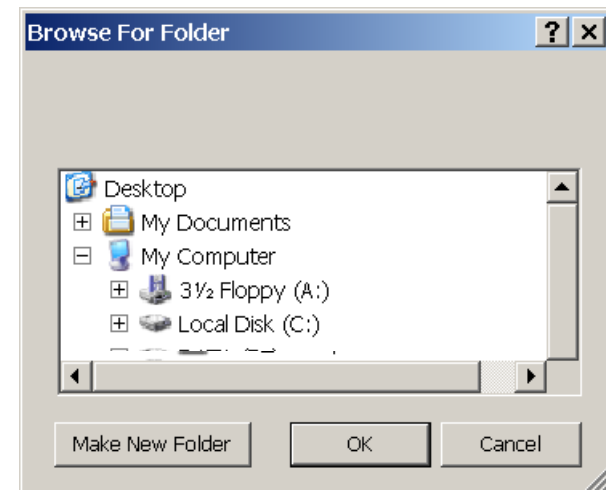
5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation

1. New project

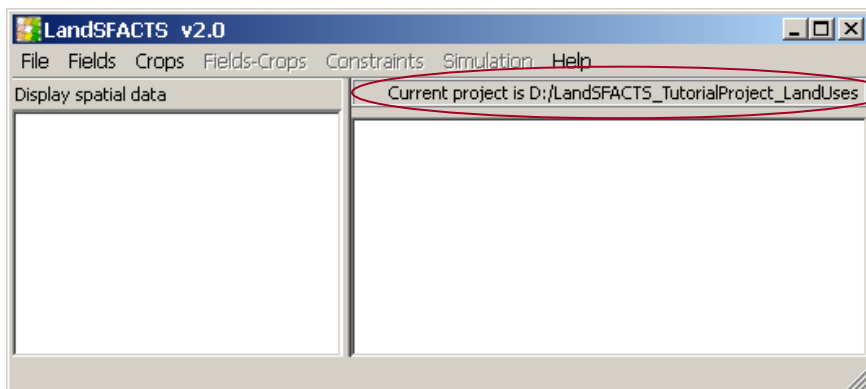
a. Select File / “New project”




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

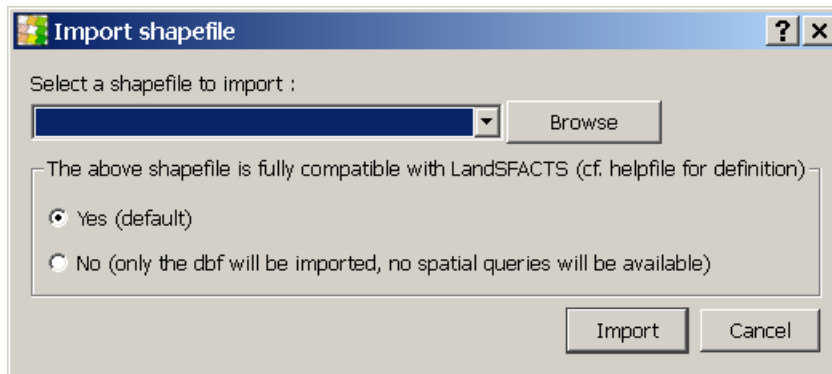
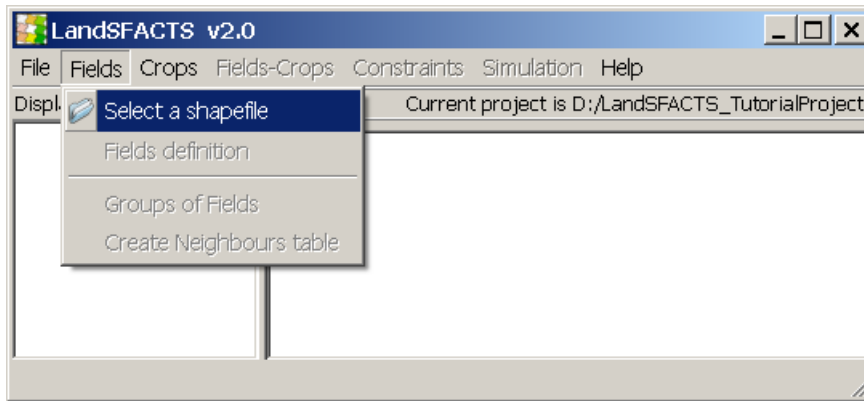
The project folder will hold all information relating to the project.



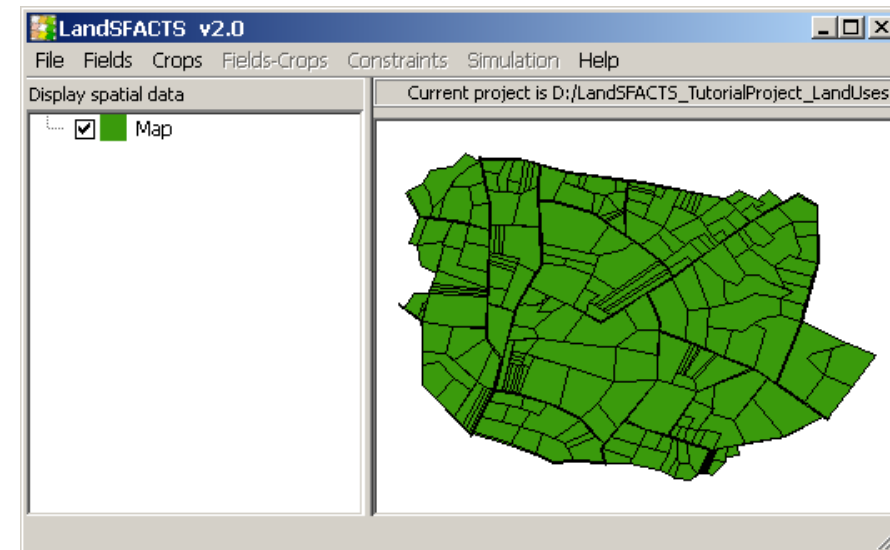
5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation

1. Select new shapefile

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



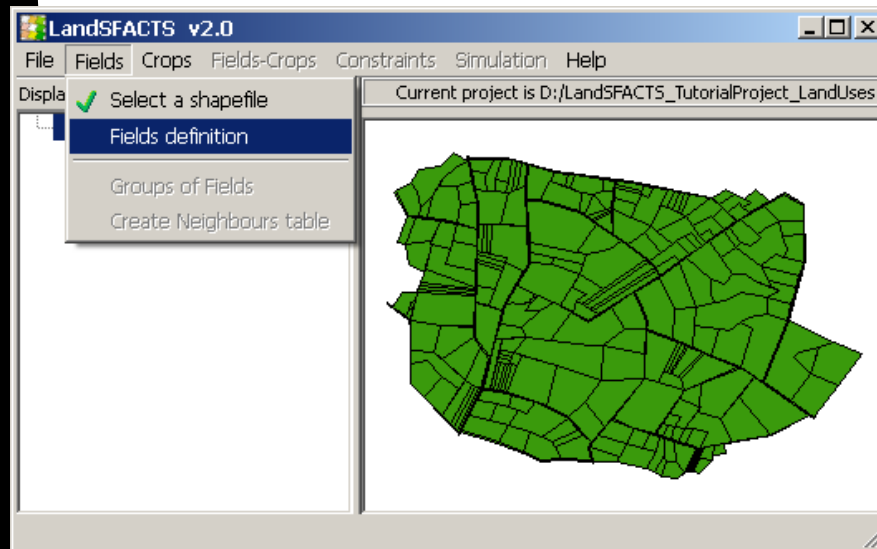
- b. The shapefile is automatically copied into
the project folder, and then displayed



2 steps process:

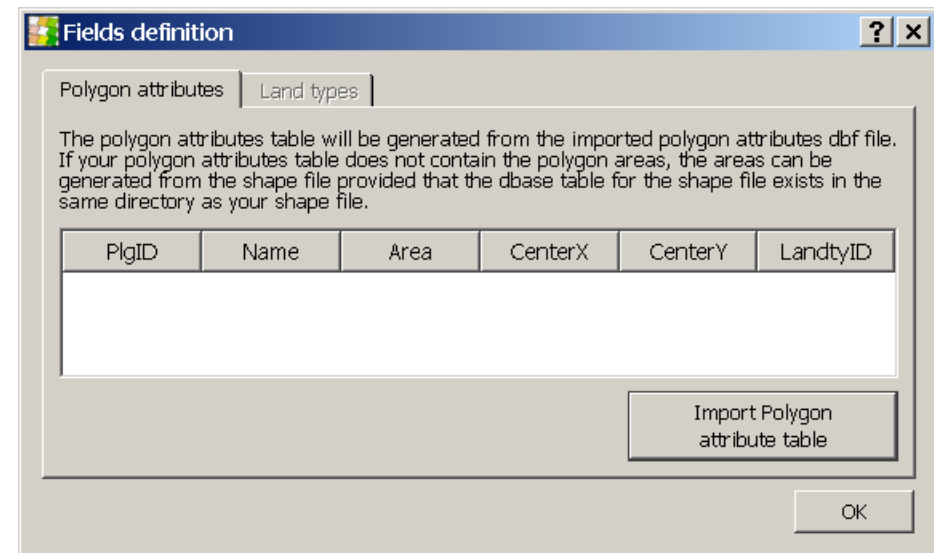
- link to every polygon a landtype ID
→ import polygon attributes table (PlgID, LandTypeID)
[BL_PolygonAttributes_LandUses.dbf]
- provide a name/definition for each landtype ID
→ import land type table (LandTypeID, name/definition)

a. Select polygon attributes



b. Import

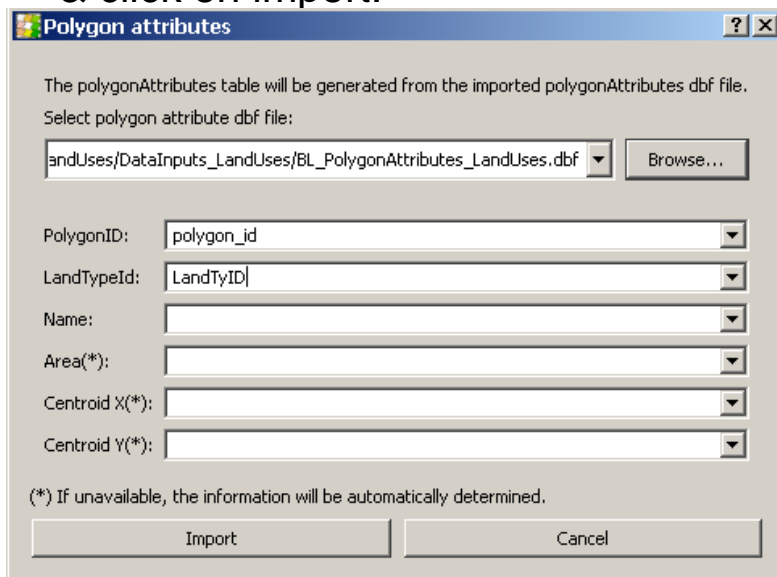
"BL_PolygonAttributes_LandUses.dbf"



5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation

2. Fields definition (2/4)

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



The polygonAttributes table will be generated from the imported polygonAttributes dbf file.
Select polygon attribute dbf file:

andUses/DataInputs_LandUses/BL_PolygonAttributes_LandUses.dbf

PolygonID:

LandTypeId:

Name:

Area(*):

Centroid X(*):

Centroid Y(*):

(*) If unavailable, the information will be automatically determined.

