Knowledge representation
Part 5

Conditions, synonyms, definitions, memos, object hierarchies, knowledge categories

Knowledge base clarity

The aim should be to represent local knowledge clearly, capturing the context as much as possible, and there are various ways of doing this during knowledge base development – utilise them!

Ways of making unitary statements explicit:

- Add conditions (e.g., this happens *if* these conditions are in place)
- Add definitions to formal terms
- Use synonyms
- Attach a memo to the statement where appropriate to add value
- Add statements to ‘knowledge categories’ (i.e. location specific info)

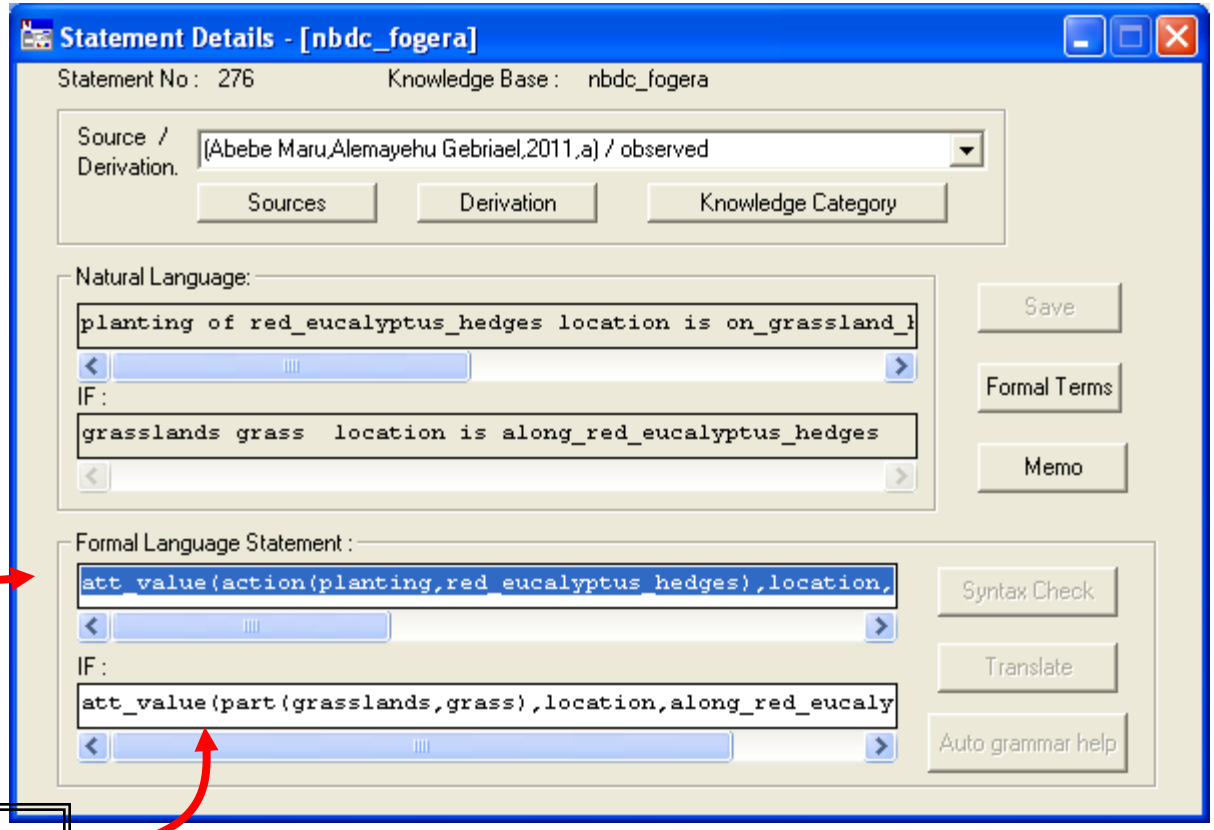
Statements with conditions

Some examples:

- **Red eucalyptus and grassland**
  - planting of red_eucalyptus_hedges location is on_grassland_boundaries causes an increase in rate of dying of grasslands grass *if* grasslands grass location is along_red_eucalyptus_hedges

- **Soil**
  - the content of walka_soil organic_matter is high causes the rate of disintegration of walka_soil aggregates is high *if* the sunlight_exposure of walka_soil is high

