

**Testplan**

**FEARLUS 0-6-3**

**FEARLUS 0-6-4**

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## **Introduction**

This document records the test conditions used for testing FEARLUS model0-6-3 and model0-6-4. This was a black box test (the code was not examined for test conditions). The debugging output was used to check that the model was behaving correctly. This is of course at least one step removed from the actual operation of the code. Unless explicitly stated otherwise, testing was done under Windows 2000 in GUI mode.

All errors found were documented in error reports using the bug handling procedure.

## **Results Of Tests**

The input validation (Section 1) accepted all cases of valid input. Invalid input was generally not catered for in the design – typically untidy failures would result. Currently it was deemed to be not critical to the operation of the model.

All other tests were passed successfully.

## **1. Input Validation**

### **1.1 Command Line Options**

The purpose of this testing was to check that the parameters operated correctly and that any inconsistencies due to faulty input specification are handled cleanly.

#### 1.1.1 -s

Debugging Parameter -DP

T1.1.1 Different seeds are generated in 3 runs and the yields of land parcels is different in year 1.

#### 1.1.2 -S 275

Debugging Parameter -DP

T1.1.2.1 In two separate runs you get the same yield for land parcels in year 1.

T1.1.2.2 -S 300 gives different yields for land parcels

#### 1.1.3 -b

T1.1.3 The model runs in batch mode

#### 1.1.4 -R/-r

T1.1.4.1 Report configuration file is picked up and the report goes to the specified report using the -r parameter.

T1.1.4.2 The consequences of having an R specified without a configuration file will be tried.

T1.1.4.3 The consequences of having an r specified without a destination report will be tried.

T1.1.4.4 The consequences of having a configuration file correctly specified but without a report and vice-versa will be tried.

#### 1.1.5 -h

T1.1.5.1 The history gets saved to the specified file.

T1.1.5.2 The consequences of having an h specified without a corresponding file will be tried.

T1.1.5.3 Try specifying without .txt extension on history file.

#### 1.1.6 -d

T1.1.6.1 DOS mode output of reports (CR+LF) rather than just CR.

T1.1.6.2 Works on a PC platform.

T1.1.6.3 Works on a UNIX platform.

#### 1.1.7 -D

T1.1.7.1 The consequence of having a -D without a debugging parameter will be tried.

T1.1.7.2 -D along with all the debugging parameters results in the desired output being produced in all cases.

#### 1.1.8 -o

T1.1.8.1 The consequence of having an o specified without an observer file will be tried.

T1.1.8.2 The correct observer file is picked up along with all parameters.

#### 1.1.9 -p

T1.1.9.1 The consequence of having a p specified without a parameter file will be tried.

T1.1.9.2 The correct parameter file along with all parameters is picked up

#### 1.1.10 -q

T1.1.10.1 The consequences of entering the above invalid parameter were tried.

1.1.11 -Z1 ..... -Z10

T1.1.11.1 The post initial seed was tested by doing multiple runs with the same starting conditions/seed. This was effectively tested while testing SimplePhysicalCopyingStrategy (see later).

## **1.2 Parameter Loading**

The purpose of this testing is to ensure that the desired parameters are picked up and loaded not to check the correct operation of the parameters – which will be verified by subsequent testing.

### 1.2.1 Model File

The parameters were picked up from the model file – not GUI input.

#### 1.2.1.1 Invalid Parameter

T1.2.1.1 .HumptyDumpty was put in as a parameter. This error condition should be trapped.

#### 1.2.1.2 EnvironmentType

T1.2.1.2.1 valid entries adequately tested with environment creation testing.

T1.2.1.2.2 Try alpha nonsense data “AAAAAA”

Try mixture of valid and invalid parameters

T1.2.1.2.3 “Toroidal-aAAA”

T1.2.1.2.4 “AAAAAA-Moore”

#### 1.2.1.3 NeighbourhoodRadius

T1.2.1.3.1 valid entries adequately tested with environment creation testing.

T1.2.1.3.2 Try “2A”

T1.2.1.3.3 Try 3.5

#### 1.2.1.4 ClimateBSSize

T1.2.1.4.1 investigate the consequences of setting all of these to zero.

T1.2.1.4.2 Try “4A”

T1.2.1.4.3 Try “3.5”

#### 1.2.1.5 EconomyBSSize

T1.2.1.5.1 investigate the consequences of setting all of these to zero.

T1.2.1.5.2 Try “4A”

T1.2.1.5.3 Try “3.5”

#### 1.2.1.6 LandParcelBSSize

T1.2.1.6.1 investigate the consequences of setting all of these to zero.

T1.2.1.6.2 Try “4A”

T1.2.1.6.3 Try “3.5”

#### 1.2.1.7 NlandUse

T1.2.1.7 set the number of land uses to 0 (when values present and not present in above 3 parameters.)

#### 1.2.1.8 PLandUseDontCare

T1.2.1.8.1 investigate setting to zero.

T1.2.1.8.2 Investigate setting to one.

T1.2.1.8.3 Try 0.25A.

T1.2.1.8.4 Try setting to 2.5

T1.2.1.8.5 Try setting to -0.5

#### 1.2.1.9 NLandParcelClump

T1.2.1.9 AAAAAAA

#### 1.2.1.10 Clumping

- T1.2.1.10.1 CAVNT3Clumper:Cycles=6
- T1.2.1.10.2 Same10PropClumper
- T1.2.1.10.3 try with completely invalid parameter AAAAAA
- T1.2.1.10.4 CAVNT3Clumper:Apples=5
- T1.2.1.10.5 CAVNT3Clumper
- T1.2.1.10.6 CAVNT3Clumper:Cycles=7A
- T1.2.1.10.7 Same10PropClumper:Apples=6
- T1.2.1.10.8 Same10PropClumper:bitsToClump=1.5

#### 1.2.1.11 EnvXSize

- T1.2.1.11.1 try setting to zero
- T1.2.1.11.2 Try setting to 4A
- T1.2.1.11.3 Otherwise valid entries tested with environment creation testing

#### 1.2.1.12 EnvYSize

- T1.2.1.12.1 try setting to zero
- T1.2.1.12.2 Try setting to 5B
- T1.2.1.12.3 Otherwise valid entries tested with environment creation testing

#### 1.2.1.13 LandParcelFile/ uselandparcelfile

- T1.2.1.13.1 try a specified landparcelfile with use set to zero.
- T1.2.1.13.2 try a specified landparcelfile with use set to 1A.
- T1.2.1.13.3 try with use set to one and no specified land parcel file.
- T1.2.1.13.4 Try with use set to one and with specified file existing.
- T1.2.1.13.5 Try with use set to one and with specified file not existing.

#### 1.2.1.14 LandUseFile/uselandUsefile

- T1.2.1.14.1 try a specified landusefile with use set to zero.
- T1.2.1.14.2 try a specified landusefile with use set to 1A.
- T1.2.1.14.3 try with use set to one and no specified land use file.
- T1.2.1.14.4 Try with use set to one and with specified file existing.
- T1.2.1.14.5 Try with use set to one and with specified file not existing.