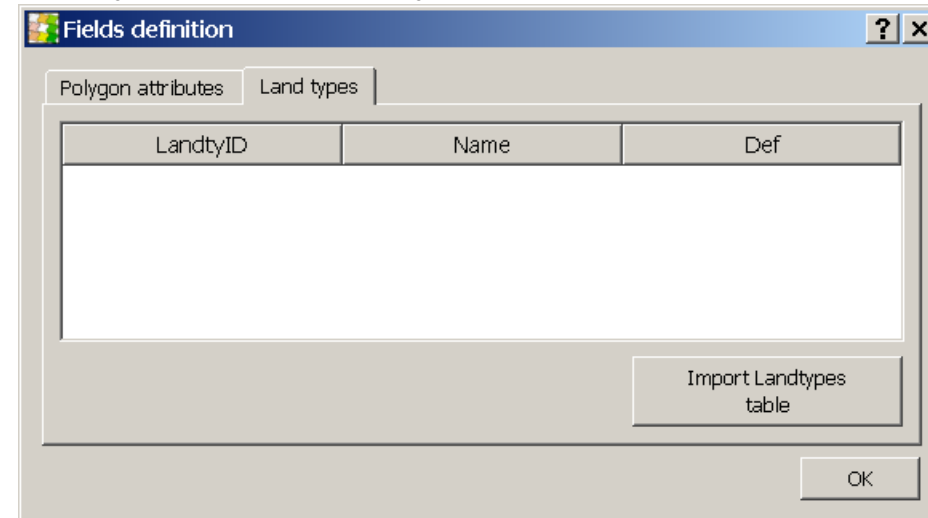


The areas and centroids are automatically calculated.

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"



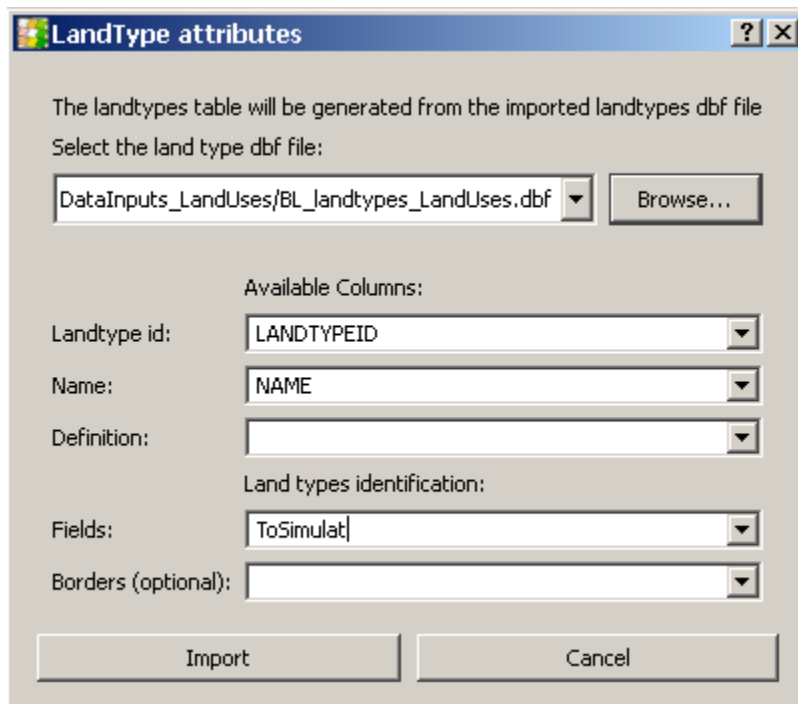
Fields definition

Polygon attributes Land types

LandtyID	Name	Def

5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation
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



The landtypes table will be generated from the imported landtypes dbf file
Select the land type dbf file:

DataInputs_LandUses/BL_landtypes_LandUses.dbf

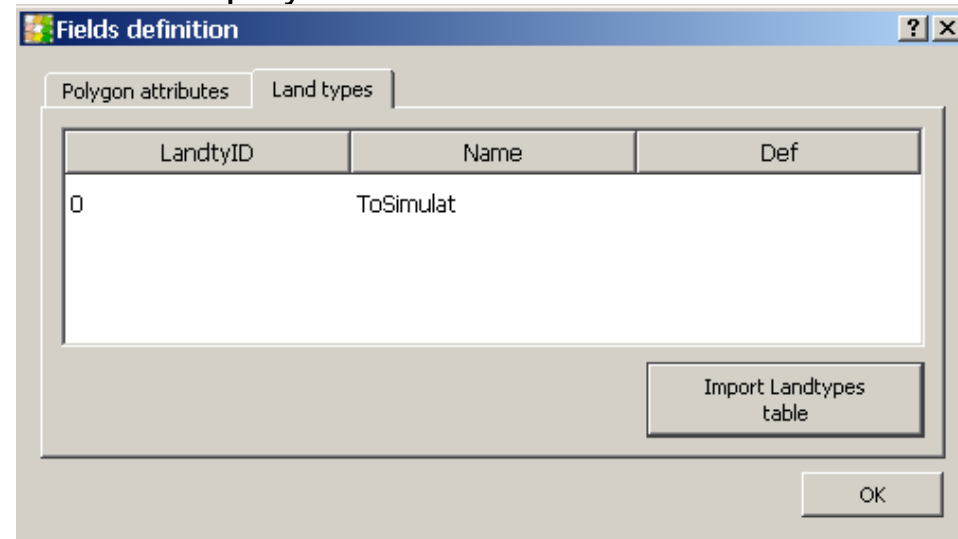
Available Columns:

Landtype id: LANDTYPEID
Name: NAME
Definition:

Land types identification:

Fields: ToSimulat
Borders (optional):

- g. Click on "Import" & the table is displayed.

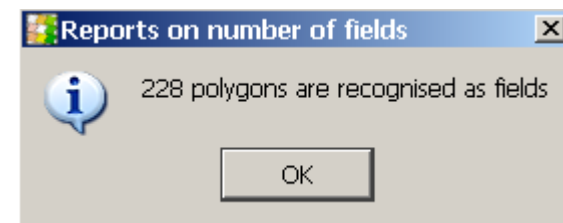


Fields definition


Polygon attributes Land types

LandtyID	Name	Def
0	ToSimulat	

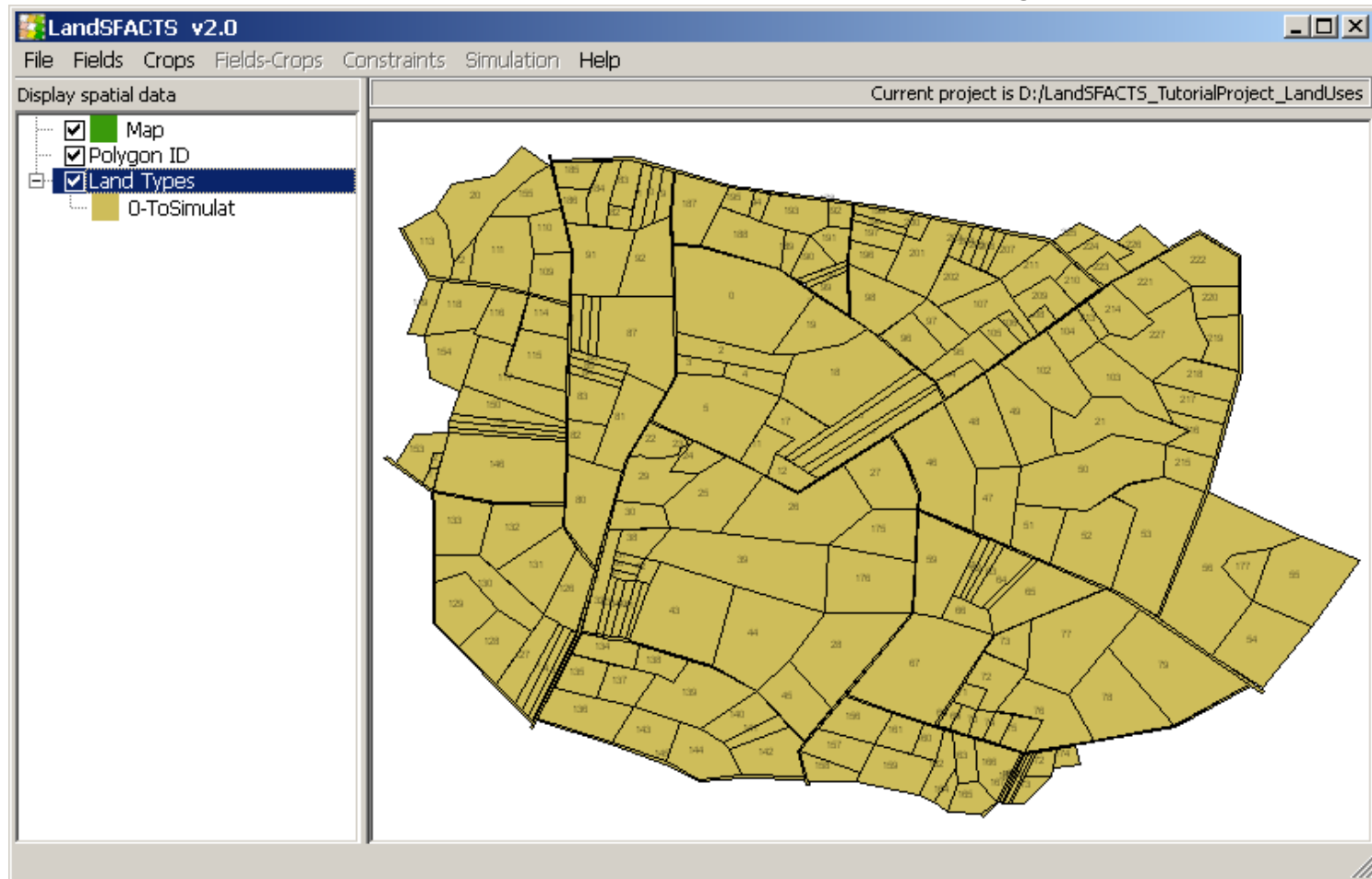
- h. Indication on the number of polygons recognised as fields by the software.