Entering conditions



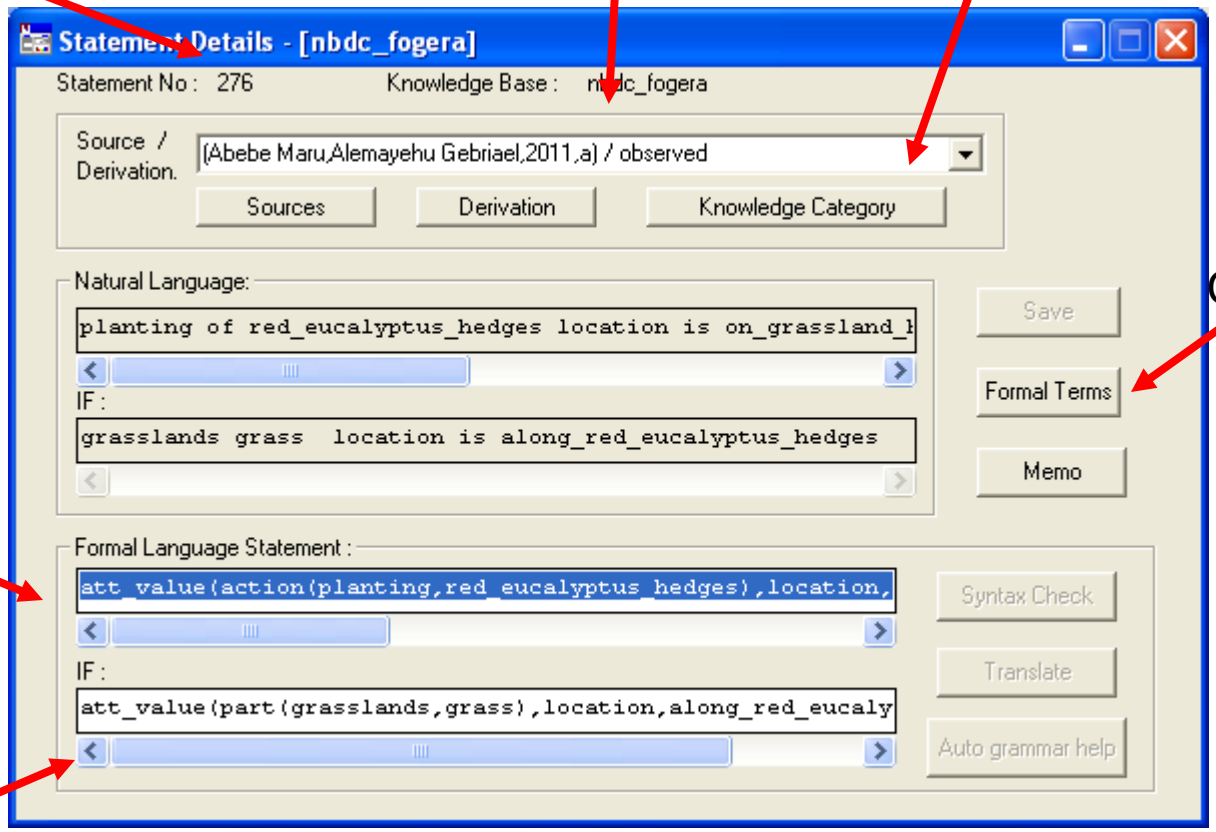
The statement is entered here

The condition is entered below it

Source and derivation

Statement number

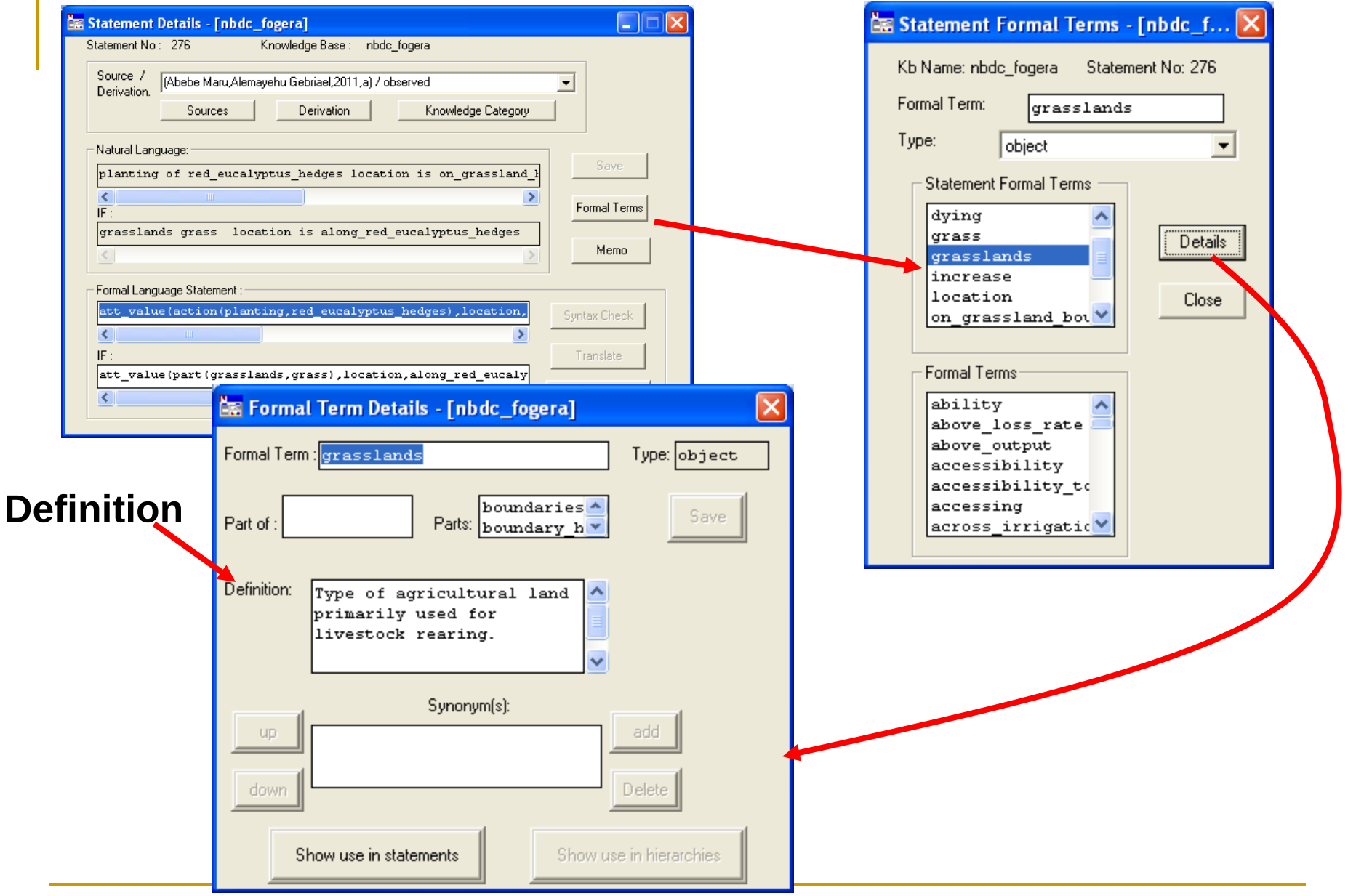
Knowledge category



Grasslands?