#### 1.2.1.15 EconomyFile/ useEconomyfile

- T1.2.1.15.1 try a specified economyfile with use set to zero.
- T1.2.1.15.2 try a specified economyfile with use set to 1A.
- T1.2.1.15.3 try with use set to one and no specified economy file.
- T1.2.1.15.4 Try with use set to one and with specified file existing.
- T1.2.1.15.5 Try with use set to one and with specified file not existing.

#### 1.2.1.16 EconomyToggleProbFile

- T1.2.1.16.1 try with file present
- T1.2.1.16.2 Try with specified file not present

#### 1.2.1.17 ClimateFile/ useClimatefile

- T1.2.1.17.1 try a specified climate file with use set to zero.
- T1.2.1.17.2 try with use set to one and no specified climate file.
- T1.2.1.17.3 Try with use set to one and with specified file existing.
- T1.2.1.17.4 Try with use set to one and with specified file not existing.

#### 1.2.1.18 ClimateToggleProbFile

- T1.2.1.18.1 try with file present
- T1.2.1.18.2 Try with specified file not present

#### 1.2.1.19 MaxYear

T1.2.1.19.1 try with valid input (check stops at stated year)

T1.2.1.19.2 Try with alpha input

#### 1.2.1.20 InfiniteTime

T1.2.1.20.1 try using 1 for a batch run

T1.2.1.20.2 Try with 0 and no max year specified

T1.2.1.20.3 Try with 0 and invalid max year specified

T1.2.1.20.4 Try with 0 and max year specified

T1.2.1.20.5 Try with 1 and max year not specified

T1.2.1.20.6 Try with 1 and max year specified

T1.2.1.20.7 Try with 1 and no entry opposite max year.

#### 1.2.1.21 NsubPops

T1.2.1.21.1 try 0 as number of sub-populations

T1.2.1.21.2 Try 1 as number of sub-populations

T1.2.1.21.3 Try 3 as number of sub-populations

T1.2.1.21.4 Try 3.5 as number of sub-populations

T1.2.1.21.5 Try alpha as number of sub-populations

#### 1.2.1.22 SubPopFile

T1.2.1.22.1 try with mis-named file

#### 1.2.1.23 StrategyChangeUnit

T1.2.1.23.1 try with valid 2.5

T1.2.1.23.2 Try with integer input – 2

T1.2.1.23.3 Try with negative number

T1.2.1.23.4 Try with alpha input

#### 1.2.1.24 NeighbourNoiseMax

T1.2.1.24.1 try with valid 0.6

T1.2.1.24.2 Try with input out of valid range 1.3

T1.2.1.24.3 Try with input out of valid range –0.2

T1.2.1.24.4 try with alpha input

#### 1.2.1.25 neighbourNoiseMin

1.2.1.25.1 try with valid 0.2

1.2.1.25.2 Try with input out of valid range 1.3

1.2.1.25.3 Try with input out of valid range –0.2

1.2.1.25.4 try with alpha input

1.2.1.25.5 try with min>max

#### 1.2.1.26 breakEvenThreshold

T1.2.1.26.1 try with 5.75

T1.2.1.26.2 try with –8.0

T1.2.1.26.3 try with alpha input

#### 1.2.1.27.landParcelPrice

T1.2.1.27.1 try with 4.5

T1.2.1.27.2 try with –7.75

T1.2.1.27.3 try with alpha input

#### 1.2.1.28 nInitXParcels

T1.2.1.28.1 try with 0

T1.2.1.28.2 try with -3

T1.2.1.28.3 try with 3 when envxSize = 19

T1.2.1.28.4 try with 3 when envXSize = 18

#### 1.2.1.29 nInitYParcels

T1.2.1.29.1 try with 0

T1.2.1.29.2 try with -3

T1.2.1.29.3 try with 3 when envxSize = 19

T1.2.1.29.4 try with 3 when envXSize = 18

#### 1.2.1.30 dumpHistory

T1.2.1.30.1 Try with 2

T1.2.1.30.2 Try with alpha

T1.2.1.30.3 Try with 1 and -h option not specified

T1.2.1.30.4 Try with 1 and -h option specified

T1.2.1.30.5 Try with 0

#### 1.2.1.31 MaxHistoryLength

T1.2.1.31.1 try with alpha

T1.2.1.31.2 Try with -5

T1.2.1.31.3 Try with 4.5

T1.2.1.31.4 Try with 5

## 1.2.2 Climate Toggle Probability File

### 1.2.2.1 NumberOfElements

T1.2.2.1.1 12 – which would be bigger than 5 specified by climateBSSize

T1.2.2.1.2 3 – which would be less than the 5 specified by climateBSSize

T1.2.2.1.3 5 – the number specified by climateBSSize

T1.2.2.1.4 try alpha input

T1.2.2.1.5 try -4

T1.2.2.1.6 try 5.5

### 1.2.2.2 probability bit will flip over

T1.2.2.2.1 with 5 as valid input above

T1.2.2.2.2 try with 3 lines of input

T1.2.2.2.3 try with 6 lines of input

T1.2.2.2.4 try with alpha input

T1.2.2.2.5 try with valid input

## 1.2.3 Economy Toggle Probability File

### 1.2.3.1 NumberOfElements

T1.2.3.1.1 12 – which would be bigger than 5 specified by economyBSSize

T1.2.3.1.2 3 – which would be less than the 5 specified by economyBSSize

T1.2.3.1.3 5 – the number specified by economyBSSize

T1.2.3.1.4 try alpha input

T1.2.3.1.5 try -4

T1.2.3.1.6 try 5.5

### 1.2.3.2 probability bit will flip over

T1.2.3.2.1 with 5 as valid input above

T1.2.3.2.2 try with 3 lines of input

T1.2.3.2.3 try with 6 lines of input

T1.2.3.2.4 try with alpha input

T1.2.3.2.5 try with valid input

## 1.2.4 Subpopulation Contest File

### 1.2.4.1 NumberOfSubPopulations

T1.2.4.1.1 try alpha

T1.2.4.1.2 Try 3 when nSubPops is 2

T1.2.4.1.3 Try 1 when nSubPops is 2

T1.2.4.1.4 Try 2 when nSubPops is 2

T1.2.4.1.5 Try 0 when nSubPops is 2

T1.2.4.1.6 Try -2 when nSubPops is 2

### 1.2.4.2 SubPopulationFile

T1.2.4.2.1 alpha followed by valid file

T1.2.4.2.2 1 followed by invalid file name

T1.2.4.2.3 0/1/2 followed by valid file names

T1.2.4.2.4 1 with valid file name 2 with an invalid file name

T1.2.4.2.5 Number sequence 1 then 3.