Reports on number of fields

 228 polygons are recognised as fields

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

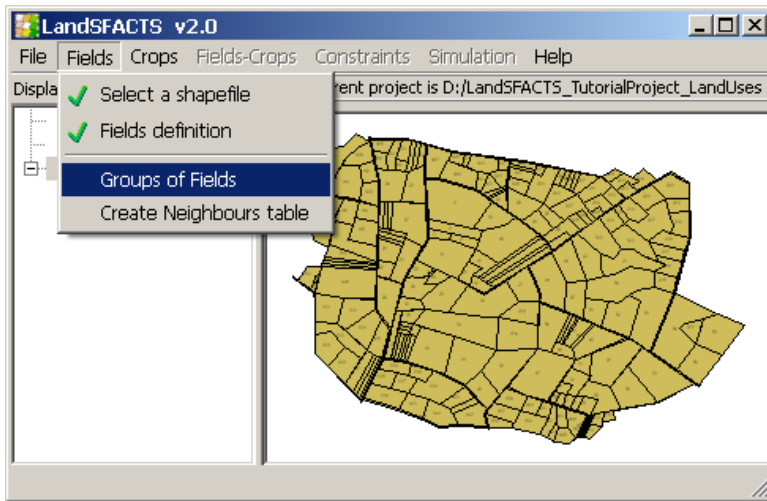


 The "Map" tick is an on-off button controlling the map display

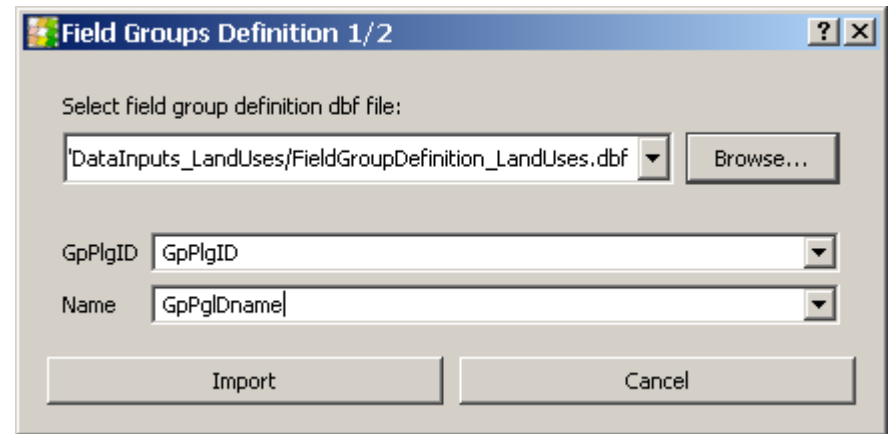
5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation

3. Groups of fields (1/2)

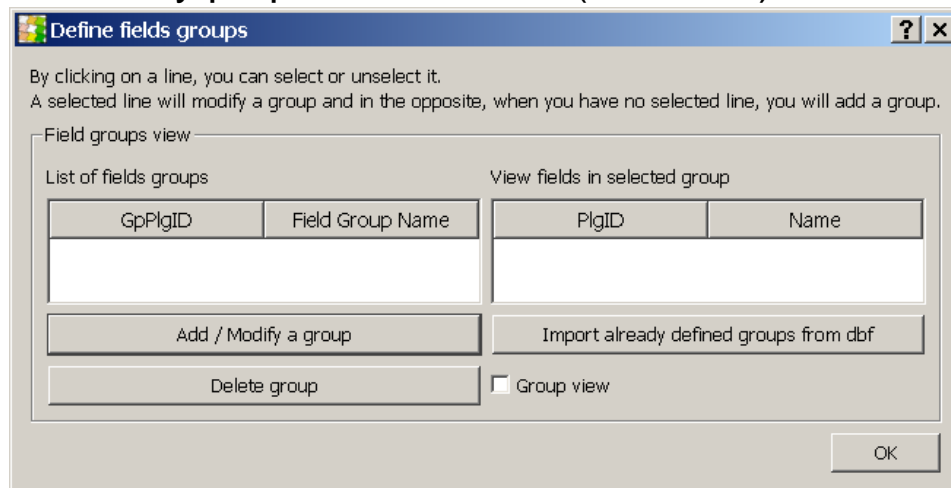
a. Select “groups of fields”



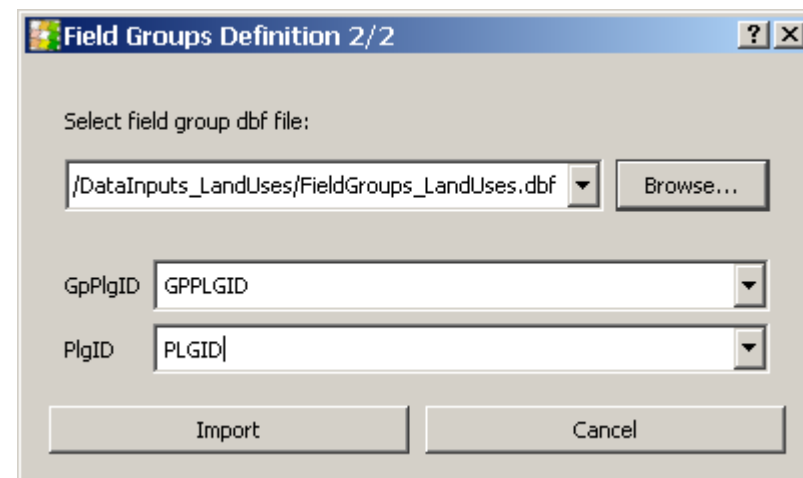
c. In “Import” interface, import the definition of the groups (group ID and names):



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

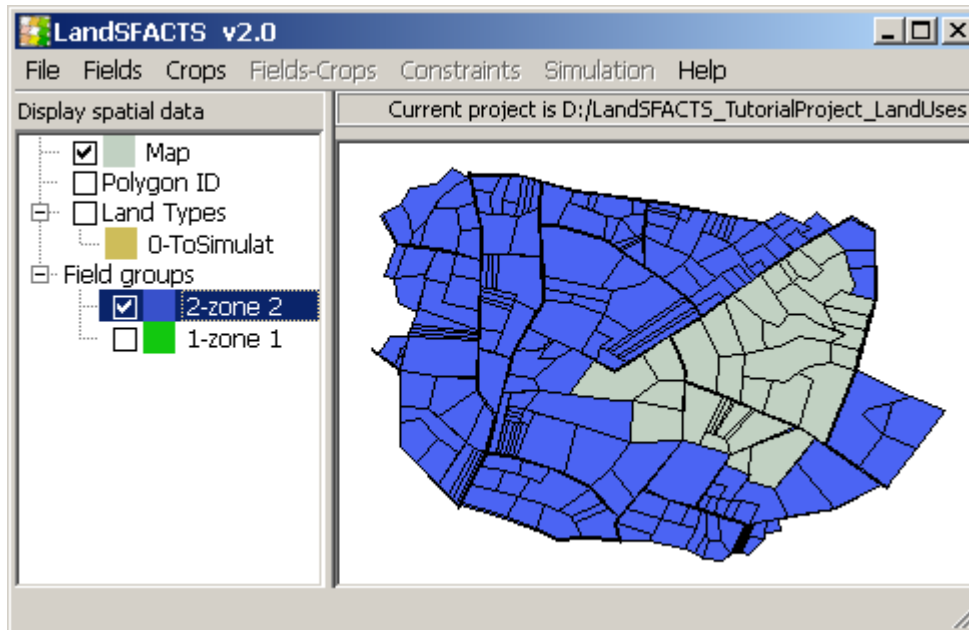


d. then, import the groups (group ID and polygon ID):

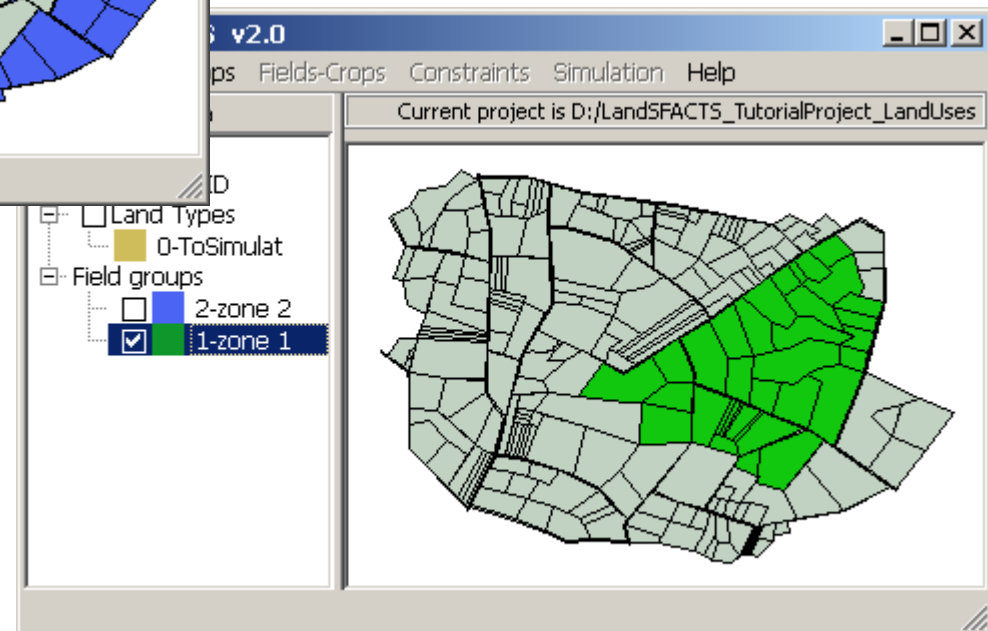


5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation

3. Groups of fields (2/2)



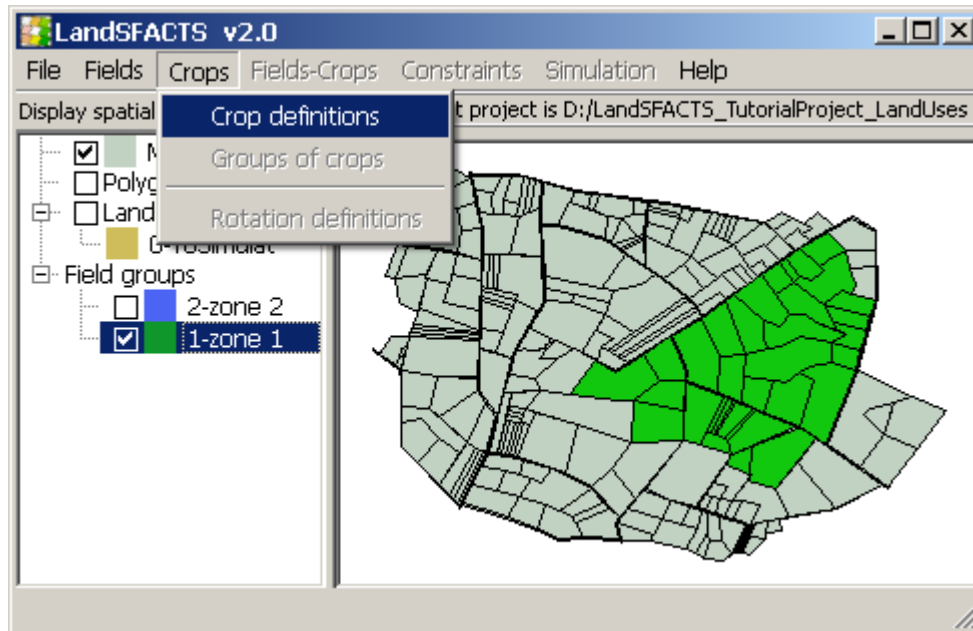
d. Both groups can be displayed



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

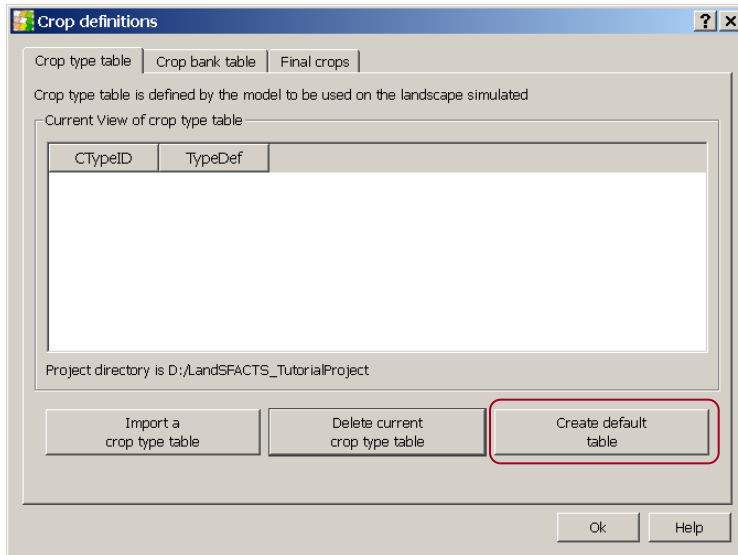
CBankID	Cname
1	Cereals
2	Vegetables
3	Fallow