Statement

Condition

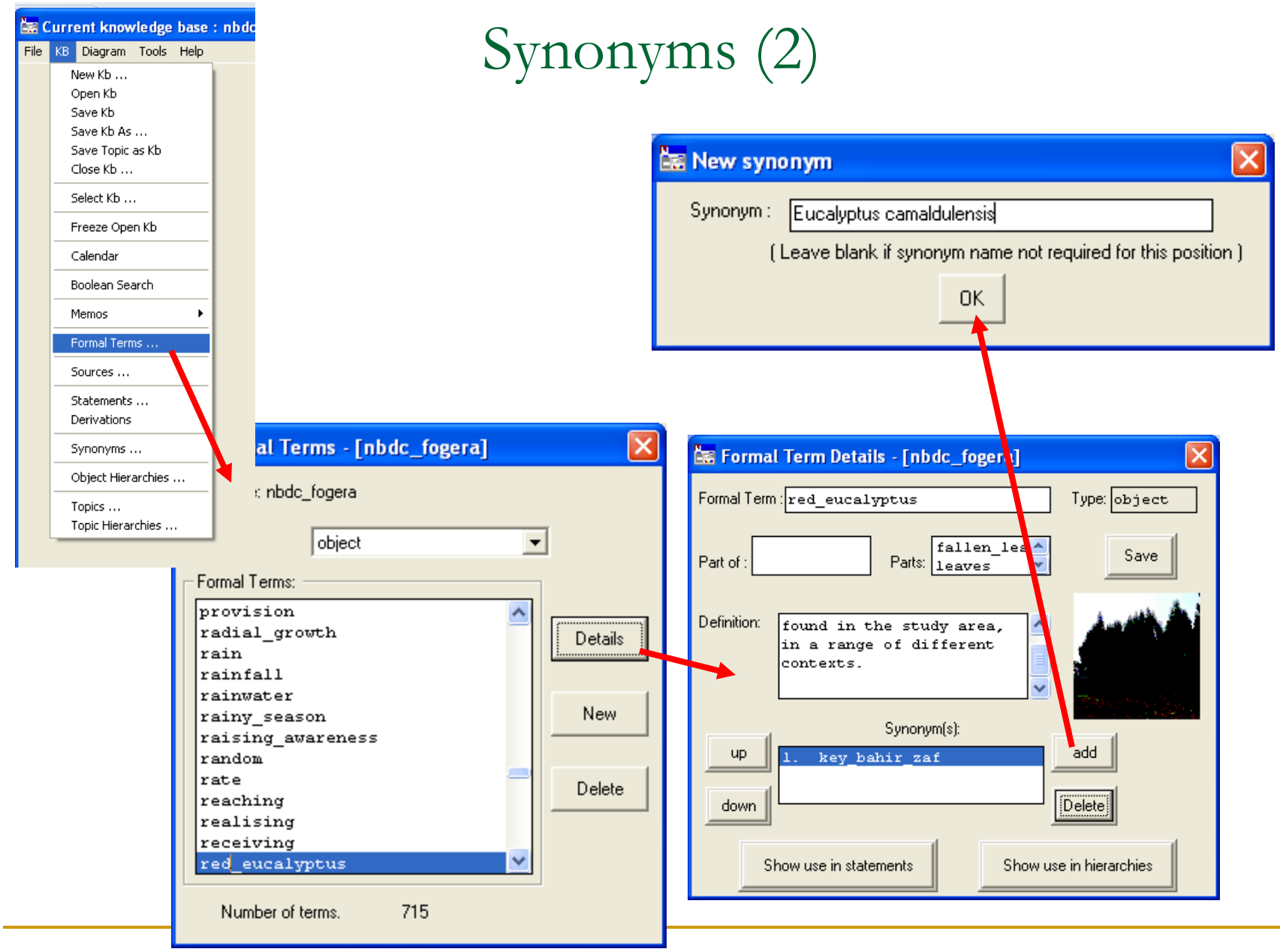

Statement Details - [nbdc_fogera]
Statement No : 276
Knowledge Base : nbdc_fogera
Source / Derivation.
(Abebe Maru,Alemayehu Gebriael,2011,a) / observed
Sources
Derivation
Knowledge Category
Natural Language:
planting of red_eucalyptus_hedges location is on_grassland_l
IF :
grasslands grass location is along_red_eucalyptus_hedges
Save
Formal Terms
Memo
Formal Language Statement :
att_value(action(planting,red_eucalyptus_hedges),location,
IF :
att_value(part(grasslands,grass),location,along_red_eucaly
Syntax Check
Translate
Statement Formal Terms - [nbdc_f...
Kb Name: nbdc_fogera
Statement No: 276
Formal Term:
grasslands
Type:
object
Statement Formal Terms
dying
grass
grasslands
increase
location
on_grassland_bou
Details
Close
Formal Terms
ability
above_loss_rate
above_output
accessibility
accessibility_tc
accessing
across_irrigatic
Formal Term Details - [nbdc_fogera]
Formal Term :
grasslands
Type:
object
Part of :
Parts:
boundaries
boundary_h
Save
Definition:
Type of agricultural land primarily used for livestock rearing.
Synonym(s):
up
down
add
Delete
Show use in statements
Show use in hierarchies
Definition

Synonyms (1)

- A synonym is a word or phrase that has exactly the same meaning as something known by another word/phrase.

- Synonyms are used to:
  - Specify the botanical names of animals and plants, e.g. *Eucalyptus camaldulensis* is the Latin name for red eucalyptus.
  - Specify any local names used within a community for a specific term, e.g. *key bahir zaf* is the local name for red eucalyptus.
  - Translate whole knowledge bases into other languages. So far knowledge bases have been translated into Spanish and into Thai (using Thai script)

Synonyms (2)


Current knowledge base : nbdc
File
KB
Diagram
Tools
Help
New Kb ...
Open Kb
Save Kb
Save Kb As ...
Save Topic as Kb
Close Kb ...
Select Kb ...
Freeze Open Kb
Calendar
Boolean Search
Memos
Formal Terms ...
Sources ...
Statements ...
Derivations
Synonyms ...
Object Hierarchies ...
Topics ...
Topic Hierarchies ...
New synonym
Synonym :
Eucalyptus camaldulensis
(Leave blank if synonym name not required for this position)
OK
al Terms - [nbdc_fogera]
: nbdc_fogera
object
Formal Terms:
provision
radial_growth
rain
rainfall
rainwater
rainy_season
raising_awareness
random
rate
reaching
realising
receiving
red_eucalyptus
Details
New
Delete
Number of terms.
715
Formal Term Details - [nbdc_fogera]
Formal Term :
red_eucalyptus
Type:
object
Part of :
Parts:
fallen_le
leaves
Save
Definition:
found in the study area,
in a range of different
contexts.
Synonym(s):
up
down
1. key_bahir_zaf
add
Delete
Show use in statements
Show use in hierarchies

Synonyms (3)

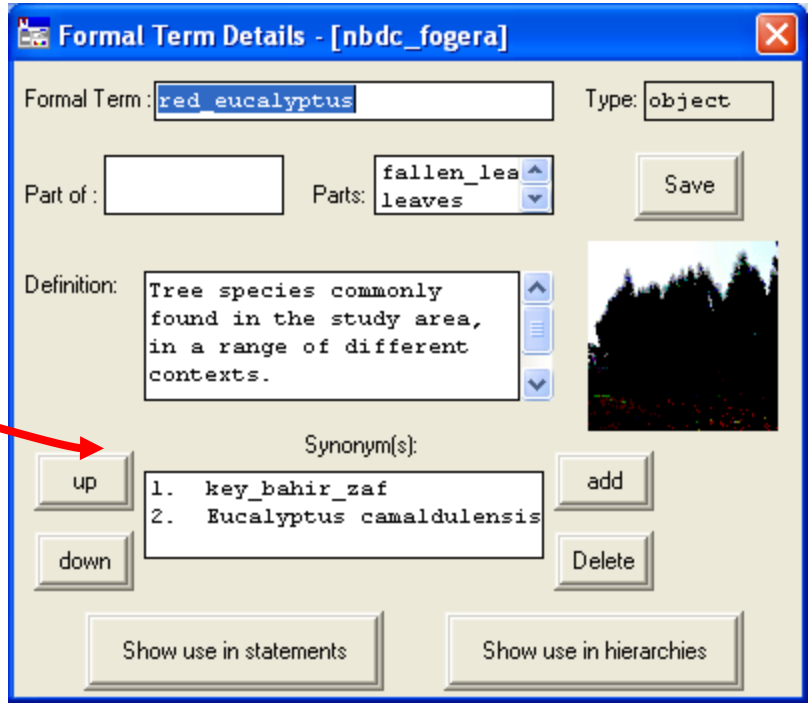
- You can only add a synonym to a formal term after you have saved the term itself.

- There are 2 ways to add a synonym to a formal term
  - through selecting ‘Formal Terms’ in the KB main menu and going into the ‘details’ of a selected formal term (previous slide)
  - through selecting ‘Synonyms’ in the KB main menu and going into the ‘details’ of the synonym of the formal term you want to add another synonym to

Synonyms (4)

- The numbering and ordering of synonyms is important if you are going to 'translate' the KB i.e. if you want to swap the formal terms for their synonyms throughout the whole Kb.
  - If this is the case, then be consistent. It is easy to swap the ordering of synonyms using the 'up' and 'down' buttons if you need to.

For example, put one language in position 1, another language in position 2. In this case, the local name is given in position 1 and the botanical name in position 2.

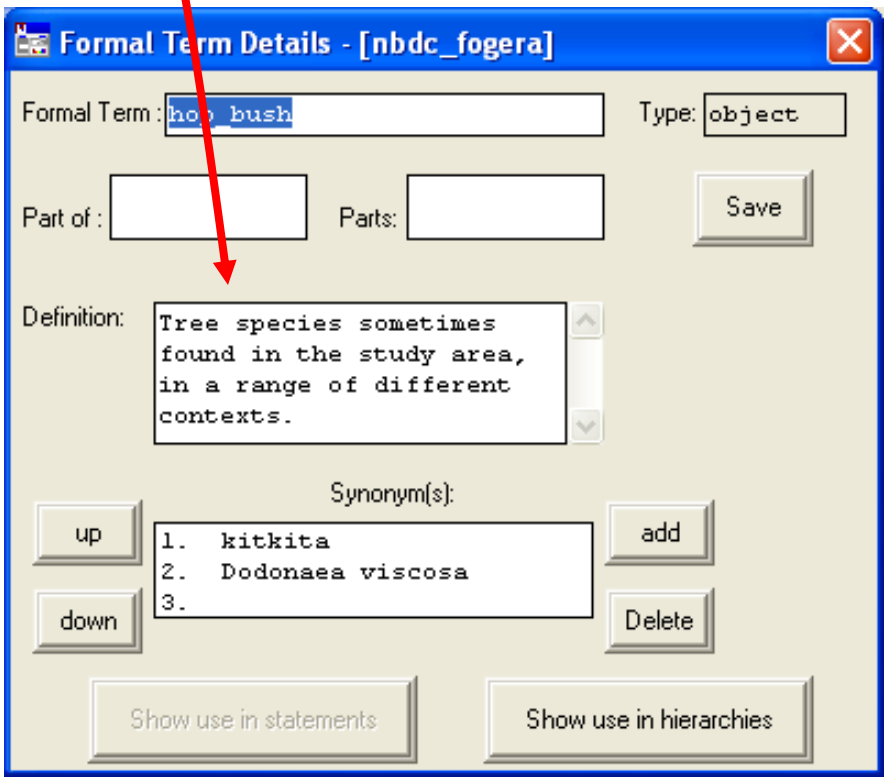


Definitions (1)