## 1.2.5 Subpopulation File

### 1.2.5.1 Label

T1.2.5.1.1 none present

T1.2.5.1.2 Numeric

T1.2.5.1.3 Alphanumeric label

### 1.2.5.2 Colour

T1.2.5.2.1 alpha

T1.2.5.2.2 -1

T1.2.5.2.3 0

T1.2.5.2.4 5

T1.2.5.2.5 1

### 1.2.5.3 probability

T1.2.5.3.1 alpha

T1.2.5.3.2 -0.5

T1.2.5.3.3 2

T1.2.5.3.4 0.5

T1.2.5.3.5 also will need to do a test with two subpopulations 0.2 and 0.6 to see what happens when the combined probabilities do not sum to unity.

T1.2.5.3.6 Also try with two subpopulations and -0.5 and 1.5 where the sum of probabilities is correct but individual values are out of range.

### 1.2.5.4 strategySelectorFile

T1.2.5.4.1 non-existing file

T1.2.5.4.2 existing file

T1.2.5.4.3 blank

### 1.2.5.5 memorySizeMin

T1.2.5.5.1 alpha

T1.2.5.5.2 -1

T1.2.5.5.3 1.5

T1.2.5.5.4 1

T1.2.5.5.5 10

### 1.2.5.6 memorySizeMax

T1.2.5.6.1 alpha

T1.2.5.6.2 -1

T1.2.5.6.3 1.5

T1.2.5.6.4 1

T1.2.5.6.5 10

T1.2.5.6.6 Supplementary – test min/max difference >0 /0/ <0

T1.2.5.6.7 - test min > max.

### 1.2.5.7 neighbourWeightDist

T1.2.5.7.1 malformed

T1.2.5.7.2 blank

T1.2.5.7.3 normal

T1.2.5.7.4 uniform

1.2.5.8 neighbourWeightMin

T1.2.5.8.1 alpha

T1.2.5.8.2 -1

T1.2.5.8.3 1.5

T1.2.5.8.4 1

T1.2.5.8.5 0

T1.2.5.8.6 1 present with normal above

1.2.5.9 neighbourWeightMax

T1.2.5.9.1 alpha

T1.2.5.9.2 -1

T1.2.5.9.3 1.5

T1.2.5.9.4 1

T1.2.5.9.5 10

T1.2.5.9.6 10 present with normal above

T1.2.5.9.7 Supplementary – test min/max difference >0 /0/ <0

T1.2.5.9.8 min > max

1.2.5.10 neighbourWeightMean

T1.2.5.10.1 alpha

T1.2.5.10.2 -1

T1.2.5.10.3 1.5

T1.2.5.10.4 1

T1.2.5.10.5 0

T1.2.5.10.6 1.5 present with uniform above

1.2.5.11 neighbourWeightVar

T1.2.5.11.1 alpha

T1.2.5.11.2 -1

T1.2.5.11.3 1.5

T1.2.5.11.4 1

T1.2.5.11.5 0

T1.2.5.11.6 1 present with uniform above

1.2.5.12 imitateProbDist

T1.2.5.12.1 malformed

T1.2.5.12.2 blank

T1.2.5.12.3 normal

T1.2.5.12.4 uniform

1.2.5.13 imitateProbMin

T1.2.5.13.1 alpha

T1.2.5.13.2 -1

T1.2.5.13.3 1.5

T1.2.5.13.4 1

T1.2.5.13.5 0

T1.2.5.13.6 0 present with normal above

T1.2.5.13.7 0.5

1.2.5.14 imitateProbMax

T1.2.5.14.1 alpha

T1.2.5.14.2 -1

T1.2.5.14.3 1.5

T1.2.5.14.4 0.75

T1.2.5.14.5 0.75 present with normal above

T1.2.5.14.6 0 with 1 entered as a minimum

T1.2.5.14.7 Supplementary – test min/max difference  $>0$  /  $0$  /  $<0$

1.2.5.15 imitateProbMean

T1.2.5.15.1 alpha

T1.2.5.15.2 -1

T1.2.5.15.3 1.5

T1.2.5.15.4 1

T1.2.5.15.5 0

T1.2.5.15.6 0.4

T1.2.5.15.7 0.4 present with uniform above

1.2.5.16 imitateProbVar

T1.2.5.16.1 alpha

T1.2.5.16.2 -1

T1.2.5.16.3 1.5

T1.2.5.16.4 1

T1.2.5.16.5 0

T1.2.5.16.6 0.2

T1.2.5.16.7 0.2 present with uniform above

1.2.5.17 habitImitateThresholdDist

T1.2.5.17.1 malformed

T1.2.5.17.2 blank

T1.2.5.17.3 normal

T1.2.5.17.4 uniform

1.2.5.18 habitImitateThresholdMin

T1.2.5.18.1 alpha

T1.2.5.18.2 -1

T1.2.5.18.3 1.5

T1.2.5.18.4 1

T1.2.5.18.5 0

T1.2.5.18.6 1 present with normal above

1.2.5.19 habitImitateThresholdMax

T1.2.5.19.1 alpha

T1.2.5.19.2 -1

T1.2.5.19.3 1.5

T1.2.5.19.4 1

T1.2.5.19.5 10

T1.2.5.19.6 10 present with normal above

T1.2.5.19.7 Supplementary – test min/max difference  $>0$  /  $0$  /  $<0$

1.2.5.20 habitImitateThresholdMean

T1.2.5.20.1 alpha

T1.2.5.20.2 -1

T1.2.5.20.3 1.5

T1.2.5.20.4 1

T1.2.5.20.5 0

T1.2.5.20.6 1.5 present with uniform above

1.2.5.21 habitImitateThresholdVar

T1.2.5.21.1 alpha

T1.2.5.21.2 -1

T1.2.5.21.3 1.5

T1.2.5.21.4 1

T1.2.5.21.5 0

T1.2.5.21.6 1 present with uniform above

## 1.2.6 Strategy Selector File

### 1.2.6.1 Number OfStrategyClasses

T1.2.6.1.1 alpha

T1.2.6.1.2 0 with none present

T1.2.6.1.3 0 with one present

T1.2.6.1.4 0.5

T1.2.6.1.5 1 or 2 as required to be valid for tests below

### 1.2.6.2 Strategy Combinations

1.2.6.2.1 Strategies don't add up to 1	Fickle	0.2	0.2	0.2	0.2
1.2.6.2.2 Alpha input	Random	1	A	A	1
1.2.6.2.3 Valid set	Random	0.1	0.2	0.3	0.4
	Habit	0.9	0.8	0.7	0.6
1.2.6.2.4	Random	0.1	0.2	0.3	0.4
	Habit	0.9	0.7	0.7	0.6

### 1.2.7 Land Parcel Biophysical Properties File

Testing is working on the basis that the wrong file may be attached in error to a model. Therefore, it is not necessary to test formatting errors but only data consistency errors.