Crop type: default

CTypeID	TypeDef
1	default

5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation 1. Crop definition (2/3)

b. Create default default

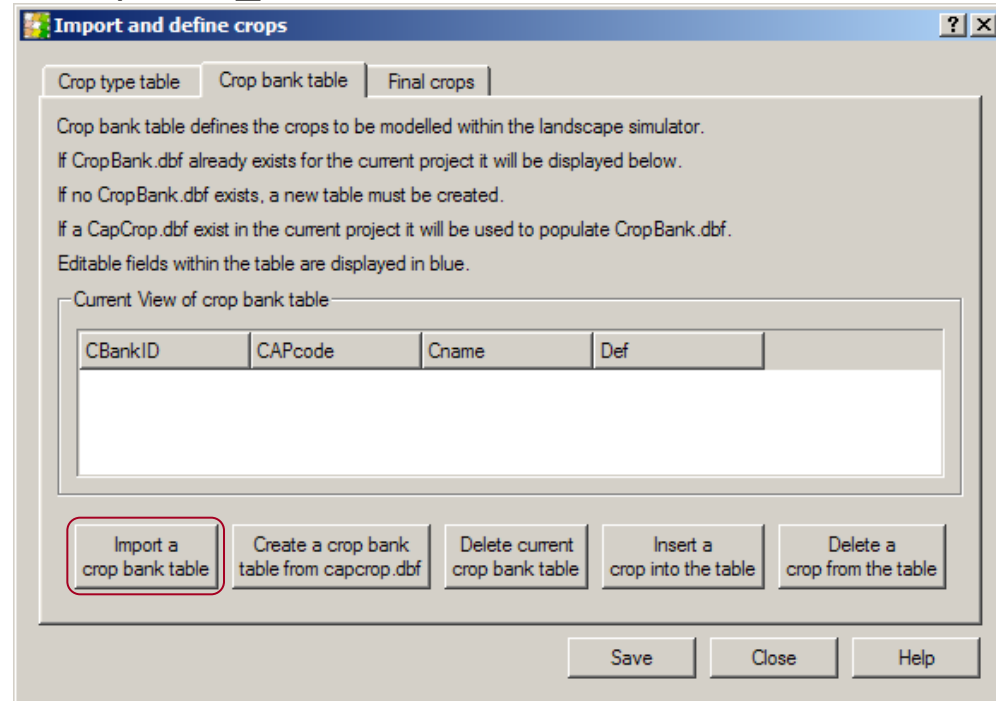


c. The crop type table is displayed

Current View of crop type table

	CTypeID	TypeDef
1	1	default

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



e. Crop bank table is displayed

Current View of crop bank table

	Crop bank id	Cap code	Crop name
1	6		Others
2	5		Build up
3	4		Forestry
4	3		Fallow
5	2		Vegetables
6	1		Cereals

f. Next tab: Final crops

Crop definitions

Crop type table | Crop bank table | **Final crops**

Crop banks and type table defines the link between the crop bank (full list of crops) and the type used in subsequent models

Crop bank name

Crop type name

Cname	TypeDef
Cereals	default
Vegetables	
Fallow	
Forestry	
Build up	
Others	

↓ Add ↑ Remove

Remove all

Import from Final Crops table

Crop bank name Crop type name

Cname	TypeDef
Cereals	default
Vegetables	default
Fallow	default
Forestry	default
Build up	default
Others	default

Ok Help

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

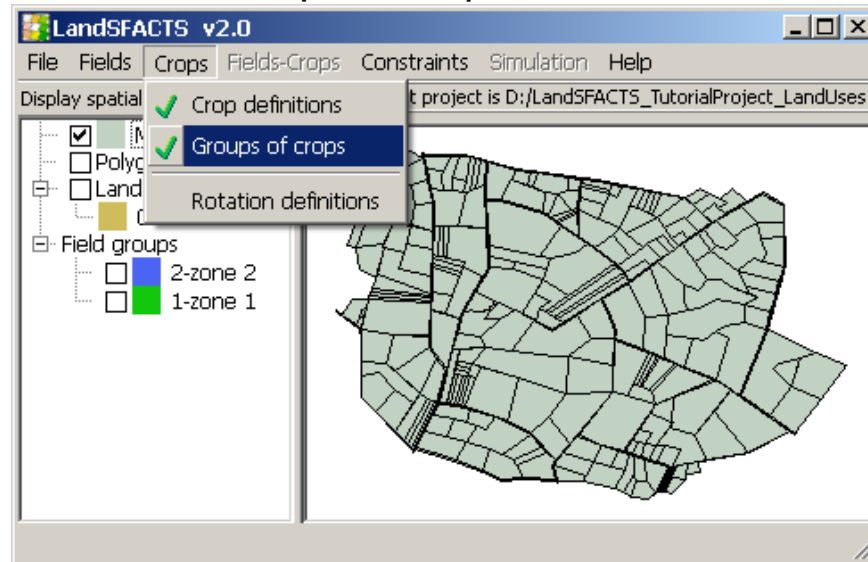



All the crops to be used within the project must be listed here.

Final crop table

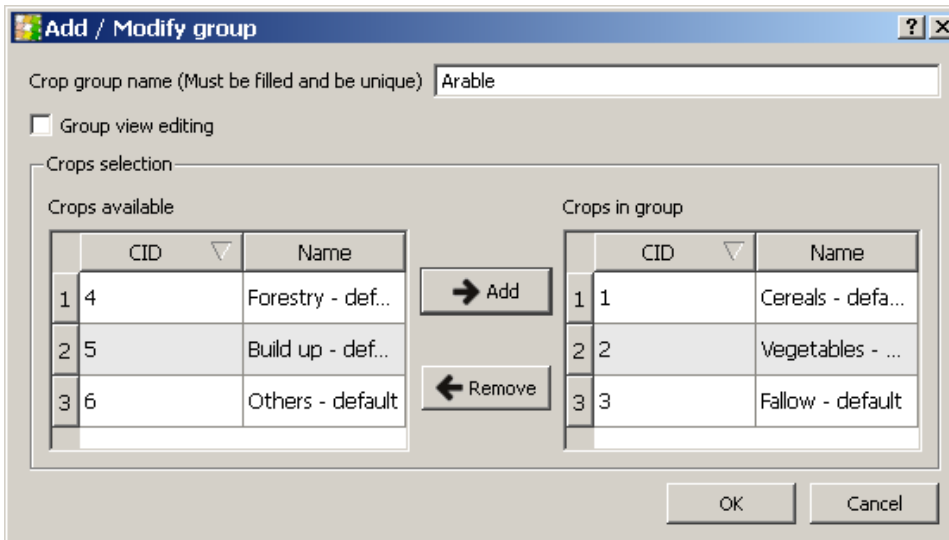
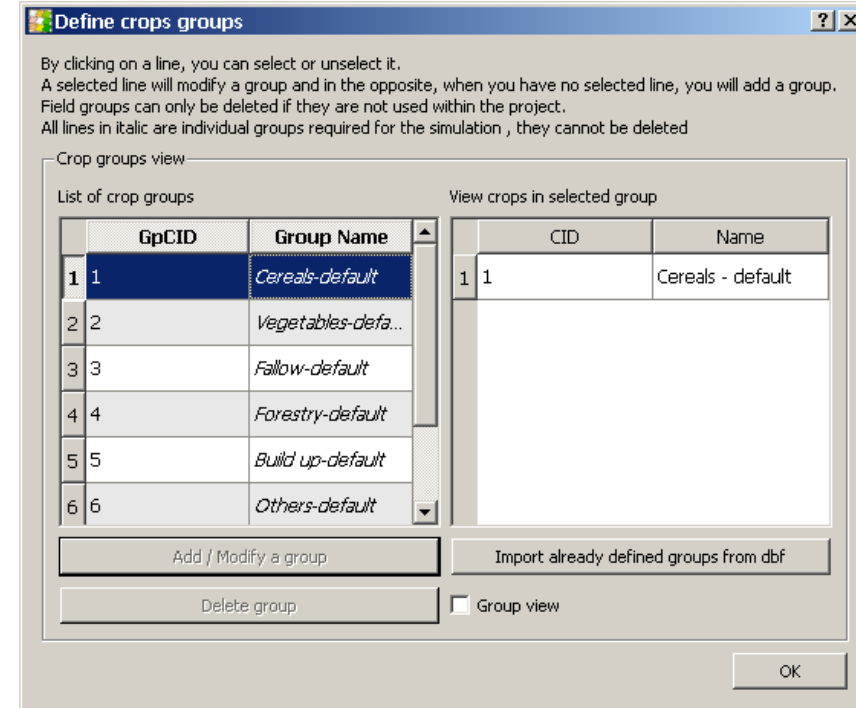
5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation 2. Groups of crops

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

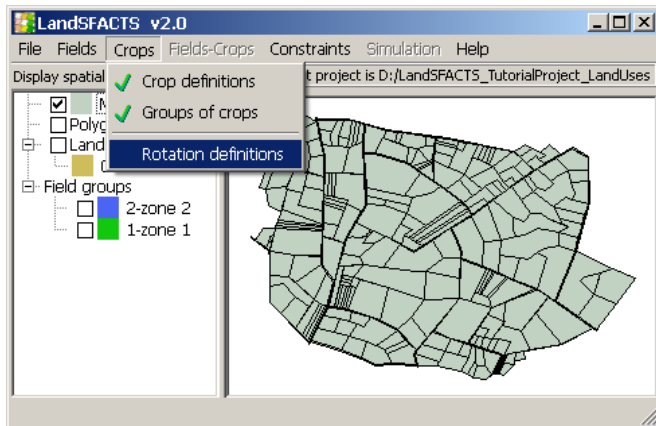


c. Click on “Add / Modify a group”, and create 1 group:
- “Arable” with Cereals + Vegetables + Fallow