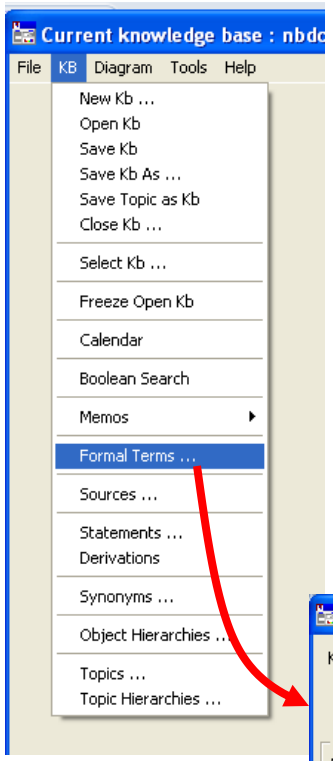
- Definitions are used to explicitly define the meaning of formal terms.
- Sometimes a word or a concept in a local language cannot be simply translated into English because there is no English word for it. In these cases it is necessary to use a definition to explain the concept instead of a synonym.
  - E.g. In Nepal 'Chiso' fodder is considered 'cold and wet' and when fed in excess, is said to cause diarrhoea. 'Ovano' fodder is considered 'hot and dry' and promotes solid consistency in animal dung.
- Definitions are commonly used to
  - Define a formal term (in addition to a synonym)
  - Provide additional information about a formal term
- Particularly important for terms that can have different meanings e.g. ‘farm’

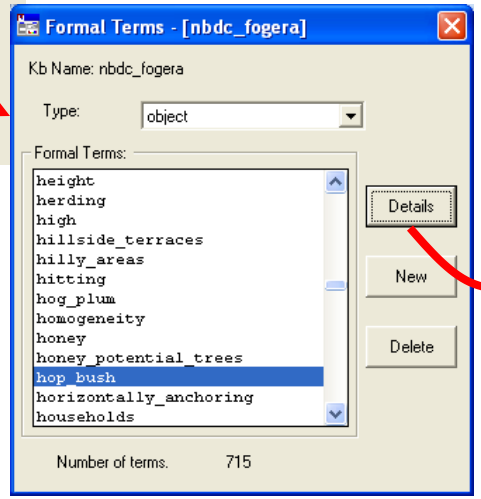
Definitions (2)

The definition makes explicit the meaning of a formal term and adds extra relevant information

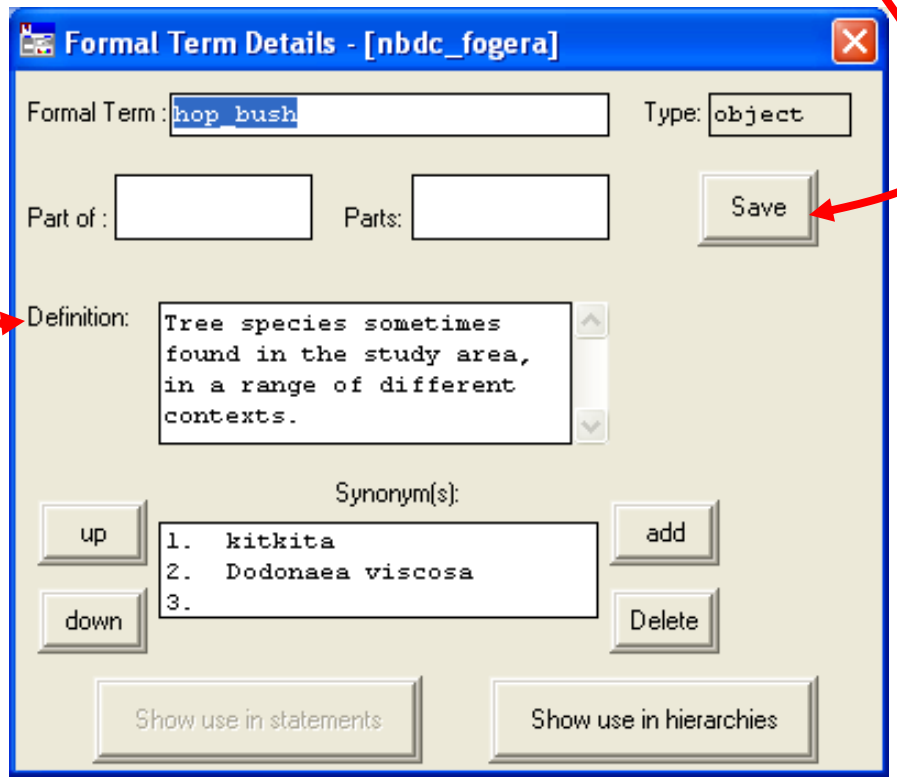


Definitions (3)





- Go to the formal term details box
- Type in the definition box
- When you have finished click on save