T1.2.7.1 EnvironmentXSize different from envXSize in model file.

T1.2.7.2 EnvironmentYSize different from envYSize in model file.

T1.2.7.3 Bitstring is of wrong length.

T1.2.7.4 A valid file gets loaded.

### 1.2.8 Land Use File

Testing is working on the basis that the wrong file may be attached in error to a model. Therefore, it is not necessary to test formatting errors but only data consistency errors.

T1.2.8.1 The number of land uses is different from the nLandUse parameter in the model file.

T1.2.8.2 The wrong number of bits in the Land Use bitstring

### 1.2.9 Climate File

T1.2.9.1 Contains the wrong number of bits in the string

T1.2.9.2 Contains the correct number of bits in the string

### 1.2.10 Economy File

T1.2.10.1 Contains the wrong number of bits in the string

T1.2.10.2 Contains the correct number of bits in the string

### 1.2.11 Report Configuration File

- T1.2.11.1 Try with a report file with invalid alpha data. (All “AAAAAAAAAAAA” in first line).
- T1.2.11.2 Try “DefaultYearsToReport: 9AA”
- T1.2.11.3 Try “DefaultYearsToReport: 10-15A”
- T1.2.11.4 Try “DefaultYearsToReport: 15-10”
- T1.2.11.5 Try “DefaultYearsToReport: 10-15”
- T1.2.11.6 Try “DefaultYearsToReport: Every 1A”
- T1.2.11.7 Try “DefaultYearsToReport: 1,3-5A,10”
- T1.2.11.8 Try “DefaultYearsToReport: 1,3-5,10”
- T1.2.11.9 Try “LandUseReport YearsToRepairssss 10-15”
- T1.2.11.10 Try “LandUseReport YearsToReport: 10-15”
- T1.2.11.11 Try “LandUseReport YearsToReport: 10-15A”
- T1.2.11.12 Try “ClumpinessReport YearsToReport: 0”
- T1.2.11.13 Try “ClumpinessReport Options: HaHa YearsToReport: 0”
- T1.2.11.14 Try “ClumpinessReport Options: Histo YearsToReport: 0”
- T1.2.11.15 Try “ClumpinessReport Options: NoHisto YearsToReport: 0”

### 1.2.12 Observer File

- T1.2.12.1 With a request to show all rasters all appear.
- T1.2.12.2 With only the showStrategyColourKey raster set to be shown it is the only one shown.
- T1.2.12.3 With alternate rasters to be shown the selected ones are the ones shown.
  
- T1.2.12.4 Investigate the consequences of varying nHistogramBins.
- T1.2.12.5 Investigate the consequences of varying the zoomSize.
- T1.2.12.6 Investigate the consequences of varying the displayFrequency.
  
- T1.2.12.7 Check that with the saveDumpedHistory set to 1 the history is used in GUI.
- T1.2.12.8 Check that with the saveDumpedHistory set to 0 the history is not used in GUI.

**This completes the validation testing. Subsequent testing can assume valid parameters have been fed into the model.**

## 2 Initial set Up

### 2.1 Creation of land parcels and Random initial Biophysical Properties

The -DU parameter was used to obtain displays of the bit strings.

T2.1.1 0 bits in biophysical properties

T2.1.2 1 bit in biophysical properties

T2.1.3 3 bits in biophysical properties

T2.1.4 Test Biophysical Properties loaded from file successfully

### 2.2 Subsequent Clumping Of Biophysical Properties

2.2.1 0 bits in string

T2.2.1.1 1A - Same10PropClumper:bitsToClump=1

T2.2.1.2 1B - CAVNT3Clumper:Cycles=6

2.2.2 CAVNT3Clumper Toroidal von Neumann

T2.2.2.1 1 bit in string / 0 and then 1 followed by 2 rounds of clumping

T2.2.2.2 1 by 1

T2.2.2.3 2 by 1

T2.2.2.4 2 by 2

T2.2.2.5 10 by 8 environment

2.2.3 Same10PropClumper Toroidal Moore

T2.2.3.1 1 bit in string

T2.2.3.2 1 by 1

T2.2.3.3 2 by 1

T2.2.3.4 2 by 2

T2.2.3.5 10 by 8 environment

### 2.3 Creation Of Land Uses And random Initial Match And Don't care bitstrings

The -DU parameter was used to obtain displays of the bit strings.

T2.3 - climate=5, economy=3, biophysical=6 the above get created with correct length and don't vary

### 2.4 Test Loading And Saving Of Land Uses

The -D U parameter was used to obtain displays of the bit strings.

Tested in parameter validation

### 2.5 Creation of climate and economy bitstrings

The -D U parameter was used to obtain displays of the bit strings.

The -s parameter used to vary seed.

T2.5.1 - creation of correct length tested in land uses above.

T2.5.2 - test saving and loading of bitstrings.

## 2.6 Agent Populations

### T2.6.1

The following two sub-populations will be set up and their respective numbers and values will be checked to try to confirm that they have been set up properly – this can be done by examining the histogram graphs.

Label	Strategy1	Strategy2
Colour	1	2
Probability	0.2	0.8
StrategySelectorFile	Strategy1	Strategy2
MemorySizeMin	1	4
MemorySizeMax	2	5
NeighbourWeightDist	normal	uniform
NeighbourWeightMin		5
NeighbourWeightMax		7
NeighbourWeightMean	2	
NeighbourWeightVar	0.5	
ImitateProbDist	uniform	normal
ImitateProbMin	0.1	
ImitateProbMax	0.2	
ImitateProbMean		0.6
ImitateProbVar		0.1
HabitImitateThresholdDist	normal	uniform
HabitImitateThresholdMin		6
HabitImitateThresholdMax		8
HabitImitateThresholdMean	4	
HabitImitateThresholdVar	1	

Check that colour assigned to sub-populations is consistent across runs.

### T2.6.2

A population comprising 100 % Strategy 1 will be tried and verified.

## 2.7 Allocation Of Land Parcels To Land Managers

These can be verified by means of the -D mM debugging parameters.

T2.7.1 With nInitXParcels and nInitYParcels set to 1 – one land manager gets set to each land parcel.

T2.7.2 Investigate what happens when nInitXParcels=2 and the size in the X direction is 6.

## 2.8 Creation Of Environment X x Y Land Parcels

**Aim : to ensure the social and physical neighbourhoods are correctly assigned.**

**The debugging parameter used was –DMc.**

There are several parameters that have to be considered.

World : planar/toroidal/cylindrical  
Neighbourhood : von Neumann/Moore  
Geometry : square/hexagonal/triangular  
Relationship : physical/social  
Ownership : 1 land-parcel/manager several land-parcels/manager  
Radius : any positive integer greater than one.