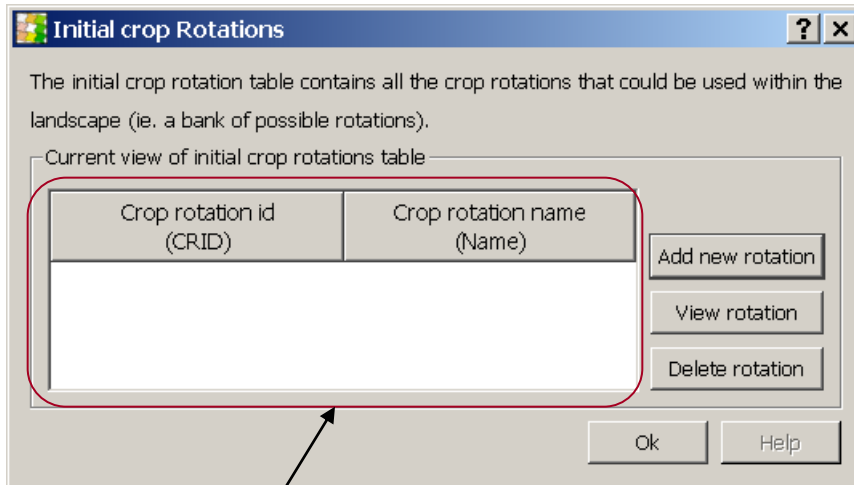


5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation 3. Rotation definitions (1/2)

a. Select rotations definition



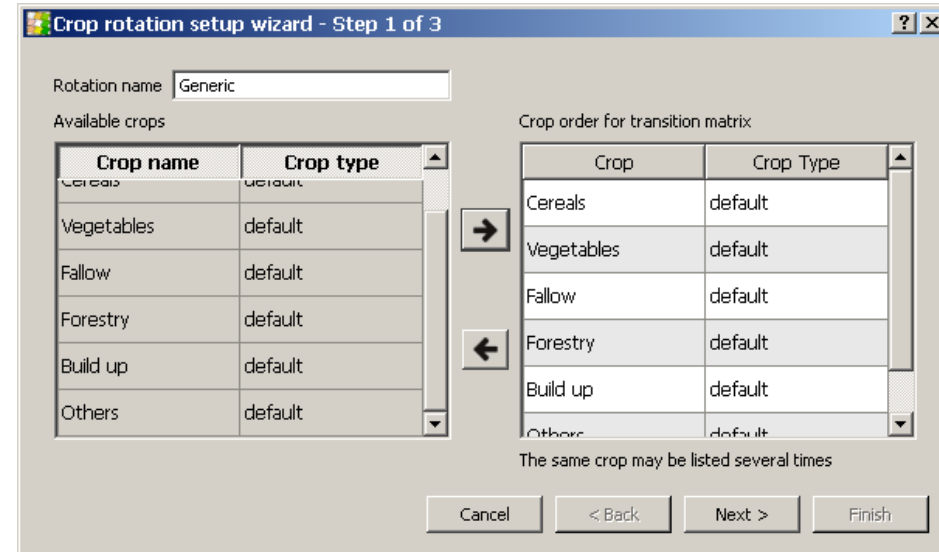
b. "Add new rotation"



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.

d. "Set constant rotations"

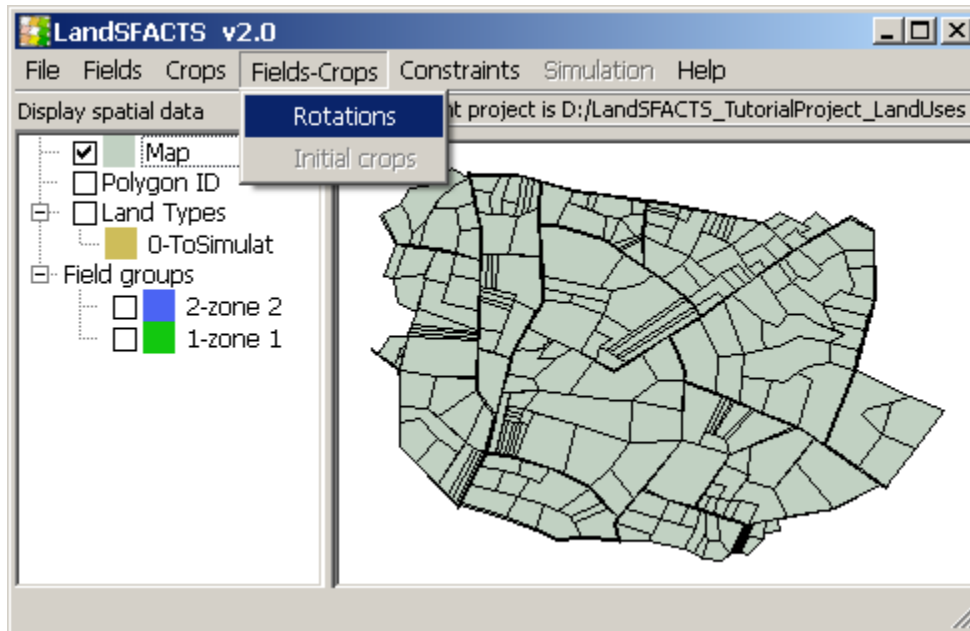
		Crop grown in year n+ 1					
		Cereals - default	Vegetables - default	Fallow - default	Forestry - default	Build up - default	Others - default
Crop grown in year n	Cereals - default	1.00	0	0	0	0	0
	Vegetables - default	0	1.00	0	0	0	0
	Fallow - default	0	0	1.00	0	0	0
	Forestry - default	0	0	0	1.00	0	0
	Build up - default	0	0	0	0	1.00	0
	Others - default	0	0	0	0	0	1.00

Set fixed Rotation
Set equal Rotation
Set constant Rotation
Export rotation matrix
Import rotation matrix

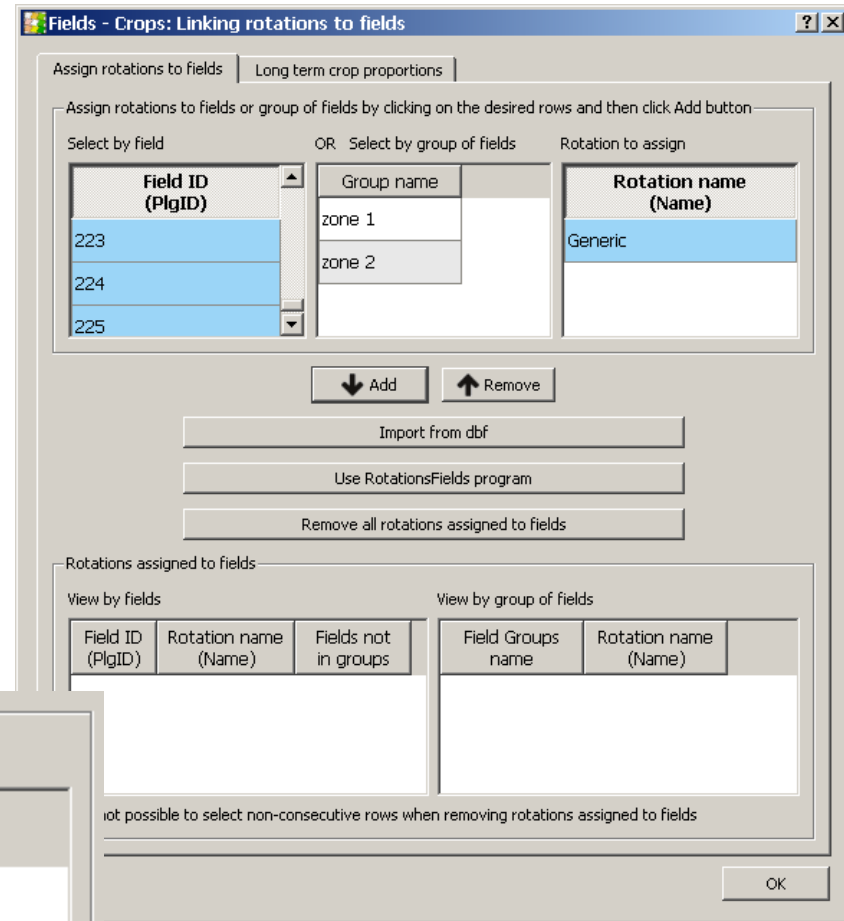
5. Create project 6. Fields 7. Crops 8. Fields-Crops 9. Constraints 10. Simulation

1. Linking rotations to fields

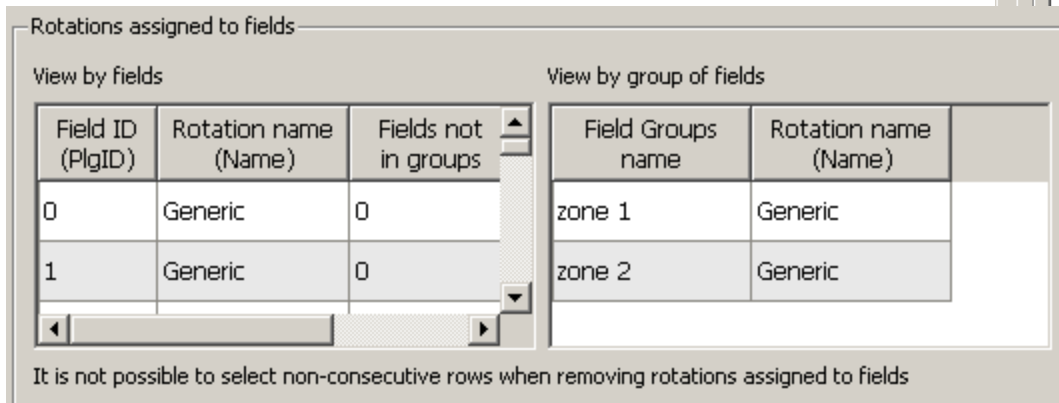
a. Select Rotations within Fields - Crops



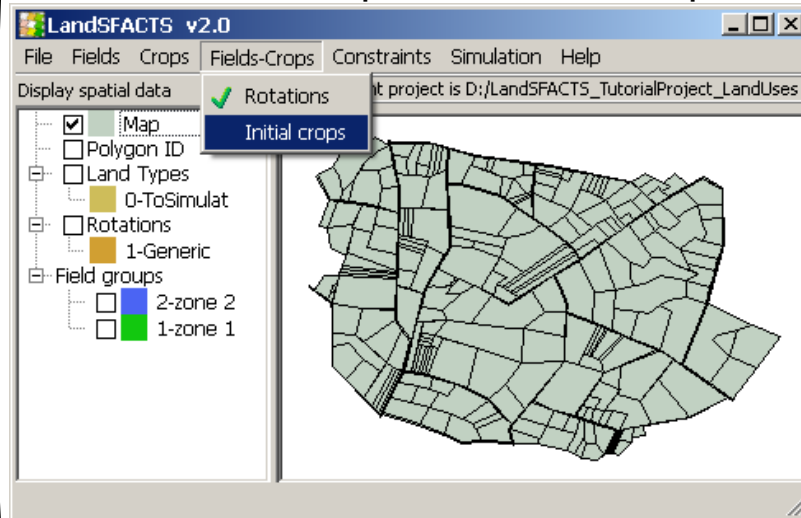
b. Assign “generic” rotation to all fields using the “add” button