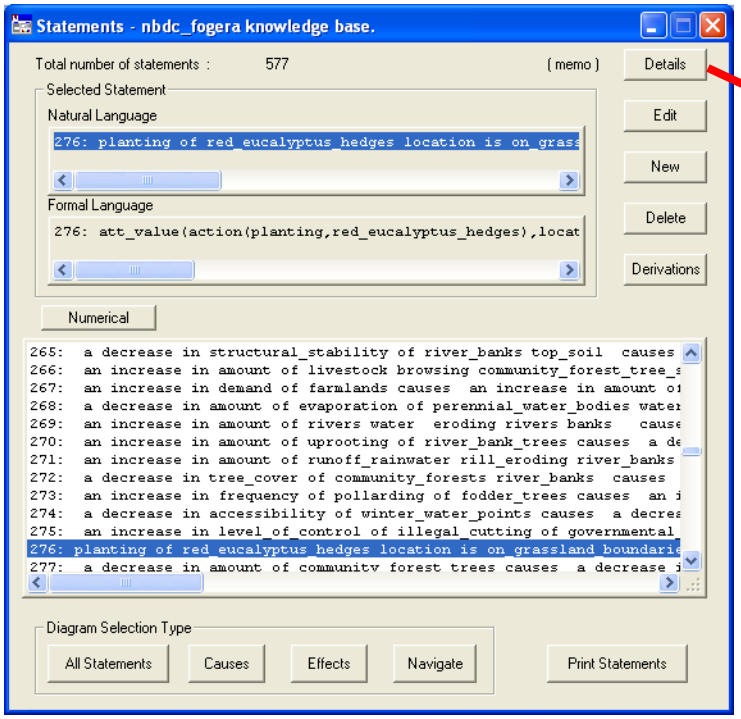


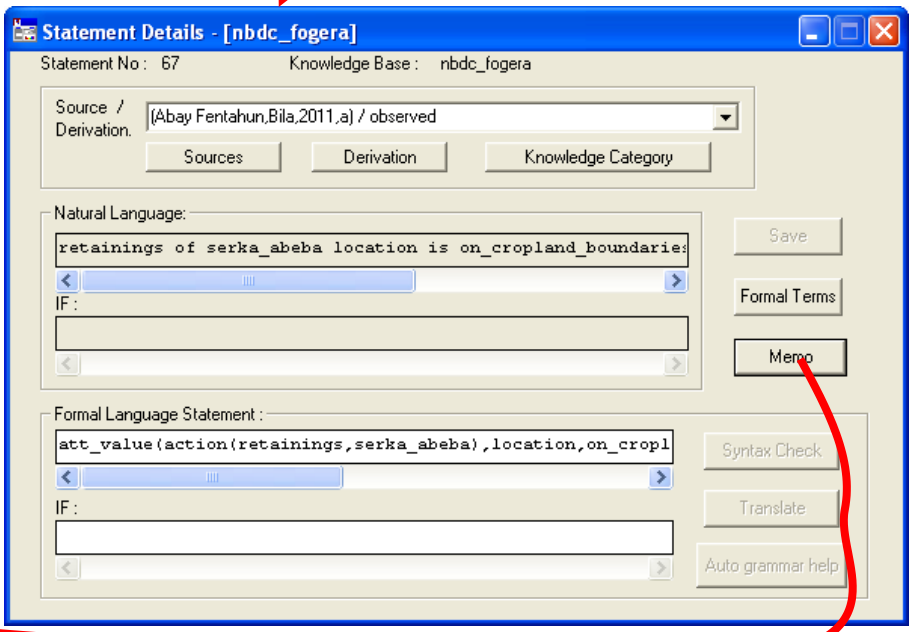
Memos (1)

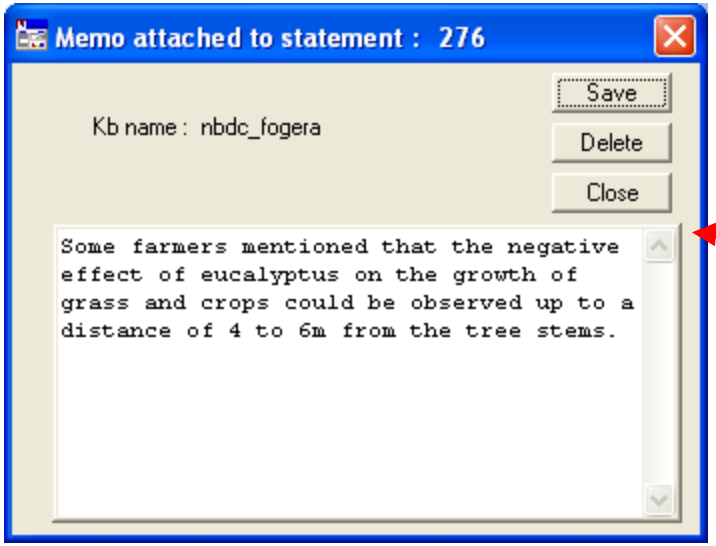
- Memos can be attached to statements when a statement remains unclear or ambiguous despite all other attempts to make it explicit by the KB creator.

- Memos can be used to add further contextual information to statements, sources and object hierarchies.

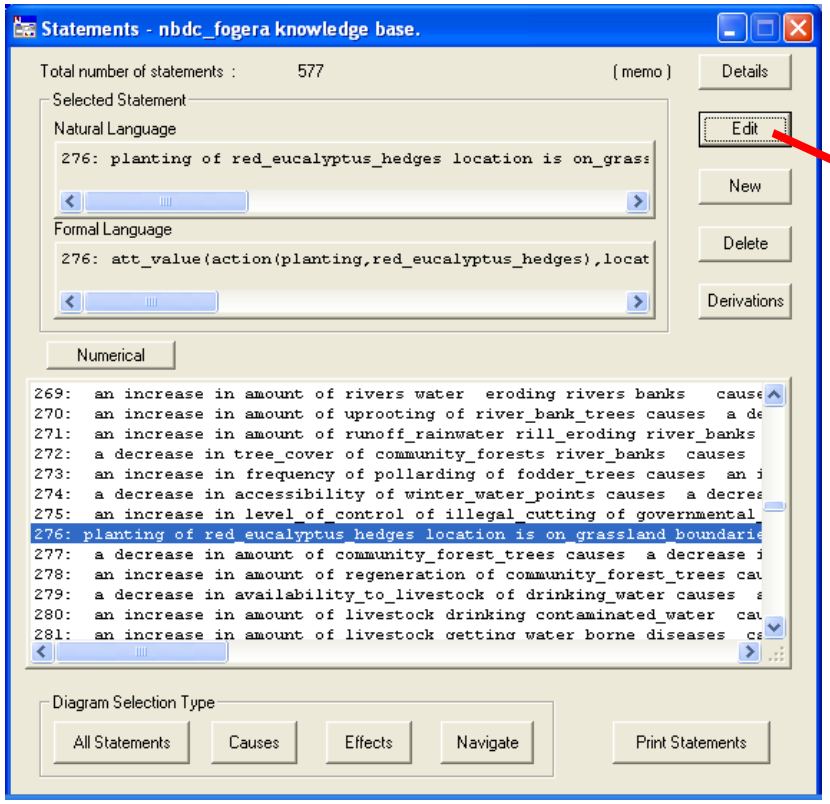
Memos (2)

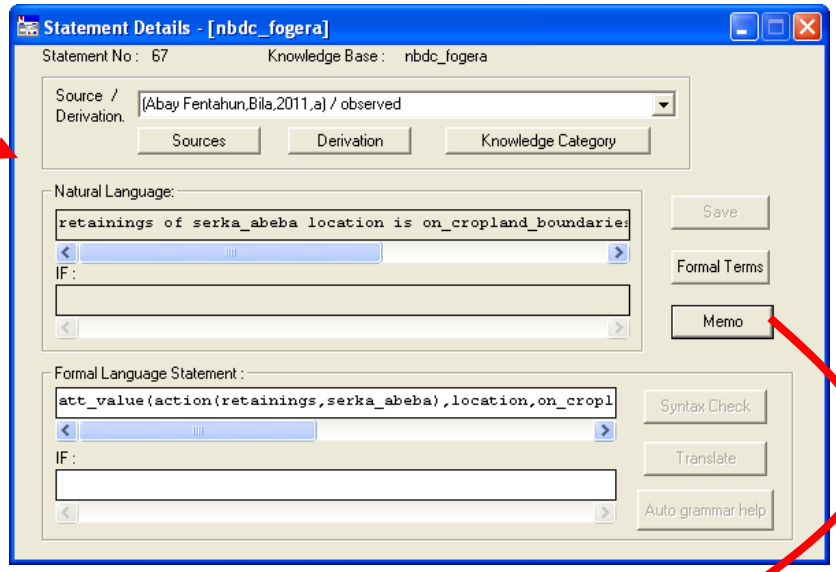

Statements - nbdc_fogera knowledge base.
Total number of statements : 577
(memo)
Details
Selected Statement
Natural Language
276: planting of red_eucalyptus_hedges location is on_grass
Edit
New
Formal Language
276: att_value(action(planting,red_eucalyptus_hedges),locat
Delete
Derivations
Numerical
265: a decrease in structural_stability of river_banks top_soil causes
266: an increase in amount of livestock browsing community_forest_tree_s
267: an increase in demand of farmlands causes an increase in amount of
268: a decrease in amount of evaporation of perennial_water_bodies water
269: an increase in amount of rivers water eroding rivers banks cause
270: an increase in amount of uprooting of river_bank_trees causes a de
271: an increase in amount of runoff_rainwater rill_eroding river_banks
272: a decrease in tree_cover of community_forests river_banks causes
273: an increase in frequency of pollarding of fodder_trees causes an i
274: a decrease in accessibility of winter_water_points causes a decrea
275: an increase in level_of_control of illegal_cutting of governmental
276: planting of red eucalyptus hedges location is on grassland boundarie
277: a decrease in amount of community forest trees causes a decrease i
Diagram Selection Type
All Statements
Causes
Effects
Navigate
Print Statements