World Size : This has to be even in the direction of wrap around for the triangular geometry.  
Therefore, a 6x4 World size will be used for testing the triangular geometry in the case of one land manager per parcel.  
A 6x5 World size will be used for testing the other geometrys. (The size is odd in one direction since this might make a difference.)  
A larger World size will have to be used where there are several land parcels per manager.

In all cases seven cells will be used to determine their neighbourhoods. They are chosen for their positions in the World .

Where there is one cell per land manager – maybe this test condition is/ can only be established for year 0 at initiation.

(0,0)  
(3,0)  
(5,0)  
(3,2)  
(0,4) (0,3) for triangular  
(2,4) (2,3) for triangular  
(5,4) (5,3) for triangular

In the case where there are several cells per land manager cells to analyze I'm not sure if we can pre-determine and control positions – but the principle above will be followed where cells will be chosen due to their positions on the nominal grid :

Bottom left,  
Bottom middle,  
Bottom right,  
Centre,  
Top left,  
Top middle,  
Top right.

To do this testing an observer file is used with : showUseRaster=1  
ShowLPBitStringDiffs=0

Then left click on a parcel and the next time the raster is redrawn the neighbouring squares are highlighted in yellow. This was done for confirmation purposes. It was actually necessary to check both the debugging output and the GUI to check that the correct neighbourhoods were created.

### 2.8.1 1 Land Parcel/Manager – Physical Relationship

For most of these the debugging parameter was `-Dn` and the grid display was used for testing. The test data used is in Test01-PhysRel under model0-6-4.

A separate parameter test file was used for each Neighbourhood/Geometry. The radius would have to be altered manually to generate all the test conditions.

The command entered to run the model included `-p I-v-S.model -o I.obs -Dn`

#### 2.8.1.1 Planar

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P1.model	T2.8.1.1.1	T2.8.1.1.2	T2.8.1.1.3
TriangularVonNeumann	I-v-P2.model	T2.8.1.1.4	T2.8.1.1.5	T2.8.1.1.6
HexagonalParallelogram	I-v-P3.model	T2.8.1.1.7	T2.8.1.1.8	T2.8.1.1.9
Moore	I-v-P4.model	T2.8.1.1.10	T2.8.1.1.11	T2.8.1.1.12
Global	I-v-P5.model	T2.8.1.1.13	T2.8.1.1.14	T2.8.1.1.15

#### 2.8.1.2 Toroidal

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P6.model	T2.8.1.2.1	T2.8.1.2.2	T2.8.1.2.3
TriangularVonNeumann	I-v-P7.model	T2.8.1.2.4	T2.8.1.2.5	T2.8.1.2.6
HexagonalParallelogram	I-v-P8.model	T2.8.1.2.7	T2.8.1.2.8	T2.8.1.2.9
Moore	I-v-P9.model	T2.8.1.2.10	T2.8.1.2.11	T2.8.1.2.12

#### 2.8.1.3 Horizontal Cylindrical

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P10.model	T2.8.1.3.1	T2.8.1.3.2	T2.8.1.3.3
TriangularVonNeumann	I-v-P11.model	T2.8.1.3.4	T2.8.1.3.5	T2.8.1.3.6
HexagonalParallelogram	I-v-P12.model	T2.8.1.3.7	T2.8.1.3.8	T2.8.1.3.9
Moore	I-v-P13.model	T2.8.1.3.10	T2.8.1.3.11	T2.8.1.3.12

#### 2.8.1.4 Vertical Cylindrical

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P14.model	T2.8.1.4.1	T2.8.1.4.2	T2.8.1.4.3
TriangularVonNeumann	I-v-P15.model	T2.8.1.4.4	T2.8.1.4.5	T2.8.1.4.6
HexagonalParallelogram	I-v-P16.model	T2.8.1.4.7	T2.8.1.4.8	T2.8.1.4.9
Moore	I-v-P17.model	T2.8.1.4.10	T2.8.1.4.11	T2.8.1.4.12

## 2.8.2 Several Land Parcels/Manager – Social Relationship

For most of these the debugging parameter was `-Dn` and the second grid display produced used for testing.

The test data used is in `Test01-SocRel` under `model0-6-4`.

The number of initial x parcels per agent was set to 2.

The command entered to run the model included `-p I-v-S.model -o I.obs -Dn`

The same cells are chosen as in the previous cases.

### 2.8.2.1 Planar

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P1.model	T2.8.2.1.1	T2.8.2.1.2	T2.8.2.1.3
TriangularVonNeumann	I-v-P2.model	T2.8.2.1.4	T2.8.2.1.5	T2.8.2.1.6
HexagonalParallelogram	I-v-P3.model	T2.8.2.1.7	T2.8.2.1.8	T2.8.2.1.9
Moore	I-v-P4.model	T2.8.2.1.10	T2.8.2.1.11	T2.8.2.1.12
Global	I-v-P5.model	T2.8.2.1.13	T2.8.2.1.14	T2.8.2.1.15

### 2.8.2.2 Toroidal

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P6.model	T2.8.2.2.1	T2.8.2.2.2	T2.8.2.2.3
TriangularVonNeumann	I-v-P7.model	T2.8.2.2.4	T2.8.2.2.5	T2.8.2.2.6
HexagonalParallelogram	I-v-P8.model	T2.8.2.2.7	T2.8.2.2.8	T2.8.2.2.9
Moore	I-v-P9.model	T2.8.2.2.10	T2.8.2.2.11	T2.8.2.2.12

### 2.8.2.3 Horizontal Cylindrical

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P10.model	T2.8.2.3.1	T2.8.2.3.2	T2.8.2.3.3
TriangularVonNeumann	I-v-P11.model	T2.8.2.3.4	T2.8.2.3.5	T2.8.2.3.6
HexagonalParallelogram	I-v-P12.model	T2.8.2.3.7	T2.8.2.3.8	T2.8.2.3.9
Moore	I-v-P13.model	T2.8.2.3.10	T2.8.2.3.11	T2.8.2.3.12

### 2.8.2.4 Vertical Cylindrical

Neighbourhood/Geometry	Test File	Radius = 1	Radius = 2	Radius = 3
VonNeuman	I-v-P14.model	T2.8.2.4.1	T2.8.2.4.2	T2.8.2.4.3
TriangularVonNeumann	I-v-P15.model	T2.8.2.4.4	T2.8.2.4.5	T2.8.2.4.6
HexagonalParallelogram	I-v-P16.model	T2.8.2.4.7	T2.8.2.4.8	T2.8.2.4.9
Moore	I-v-P17.model	T2.8.2.4.10	T2.8.2.4.11	T2.8.2.4.12

### 3. Annual Cycle

#### 3.1 Yield Calculation

**Aim : To ensure yields are calculated correctly.**

**Debug Parameters –DUMPE  
Test Data in directory Yields.**

Land use matches to three properties : Biophysical, Climate and Economy.  
Land use match string can be 0 or 1 and of variable length.  
Land use 'Don't Care' string can be 0 or 1 and of variable length.