c. The allocation of the rotation to fields is displayed

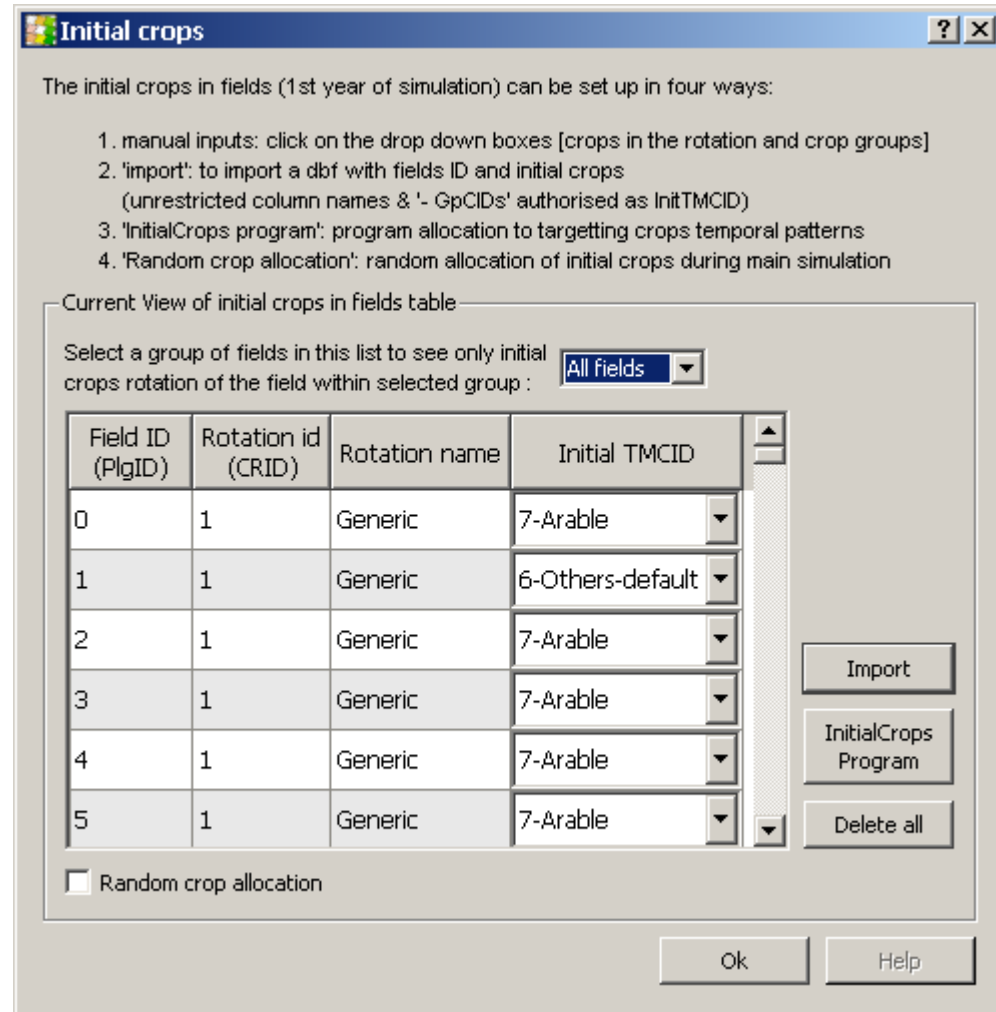


a. Select "Initial crops" in "Fields-Crops"

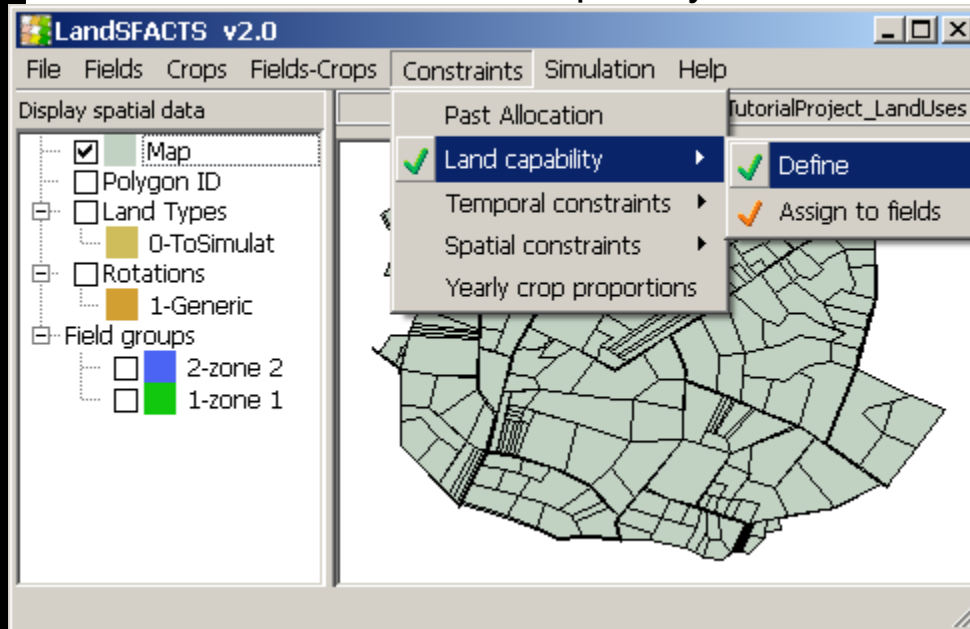


InitialTMCID refers to the initial land use or group of land use (e.g. 7-Arable) in each polygon.

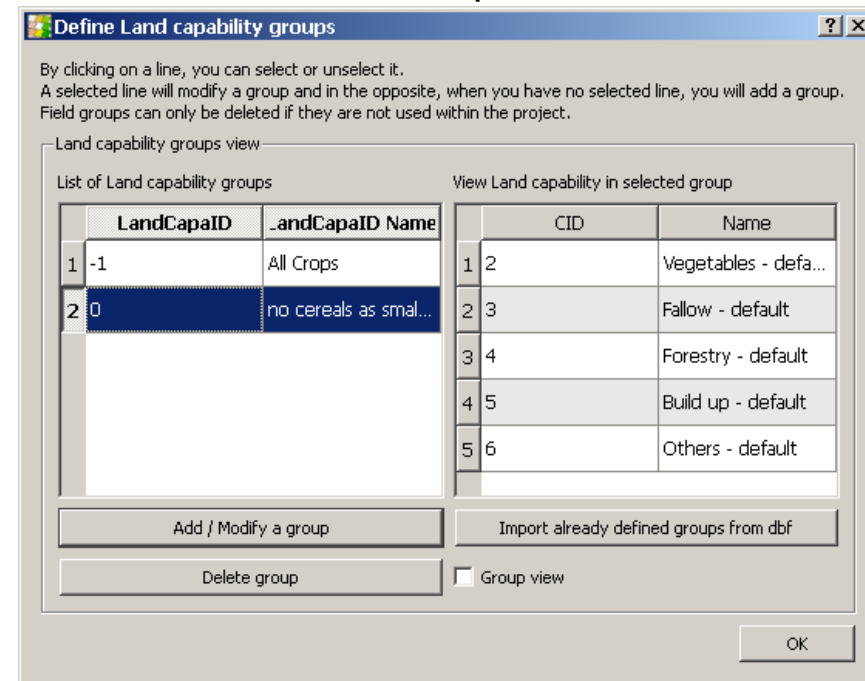
b. Select "Import", "InitialCrops_LandUses.dbf"



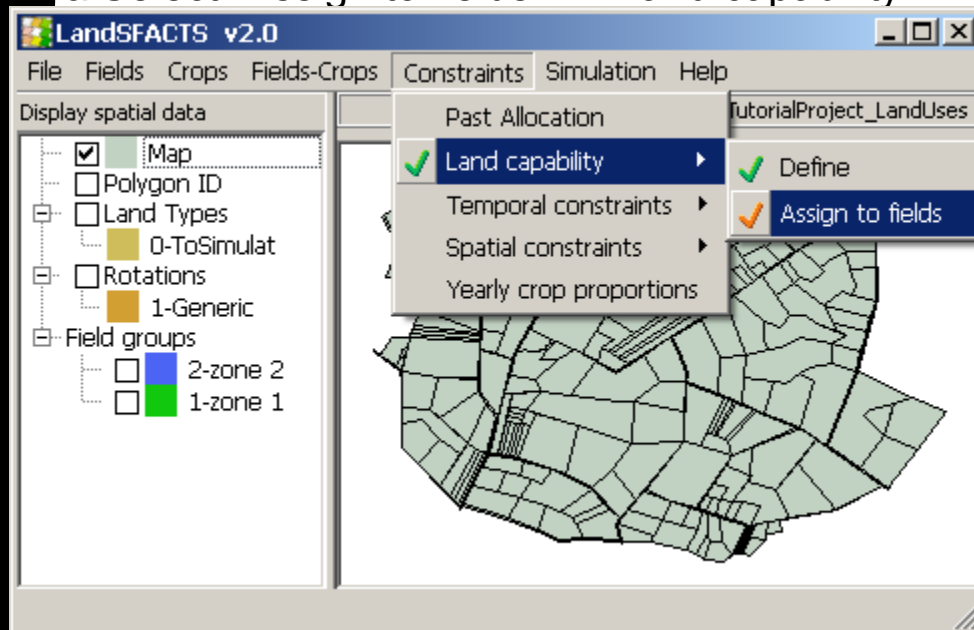
a. Select "Define" in "Land capability"



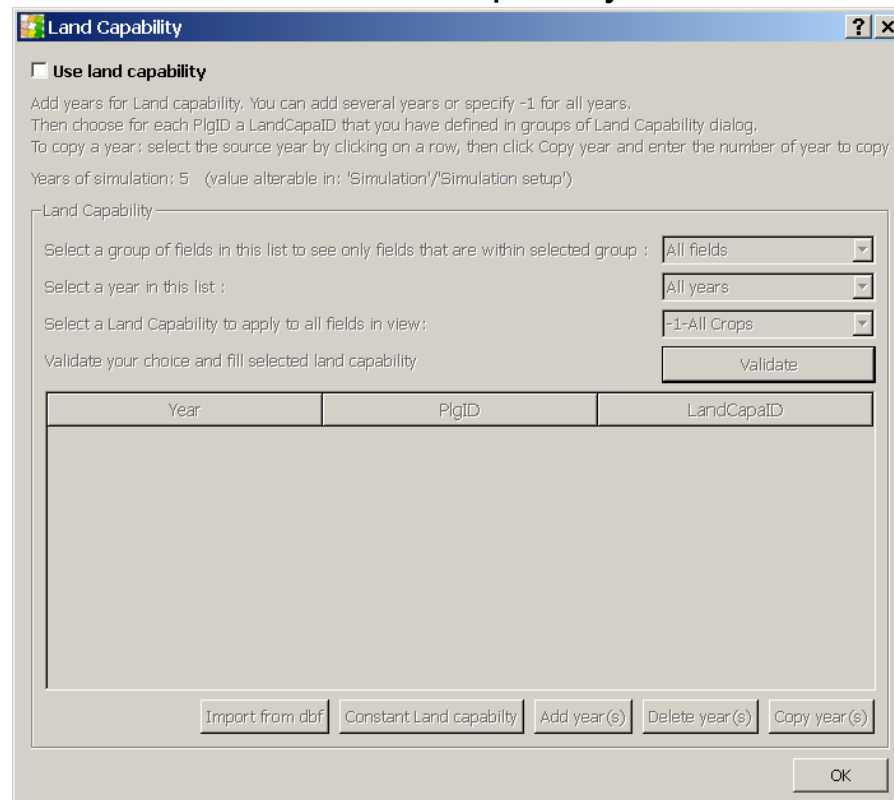
b. By default a class is created for all the crops,
add one more group "no cereals as small fields", it comprises all land uses



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"

Land Capability Yearly Fields

The LandCapabilitYearlyFields table will be generated from the imported LandCapabilitYearlyFields dbf file.
Select LandCapabilitYearlyFields dbf file:

object_Tutorial_LandUses/DataInputs_LandUses/LandCapabilityFields_LandUses.dbf

Years

PlgID

LandCapaID

Land Capability

Select a group of fields in this list to see only fields that are within selected group :