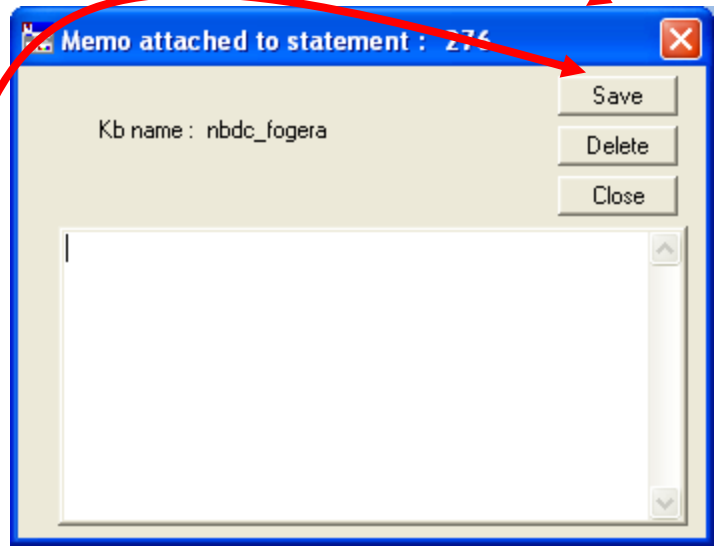

Statement Details - [nbdc_fogera]
Statement No : 67
Knowledge Base : nbdc_fogera
Source / Derivation.
(Abay Fentahun,Bila,2011,a) / observed
Sources
Derivation
Knowledge Category
Natural Language:
retainings of serka_abeba location is on_cropland_boundaries
IF :
Save
Formal Terms
Memo
Formal Language Statement :
att_value(action(retainings,serka_abeba),location,on_cropl
IF :
Syntax Check
Translate
Auto grammar help


Memo attached to statement : 276
Kb name : nbdc_fogera
Save
Delete
Close
Some farmers mentioned that the negative effect of eucalyptus on the growth of grass and crops could be observed up to a distance of 4 to 6m from the tree stems.

Memos (3)







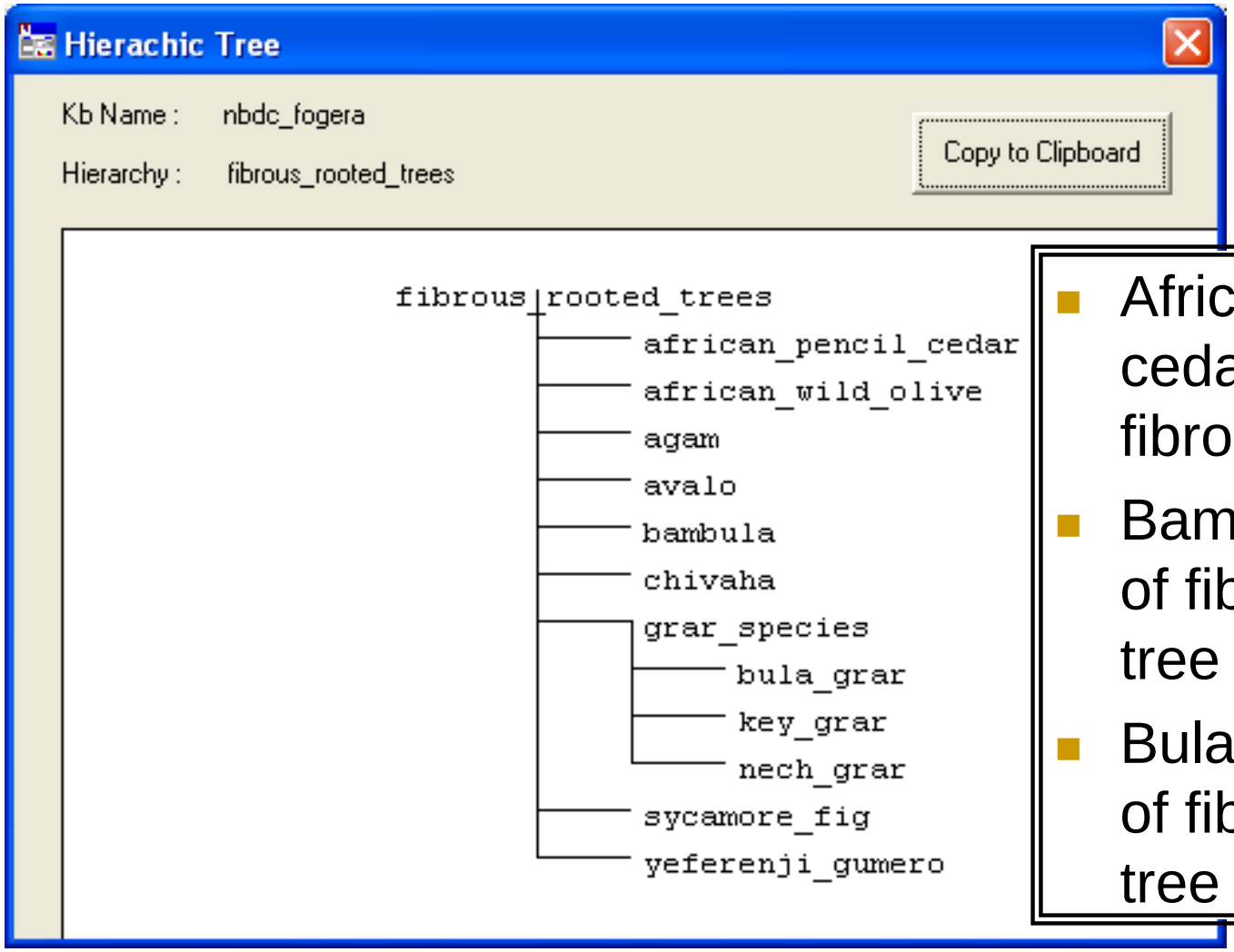
- Go to the statement and click on ‘Edit’
- Click on memo
- Type in the box
- When you have finished click on ‘Save’

Object hierarchies (1)