Initial testing	Biophysical	length 7	1010101
	Climate	length 5	01010
	Economy	length 3	101

##### T3.1.1

Land use 'Don't Care' string all Zeroes  
Land use string exact match to physical features  
Land Use File badluyield1.lu

##### T3.1.2

Land use 'Don't Care' string all Zeroes  
Land use string exact mis-match to physical features  
Land Use File badluyield2.lu

##### T3.1.3

Land use 'Don't Care' string all Ones  
Land use string exact match to physical features  
Land Use File badluyield3.lu

##### T3.1.4

Land use 'Don't Care' string all Ones  
Land use string exact mis-match to physical features  
Land Use File badluyield4.lu

For the remainder of the testing the bits of the physical features are reversed from the settings in the initial testing.

##### T3.1.5

Land use 'Don't Care' the first and then every third bit is set to 1.  
Land use every second bit is a match to the physical features.  
Land Use File badluyield5.lu

##### T3.1.6

Land use 'Don't Care' the first and then every third bit is set to 1.  
Land use every third bit is a match to the physical features.  
Land Use File badluyield6.lu

### 3.2 Strategy Selection

**Aim : to ensure the correct strategy is used by managers**

**Debugging Option : -DUMPE**

**Test Data is in directory: StrategySel**

T3.2

There are four strategy situations : -

- Initial Strategy
- Yield is above threshold – Contentment strategy
- Yield is below threshold – Imitative strategy
- Yield is below threshold – Non-imitative strategy

One strategy is set up for each of the four conditions above. Therefore, the strategy used for deciding land use will indicate which strategy situation is being invoked. Two runs were done – one where the imitative probability is zero, and one where the imitative probability is one. The model was run for three cycles and the strategies were checked to be compatible with the yields. Conditions were chosen such that all of the above strategy situations were encountered.

### 3.3 Strategies

**Aim : To ensure the correct operation of all the strategies for choosing land uses**

Some imitative strategies use information in the social neighbourhood of the land manager others use information in the physical neighbourhood.

Imitative strategies also consider neighbourhood weighting.

Imitative strategies also involve neighbourhood noise.

Both imitative and innovative strategies may involve memory by examining data from earlier cycles.

Most strategies involve social relationships. Therefore, to involve this in testing there will have to be several land parcels per manager when testing.

#### 3.3.1 Cautious Imitative Optimum

**Debug option -DMPUEich**

**Test files CautiousImitativeOptimum**

The land parcel chosen for testing purposes was (0,4). The data in the tables below was taken from the debugging output. A program was written to independently check the values of the expected yield and the variance.

##### T3.3.1.1

Neighbourhood Noise = 0

LPS/ LPN	LP	BioPhys Actual	BioPhys Visible	Land Use	Yield	Anti Match	Expected	Variance
LPS	0,4	100101	100101	2	8	0	8	0
	1,4	111111	111111	1	5	3	5.857	2.331
LPN	2,4	011001	011001	2	10	4	8.28	2.511
	3,4	001100	001100	2	9	3	8.14	2.331
	0,3	011000	011000	1	7	5	7	3.46
	1,3	111011	111011	3	8	4	7.42	3.01

##### T3.3.1.2

Neighbourhood Noise = 0.25

LPS/ LPN	LP	BioPhys Actual	BioPhys Visible	Land Use	Yield	Anti Match	Expected	Variance
LPS	0,4	100101	100101	2	8	0	8	0
	1,4	111111	111111	1	5	3	5.857	2.331
LPN	2,4	011001	010001	2	10	3	8.71	2.07
	3,4	001100	000100	2	9	2	8.42	1.695
	0,3	011000	011000	1	7	5	7	3.46
	1,3	111011	111011	3	8	4	7.42	3.01

In both cases land use 2 was chosen since it had the highest score.

### 3.3.2 Eccentric Specialist

#### T3.3.2

Make this the Strategy for all managers. Verify that over all managers there appears to be a random selection of land uses initially.

Check that each manager then continues to have the same land use for a particular instance of eccentricStrategy. The model is run for three years with memory=1/imitate=0/aspiration threshold8.1

And all land uses and yields checked that they are consistent.

Yields consistently above threshold handled correctly

Yields consistently below threshold

Yields go above, below and then above again

Yields go below, above and then below again.

### 3.3.3 Fickle

#### T3.3.3

Several years examples for all land parcels after a fickle strategy has been used all subsequent land parcels have the same land use.

The initial choice of land use each year appears to be random.

The model is run for three years with memory=1/imitate=0/aspiration threshold8.1

And all land uses and yields checked that they are consistent.

Yields consistently above threshold handled correctly (i.e. for a particular manager each instance of FickleStrategy the same manager has the same land use on each land parcel.)

Yields consistently below threshold

Yields go above, below and then above again

Yields go below, above and then below again.

### 3.3.4 Habit

#### T3.3.4

The initial choice of land use for year 0 is done using a random strategy.

The model is run for three years with memory=1/imitate=0/aspiration threshold8.1

And all land uses and yields checked that they are consistent.

Yields consistently above threshold handled correctly (i.e. a particular land parcel has the same land use each year irrespective of yields and thresholds.)

Yields consistently below threshold

Yields go above, below and then above again

Yields go below, above and then below again.

### 3.3.5 Imitative Optimum

**Debug option -DMPUEicb**

**Test files ImitativeOptimum**

The land parcel chosen for testing purposes was (0,4). The data in the tables below was taken from the debugging output. A program was written to independently check the values of the expected yield and the variance.

#### T3.3.5.1 Neighbourhood Noise = 0

LPS/ LPN	LP	BioPhys Actual	BioPhys Visible	Land Use	Yield	Anti Match	Expected	Score
LPS	0,4	100101	100101	2	8	0	8	8
	1,4	111111	111111	1	5	3	5.857	5.857
LPN	2,4	011001	011001	2	10	4	8.28	
	3,4	001100	001100	2	9	3	8.14	
	0,3	011000	011000	1	7	5	7	
	1,3	111011	111011	3	8	4	7.42	14.85

#### T3.3.5.2 Neighbourhood Noise = 0.25

LPS/ LPN	LP	BioPhys Actual	BioPhys Visible	Land Use	Yield	Anti Match	Expected	Score
LPS	0,4	100101	100101	2	8	0	8	8
	1,4	111111	111111	1	5	3	5.857	5.857
LPN	2,4	011001	010001	2	10	3	8.71	
	3,4	001100	000100	2	9	2	8.42	
	0,3	011000	011000	1	7	5	7	
	1,3	111011	111011	3	8	4	7.42	14.85

In both cases land use 3 was chosen since it had the highest score

### 3.3.6 Last N Years' Optimum

**Debug option -DMPUE**

**Test data in LastNYearsOptimum**

#### T3.3.6

The initial choice of landuse for year 0 is done using a random strategy.

The model is run for three years and all land uses and yields are checked that they are consistent with the strategy.