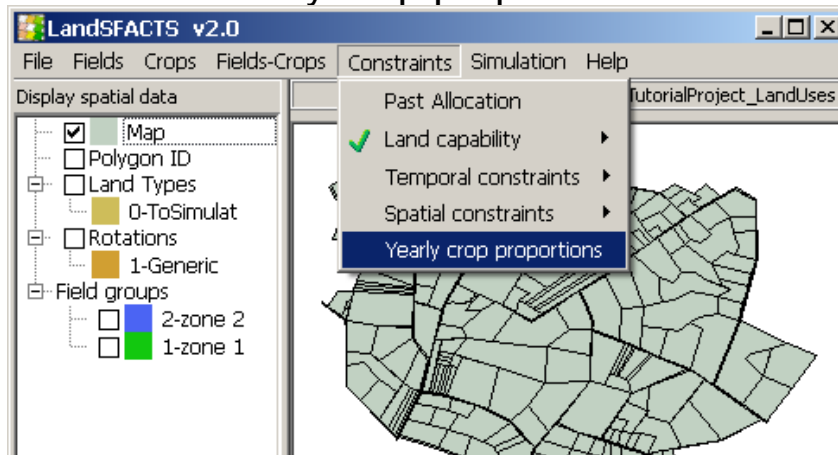
Select a year in this list :

Select a Land Capability to apply to all fields in view:

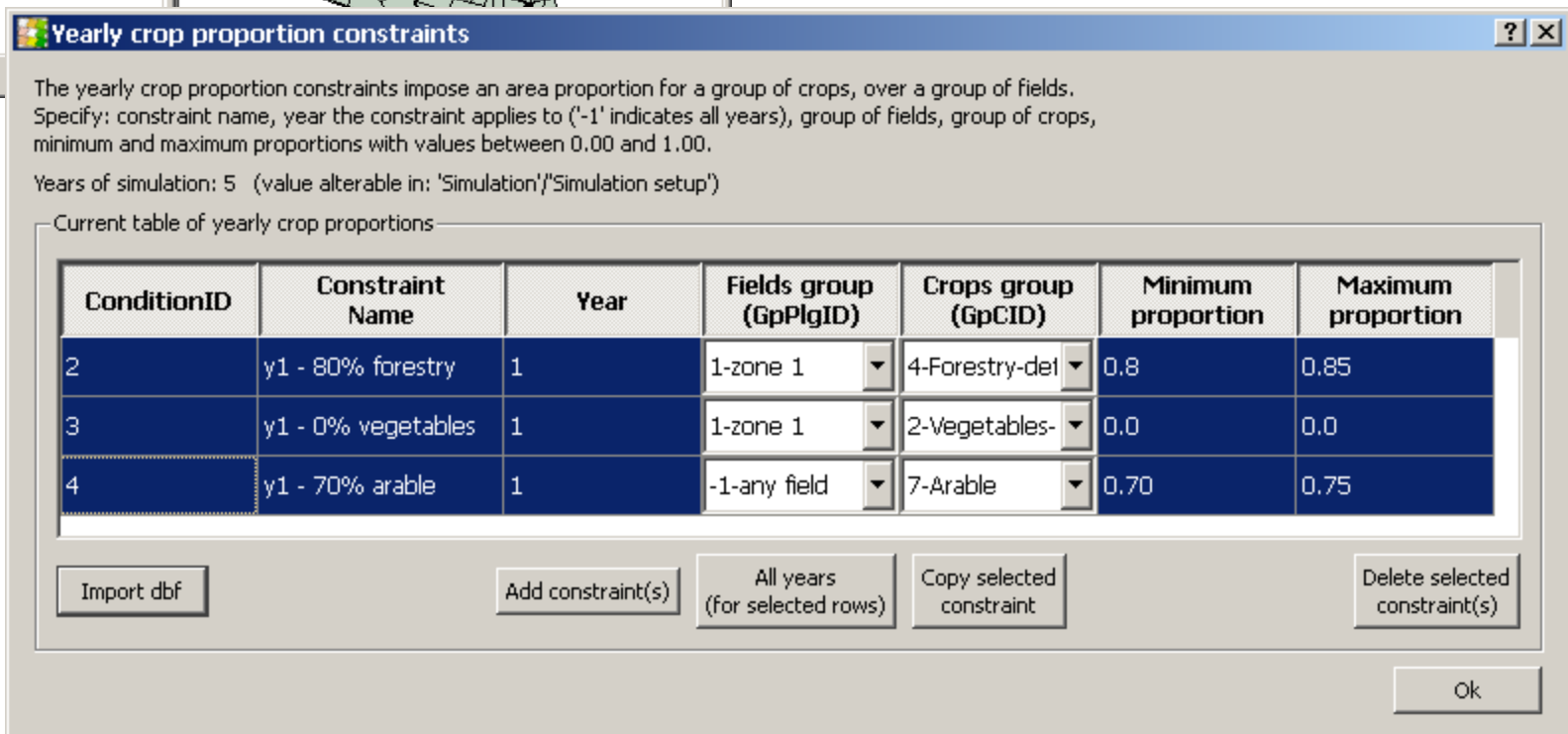
Validate your choice and fill selected land capability

Year	PlgID	LandCapaID
-1	0	-1-All Crops
-1	1	-1-All Crops
-1	2	-1-All Crops
-1	3	0-no cereals as small fields
-1	4	-1-All Crops
-1	5	-1-All Crops
-1	6	-1-All Crops
-1	7	0-no cereals as small fields

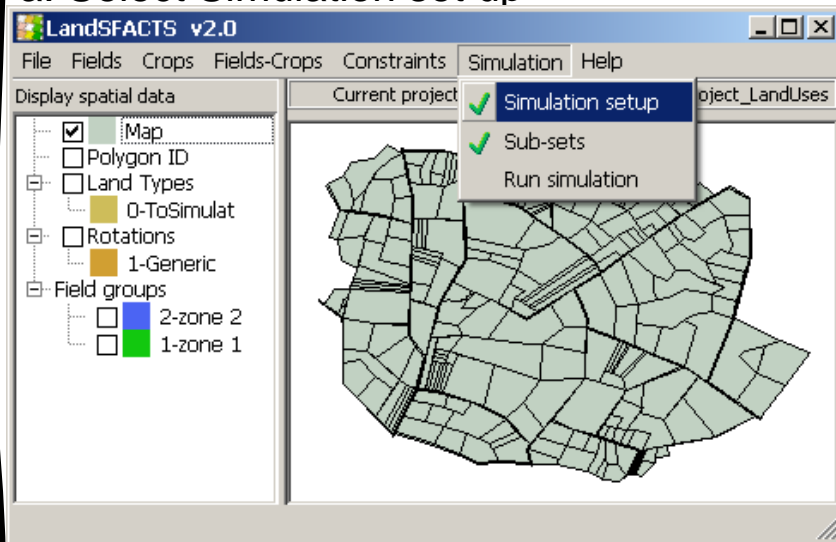
a. Select Yearly crop proportions



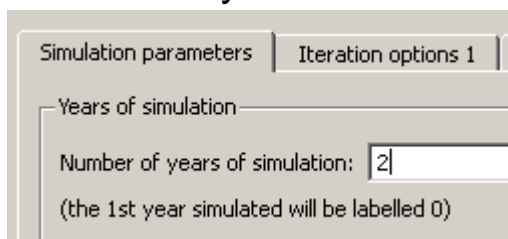
b. Click “Add constraints”, add 3, cf. below



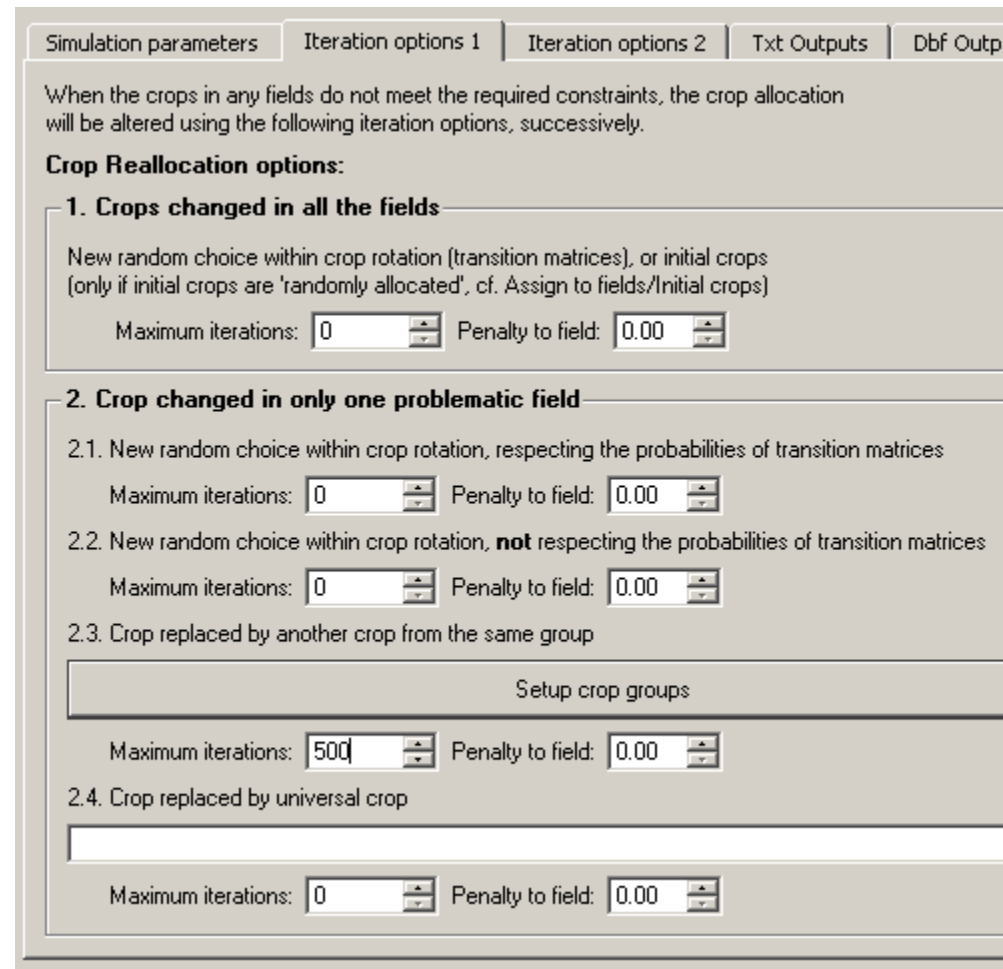
a. Select Simulation set up



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.

Add a functional group

Enter a name for this functional group and then select the crops to be included in this group

Name:

Available crops

CID	crop name (CName)
1	Cereals
2	Vegetables
3	Fallow
4	Forestry

Crops within this group

crop name (CName)	op type (TypeDe)
Cereals	default
Vegetables	default
Fallow	default
Forestry	default

Close Help

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

Simulation parameters | **Iteration options 1** | **Iteration options 2** | Txt Outputs

☒ **Simulated annealing option.**

After iterations not improving the crop allocation, the next new crop allocation will automatically be accepted to the the basis of further improvements (to avoid local minima).

☒ **Optimisation option.**

Land capability & temporal constraints must be met before other constraints are assessed.

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.

Simulation setup

Simulation parameters | Iteration options 1 | Iteration options 2 | **Txt Outputs** | Dbf Outputs

Simulation outputs to text files

☒ Print simulation outputs to text files ?