- Object hierarchies always conform to the "**is a type of**" relationship

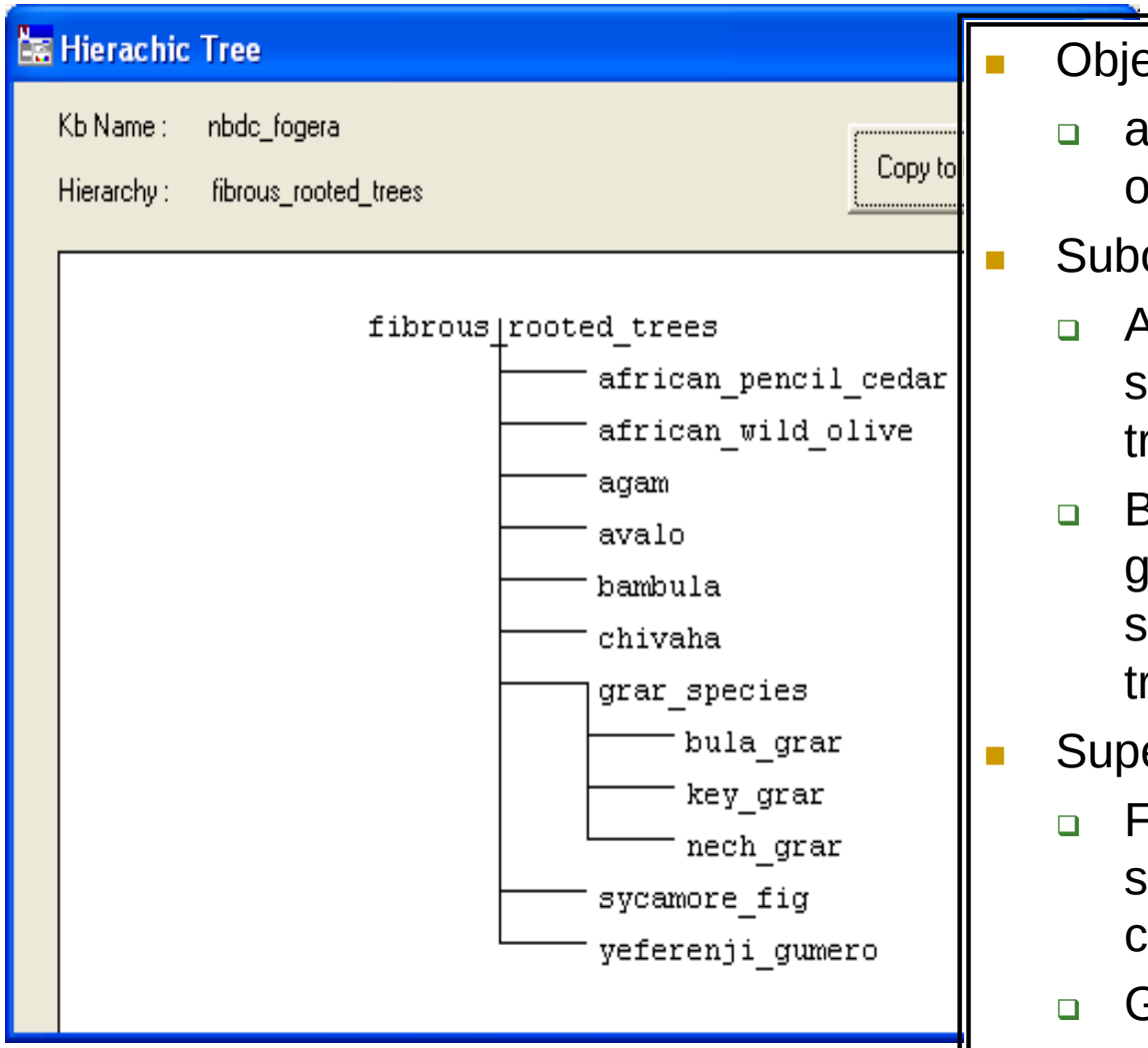
- Object hierarchies have a number of functions. They can be used to :
  - represent local classification systems
  - compact a knowledge base (i.e. to reduce the number of statements)
  - classify or add meaning to formal terms

Object hierarchies (2)



- African pencil cedar is a type of fibrous rooted tree
- Bambula is a type of fibrous rooted tree
- Bula grar is a type of fibrous rooted tree

Object hierarchies (3)



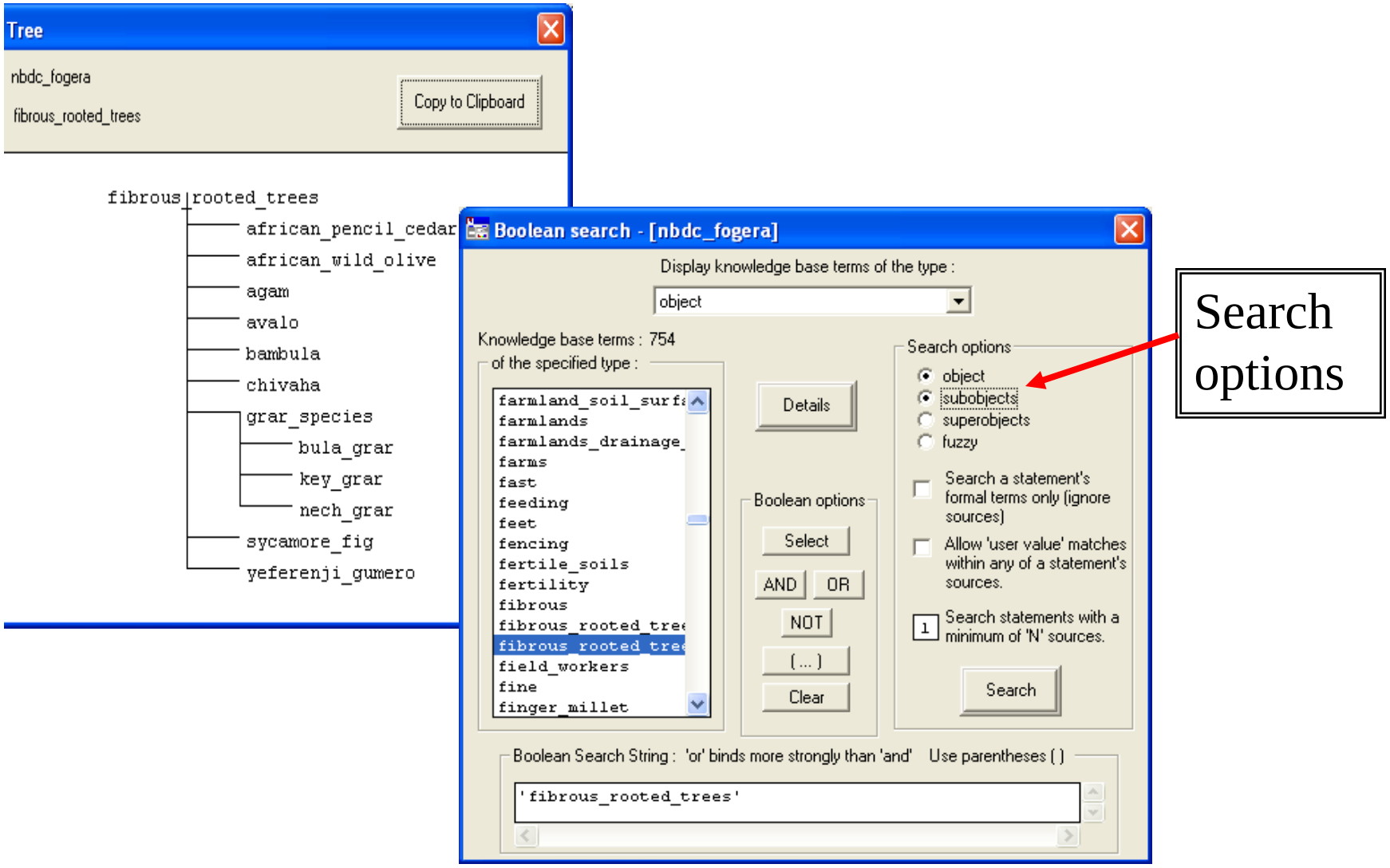
- Objects:
  - all the formal terms in an object hierarchy are objects.
- Subobjects:
  - African pencil cedar is a subobject of fibrous rooted trees
  - Bula grar is a subobject of grar species which is itself a subobject of fibrous rooted trees
- Superobjects:
  - Fibrous rooted trees is a superobject of african pencil cedar
  - Grar species is a superobject of bula grar

Object hierarchies (4)

- Creating an object hierarchy allows you to avoid repetition and reduce the number of statements in the knowledge base by combining more than one object under the same heading.