### 3.3.7 Last Year's Optimum

**Debug option -DMPUE**

**Test data in LastYearsOptimum**

#### T3.3.7

The initial choice of landuse for year 0 is done using a random strategy.

The model is run for three years and all land uses and yields are checked that they are consistent with the strategy.

### 3.3.8 Match Weighted Optimum

**Debug option –DMPUE**

**Test data in MatchWeightedOptimum**

T3.3.8

The initial choice of landuse for year 0 is done using a random strategy.

The model is run for three years and all land uses and yields are checked that they are consistent with the strategy.

### 3.3.9 Match Weighted Random

**Debug option –DMPUE**

**Test data in MatchWeightedRandom**

T3.3.9

The initial choice of landuse for year 0 is done using a random strategy..

The yield for each land parcel and use combination was calculated. The model was then run for 15 years and a tally kept of how often each land use is selected for a particular parcel. The tally percentage for each parcels land use was roughly checked to be compatible with a weighted random selection.

### 3.3.10 Parcel Corrected Yield Weighted Copying

**Debug option -DMPUEic**

**Test files ParcelWeightedCopying**

#### T3.3.10

Land parcel 0,4 was chosen to test the results. All the calculations were checked for the first year of results. The debugging output did not show the visible biophysical properties of the neighbours. However, the match was stated and that was the same as the parcel weighted copying option run with the same random seeds. Therefore, it looks as though the mutation was the same in both runs. It should be noted that the neighbourhood weighting was 2. The default seeds were used for the run.

	Parcel	Match	Land Use	Yield	Score
LPS	(0,4)	6	2	8	48
	(1,4)	3	1	5	15
LPN	(2,4)	4	2	10	80
	(3,4)	2	2	9	36
	(0,3)	1	1	7	14
	(1,3)	3	3	8	48

LU 1 had score 29  
2 164  
3 48

LU 2 was selected in this instance

The scores for the first ten parcels in the debugging output were recorded.

The total scores were in the ratio 0.2 : 0.3 : 0.4.

The ratio of land uses chosen 0.2 : 0.2 : 0.6.

### 3.3.11 Parcel Weighted Copying

**Debug option -DMPUEic**

**Test files ParcelWeightedCopying**

#### **T3.3.11**

The land parcel (0,4) was chosen to test the results. All the calculations were checked through using the default seeds and the first yearly run. Another, 9 runs were done varying the post initial seed from 1 – 9 inclusive. The land uses chosen and their scores were kept note of in an effort to verify that the land uses were chosen in roughly the correct proportion. Only the first years steps were done in order to simplify the testing in that most of the information would be the same for all runs. The testing that the land uses were chosen in the correct proportion to their parcel weighting was actually inconclusive. Over the ten runs the land use scores were in the proportion 0.2 : 0.6 : 0.2 and the land uses chosen were in proportion 0.0 : 0.8 : 0.2.

### 3.3.12 Random Copying

**Debug option -DMPUE**

**Test files Test04-RandomCopying (where neighbourhood weight is always 1)**

**Test files Test05-RandomCopying (where neighbourhood weight is always 0)**

#### **T3.3.12**

In both the above cases the initial land uses and the land uses after year 1 were recorded and checked that they were compatible with the selection strategy.

### 3.3.13 Random

**Debug option –DMPUE**

**Test files Test03-Random**

#### **T3.3.13**

All that could really be done here was check that land uses appeared to be allocated at random. All land uses had an occurrence and some sort of equal spread was obtained.

### 3.3.14 Simple Copying

**Debug option -DMPUE**

**Test files Test06-SimCopy**

#### T3.3.14

Ten test runs were done varying the post initial seed (1-10). A record was kept of the land uses generated for five cells ((0,4) (0,3) (0,2) (0,1) (0,0)). The proportions expected and actual land uses generated were compared and found to be roughly in accord. The test runs had three possible land uses to be chosen. Only one yearly run was carried out in each cycle.

Cell	Land use proportions expected 1:2:3	Land use proportions actual 1:2:3
0,4	0.1 : 0.7 : 0.2	0.1 : 0.3 : 0.6
0,3	0.6 : 0.4 : 0.07	0.4 : 0.4 : 0.2
0,2	0.3 : 0.1 : 0.6	0.1 : 0.2 : 0.7
0,1	0.3 : 0.1 : 0.6	0.3 : 0.0 : 0.7
0,0	0.2 : 0.3 : 0.5	0.0 : 0.6 : 0.4

### 3.3.15 Simple Physical Copying

**Debug option -DMPUE**

**Test files Test06-SimPhysCopy**

#### T3.3.15

Ten test runs were done varying the post initial seed (1-10). A record was kept of the land uses generated for five cells ((0,4) (0,3) (0,2) (0,1) (0,0)). The proportions expected and actual land uses generated were compared and found to be roughly in accord. The test runs had three possible land uses to be chosen. Only one yearly run was carried out in each cycle.

Cell	Land use proportions expected 1:2:3	Land use proportions actual 1:2:3
0,4	0.125 : 0.6 : 0.25	0.2 : 0.7 : 0.1
0,3	0.7 : 0.25 : 0.1	0.6 : 0.4 : 0
0,2	0.16 : 0.16 : 0.7	0.3 : 0.0 : 0.7
0,1	0.3 : 0.16 : 0.5	0.2 : 0.1 : 0.7
0,0	0.25 : 0.12 : 0.6	0.2 : 0.0 : 0.8

### 3.3.16 Stochastic Last Year's Optimum

#### **Debug option –DMPUE**

T3.3.16

The initial choice of landuse for year 0 is done using a random strategy..

The yield for each land parcel and use combination was calculated. The model was then run for 15 years and a tally kept of how often each land use is selected for a particular parcel. The tally percentage for each parcels land use was roughly checked to be compatible with a stochastic Last Years Optimum selection.

### 3.3.17 Stochastic Match Weighted Optimum

#### **Debug option –DMPUE**

T3.3.17

The initial choice of landuse for year 0 is done using a random strategy..

The yield for each land parcel and use combination was calculated. The model was then run for 15 years and a tally kept of how often each land use is selected for a particular parcel. The tally percentage for each parcels land use was roughly checked to be compatible with a stochastic Match Weighted Optimum selection.

### 3.3.18 Yield Average Weighted Temporal Copying

**Debug option -DMPUEic**

**Test files YieldAverageWeightedTemporalCopying**

T3.3.18

Using the set of test files parcel (0,4) was chosen with a memory of 2 and the calculations verified.