	Name	To write ?
1	log_Areas	5
2	log_FinalCropAllocID	5
3	log_FinalCropAllocation	5
4	log_InputTables	1
5	log_Iteration	1
6	log_OutputTables	1
7	log_Simulation	1
8	CIDName	0
9	CIDPrarr	0
10	Conditionsarr	0
11	Connectarr	0
12	FAarr	0
13	FCGDarr	0

Set 1 (detailed)

Set 2 (minimum)

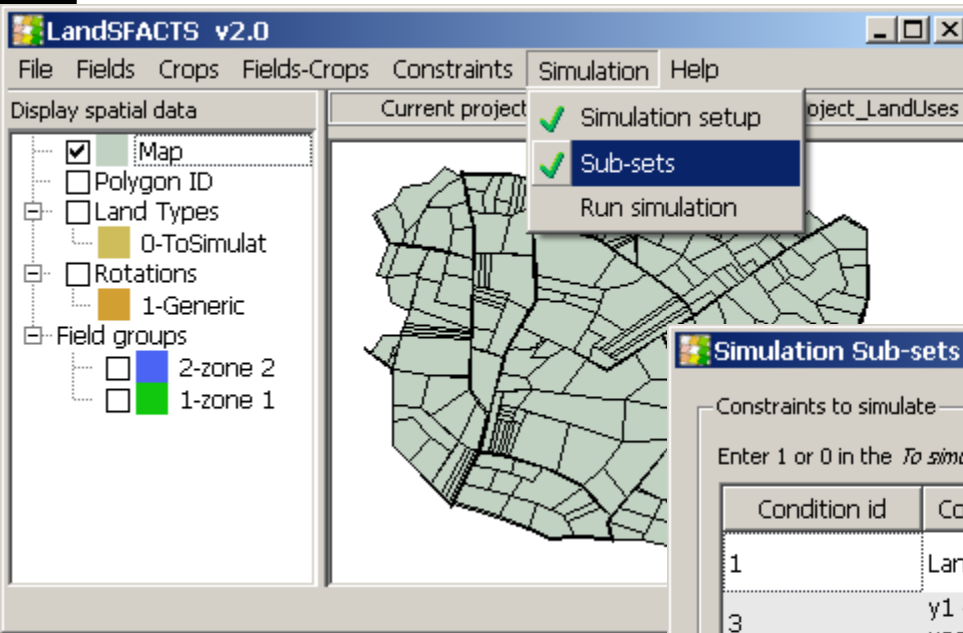
Set 2 (min and temporally consecutive simulations)

Sort display

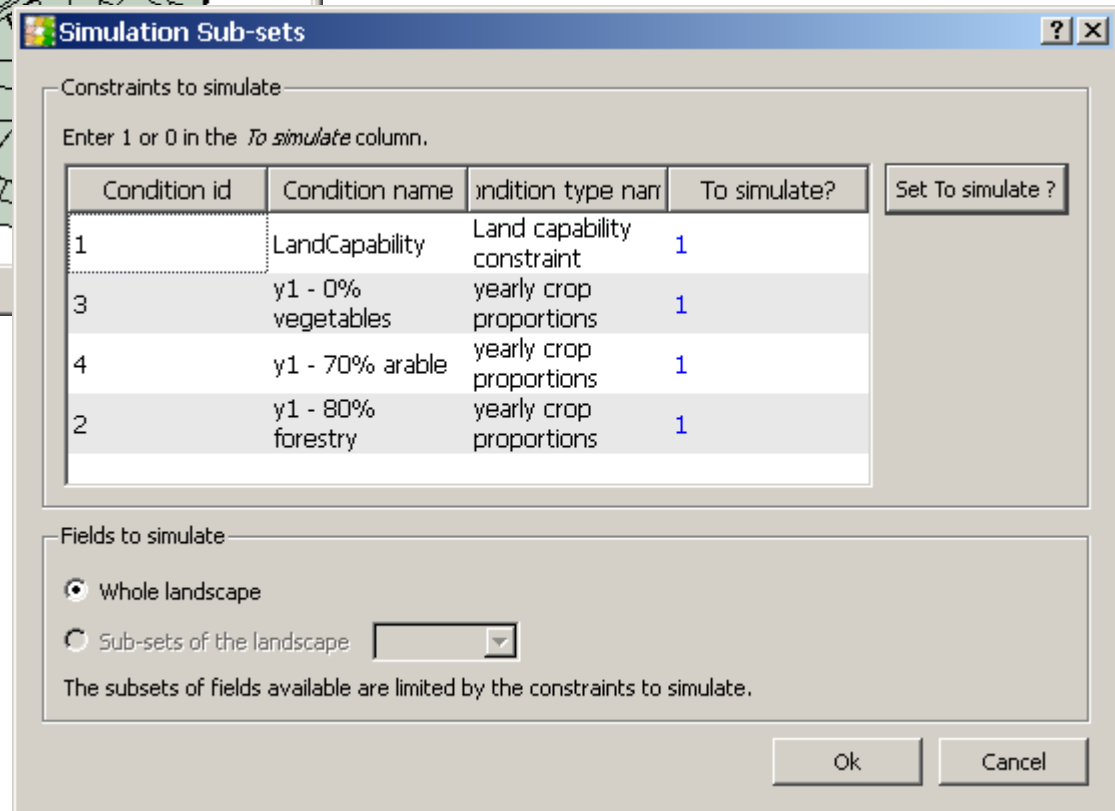
0. No outputs
 1. Outputs once in batch
 2. Outputs for every run (3. only for detailed log_Simulation)
 5. Outputs only for successful runs (53. only for detailed log_Simulation)
 6. Outputs only for unsuccessful runs (63. only for detailed log_Simulation)

Ok

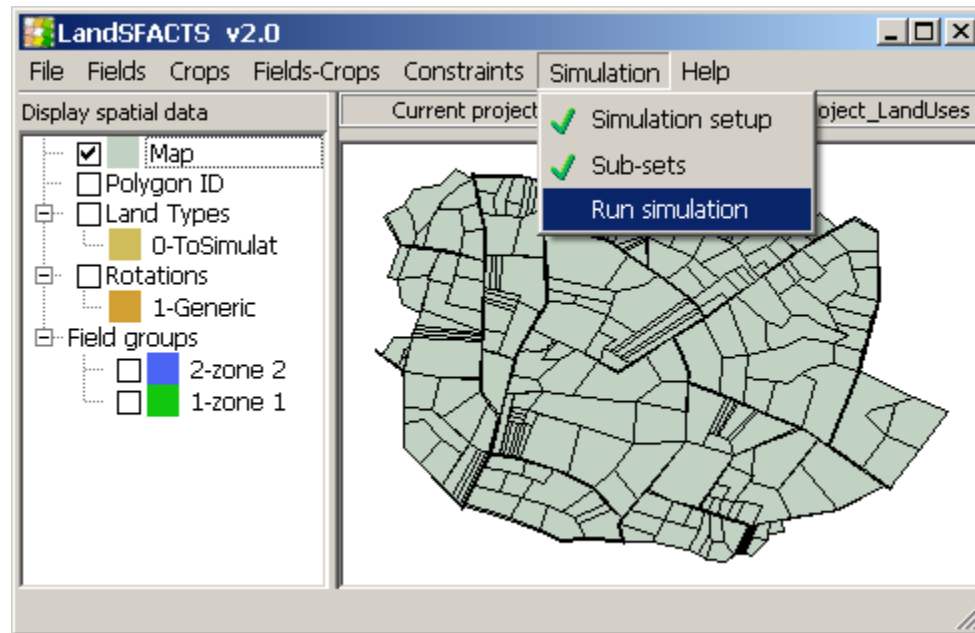
a. Select Sub-sets



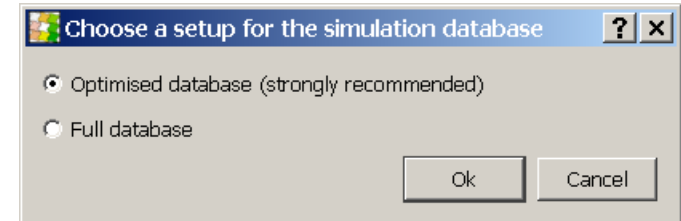
If desired, it is possible to unselect any conditions to simulate and/or to limit the simulation to a subgroup



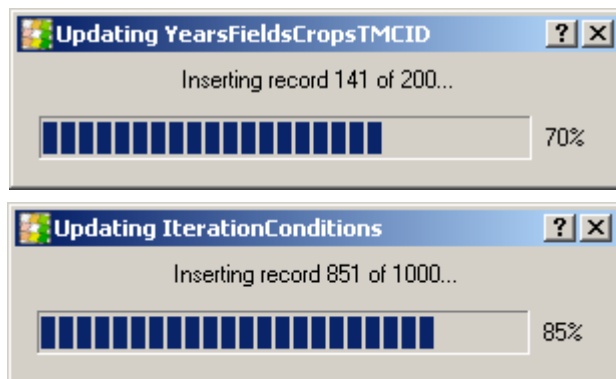
a. Select “Run simulation”



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 Results

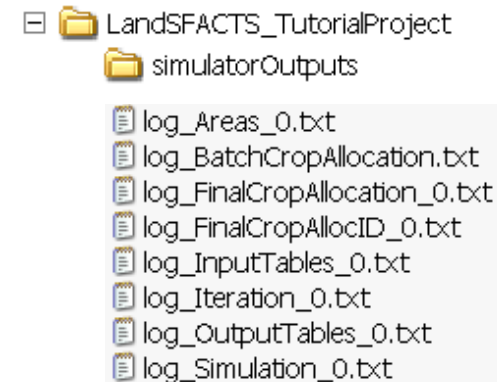
The table displayed below, shows the results of the latest simulation.

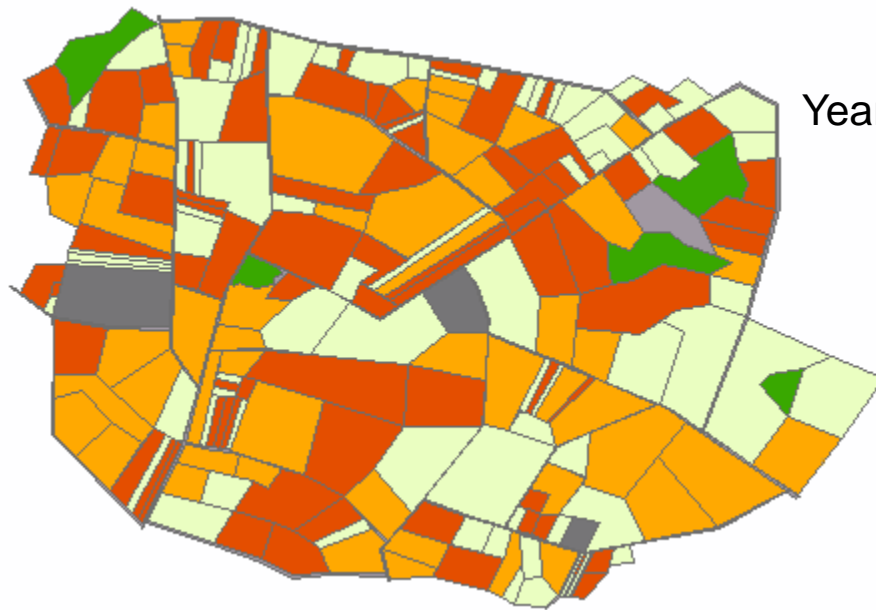
The simulation generated crop allocations for all 2 year(s).

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

Save results as a dbf Close

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





Year 0 (i.e. current)

- ☐ ☒ BigLandSCAPE_LandUses
- CID_0
- ☐ Build up - default
- ☐ Cereals - default
- ☐ Fallow - default
- ☐ Forestry - default
- ☐ Others - default
- ☐ Vegetables - default

Resulting land use allocation
visualised in a GIS software



Year 1 (i.e. with constraints)