Year 1

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	2	8	1	8
	(1,4)	1	5	1	5
LPN	(2,4)	2	10	2	20
	(3,4)	2	9	2	18
	(0,3)	1	7	2	14
	(1,3)	3	8	2	16

1 ---- 19 --> 9.5

2 ---- 46 --> 15.3

3 ---- 16 --> 16

Year 2

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	3	9	1	9
	(1,4)	2	8	3.5	28
LPN	(0,3)	3	8	3.5	28

1 ---- 42 --> 21

2 ---- 36 --> 18

3 ---- 37 --> 18.5

Year 3

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	1	6	1	6
	(1,4)	3	9	3.5	31.5
LPN	(0,3)	1	7	3.5	24.5

1 ---- 30.5 --> 15.25

2 ---- 28 --> 28

3 ---- 68.5 --> 22.8

### 3.3.19 Yield Weighted Copying

**Debug option -DMPUEic**

**Test files YieldWeightedCopying**

#### T3.3.19

The land parcel (0,4) was chosen for testing purposes. The calculations were checked through for year 1 and year 2. The year 2 check verified that the new land managers and changes in neighbourhood weighting were handled correctly.

Year 1

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	2	8	1	8
	(1,4)	1	5	1	5
LPN	(2,4)	2	10	2	20
	(3,4)	2	9	2	18
	(0,3)	1	7	2	14
	(1,3)	3	8	2	16

1 ---- 19

2 ---- 46

3 ---- 16

Year 2

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	3	7	1	7
LPN	(1,4)	3	10	2	20
	(0,3)	1	8	2	16

1 ---- 16

2 ---- 0

3 ---- 27

A visual scan of the scores and the land uses chosen looks ok. A statistical analysis was not done.

### 3.3.20 Yield Weighted Temporal Copying

**Debug option -DMPUEic**

**Test files YieldWeightedTemporalCopying1**

**YieldWeightedTemporalCopying2**

T3.3.20

Using the first set of test files parcel (0,4) was chosen to test a memory of 1 and the calculations verified.

Year 1

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	2	8	1	8
	(1,4)	1	5	1	5
LPN	(2,4)	2	10	2	20
	(3,4)	2	9	2	18
	(0,3)	1	7	2	14
	(1,3)	3	8	2	16

1 ---- 19

2 ---- 46

3 ---- 16

Year 2

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	3	8	1	8
	(1,4)	1	7	3.5	24.5
LPN	(0,3)	2	17	3.5	24.5

1 ---- 24.5

2 ---- 24.5

3 ---- 8

Using the second set of test files parcel (0,4) was chosen with a memory of 2 and the calculations verified.

Year 1

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	2	8	1	8
	(1,4)	1	5	1	5
LPN	(2,4)	2	10	2	20
	(3,4)	2	9	2	18
	(0,3)	1	7	2	14
	(1,3)	3	8	2	16

1 ---- 19

2 ---- 46

3 ---- 16

Year 2

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	3	9	1	9
	(1,4)	2	8	3.5	28
LPN	(0,3)	3	8	3.5	28

1 ---- 42

2 ---- 36

3 ---- 37

Year 3

	Parcel	Land Usage	Yield	Neighbourhood Weight	Score
LPS	(0,4)	1	8	1	8
	(1,4)	2	5	3.5	17.5
LPN	(0,3)	2	7	3.5	24.5

1 ---- 8

2 ---- 70

3 ---- 37

A statistical analysis of land uses chosen was not done.

### 3.4 Addition Of Yield To Accounts

#### **Debug Parameter -DUMPE**

**The data used in these tests is in directory YieldToAccounts/YieldToAccounts2.**

T3.4 The model was run for three years and all yield calculations and sales verified.

### 3.5 Land sales : selection of the right number of parcels, in order of yield

#### **Debug Parameter -DUMPE**

**The data used in these tests is in directory YieldToAccounts/YieldToAccounts2.**

T3.5 The model was run for three years and all yield calculations and sales verified.

### 3.6 Land sales : correct selection of eligible neighbours

#### **Debug Parameter -DUMPE**

**The data used in these tests is in directory YieldToAccounts/YieldToAccounts2.**

T3.6 The model was run for three years and all yield calculations and sales verified.

### 3.7 Land sales : shuffling of list of parcels to be sold

#### **Debug Parameter -DUMPE**

**The data used in these tests is in directory YieldToAccounts/YieldToAccounts2.**

T3.7 The model was run for three years and all yield calculations and sales verified.

### 3.8 Land sales : transfer of Land Parcel from one Land Manager to another

#### **Debug Parameter -DUMPE**

**The data used in these tests is in directory YieldToAccounts/YieldToAccounts2.**

T3.8.1 The model was run for three years and all yield calculations and sales verified.

T3.8.2

#### **Debug Parameter -DUMPEic**

#### **Test Files LandMgrClass**

There are two parameters that can be used for landMgrClass. They are LandManager and PositiveLandManager. The latter requires that the barn for a land manager must remain positive at all times. Two runs were done.

a) LandManager

Land Managers 2 and 7 do not lose parcels even though their barn is at 0.

Land Manager 6 can buy a land parcel even although its barn is the same value as the price of a land parcel.

b) PositiveLandManager

Now land managers 2 and 7 lose parcels and 6 cannot buy.

### 3.9 Creation of new Land Managers

#### **Debug Parameter -DUMPE**

**The data used in these tests is in directory YieldToAccounts/YieldToAccounts2.**

**T3.9**

The model was run for three years and all yield calculations and sales verified.

Land Manager Retirements

**Debug Parameter -DUMPE**

**The data used in these tests is in directory YieldToAccounts/YieldToAccounts2.**

The model was run for three years and all yield calculations and sales verified.

## **4 GUI Parameter Input**

### **4.1 Observer Swarm Parameters**

#### **Debug Parameter -DUMPE**

T4.1

Check each parameter in turn to see that can set them such that you can see every change from a negative to a positive display and vice versa.

### **4.2 Model Swarm Parameters**

#### **Debug Parameter -DUMPE**

T4.2

Change each parameter in turn and check that it is picked up. This is only checking that each parameter is picked up – it is not checking that in detail that it is processed correctly.

## **5 STRESS Testing**

The number of land parcels is probably the main critical feature. The model in GUI mode can handle a 150 by 150 environment. However, a 200 by 200 environment does not appear to be handled correctly. The landuse GUI display only seems to display land uses in one quadrant. This was run under windows 2000.

## **6 Batch Mode Run**

The purpose of this testing is to ensure that the model is operating correctly in batch mode.

**Debug Parameters –DUMPE.**

**The test data for these runs is in directory Batch.**

T6.1

The model was run for 30 years first of all in GUI mode and then in batch mode. The debug output was checked in both models for the first two years and then year 30 to check that the output was identical. (This also inherently verified the operation of the –D parameter.)

T6.2

It is checked that the –R and –r parameters are picked up and work in batch mode. A report configuration file was created and it was verified that information was written to the file stated in the –r parameter.

T6.3

It is checked that the –s parameter causes different seeds to be generated in two runs. It is also verified that the yield of the land parcels is different in year 1.

T6.4

It is checked that the –h parameter, used with a file name, causes the history to be written to the specified file.