- Object hierarchies help to organise knowledge. They can make retrieving knowledge statements quicker

Object hierarchies (5)

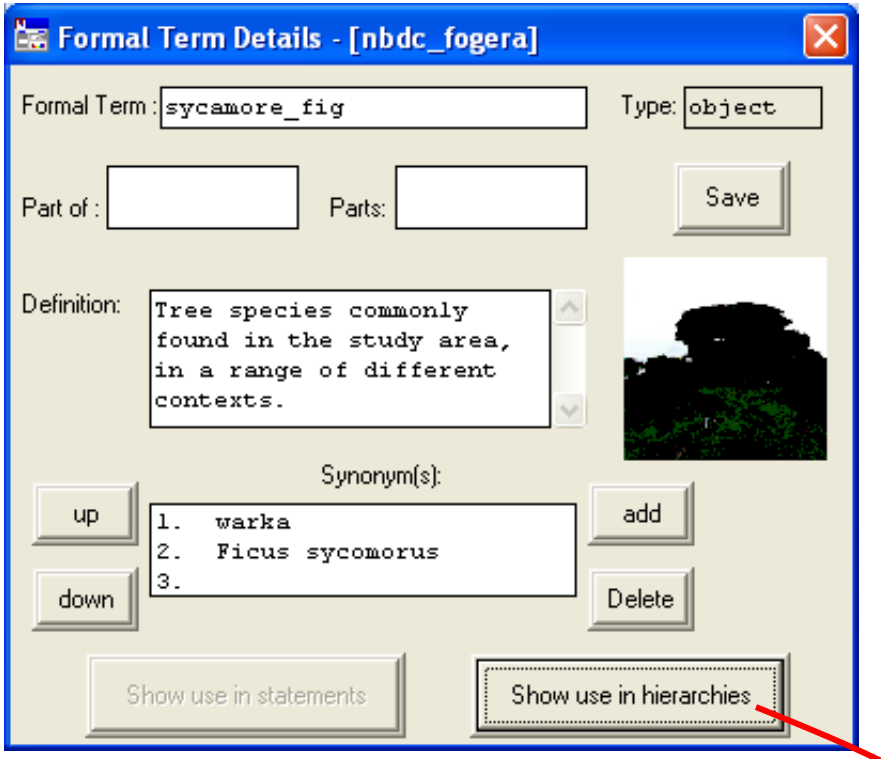


Object hierarchies (6)

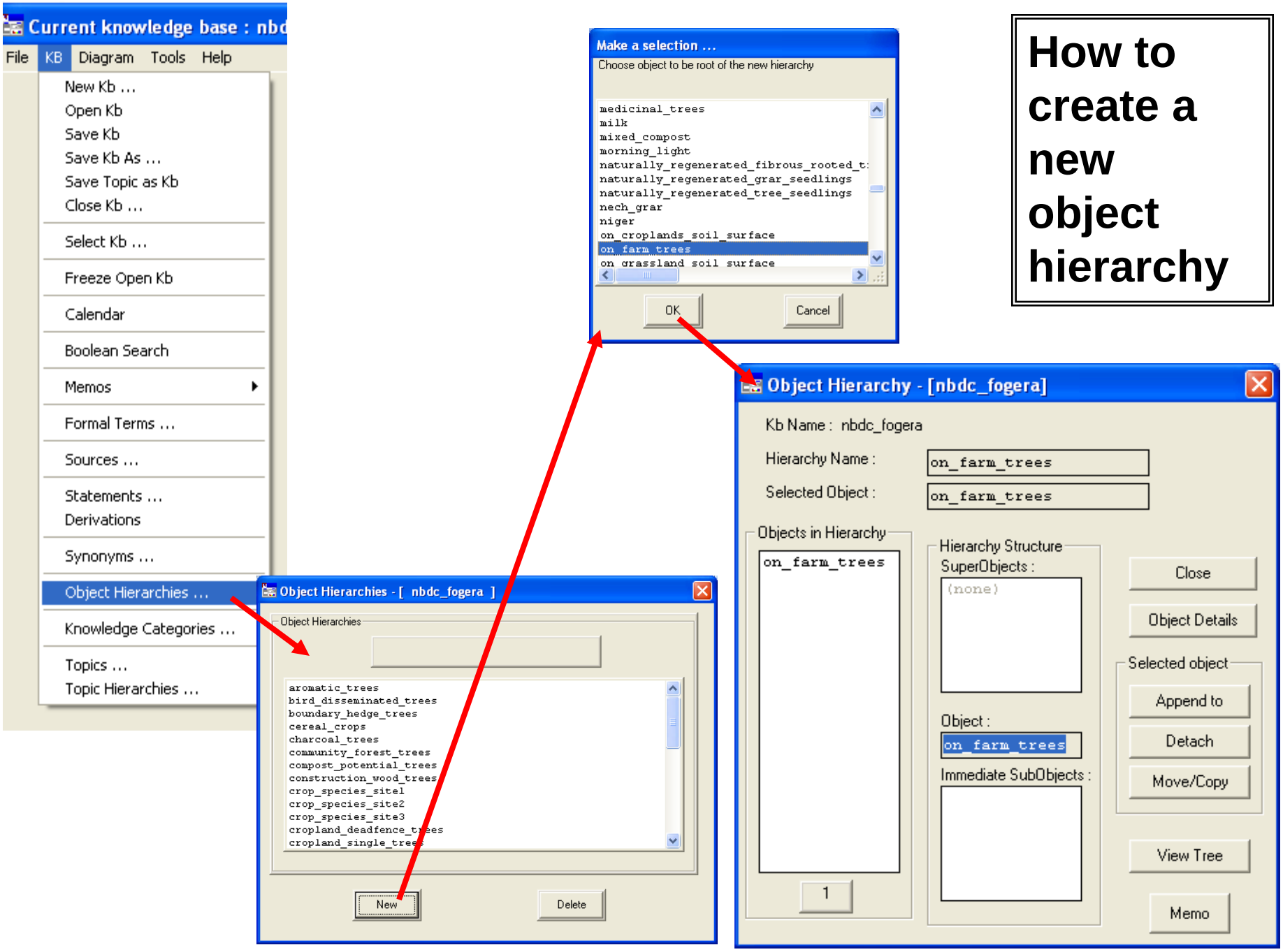
- A single object can only appear **once** in a single object hierarchy.

- However, an object **can** appear in more than one object hierarchy:
  - e.g. sycamore fig *(Ficus sycomorus)* can appear in both the object hierarchies of 'fibrous_rooted_trees' and 'fodder_trees' – as long as these two hierarchies are kept separate.

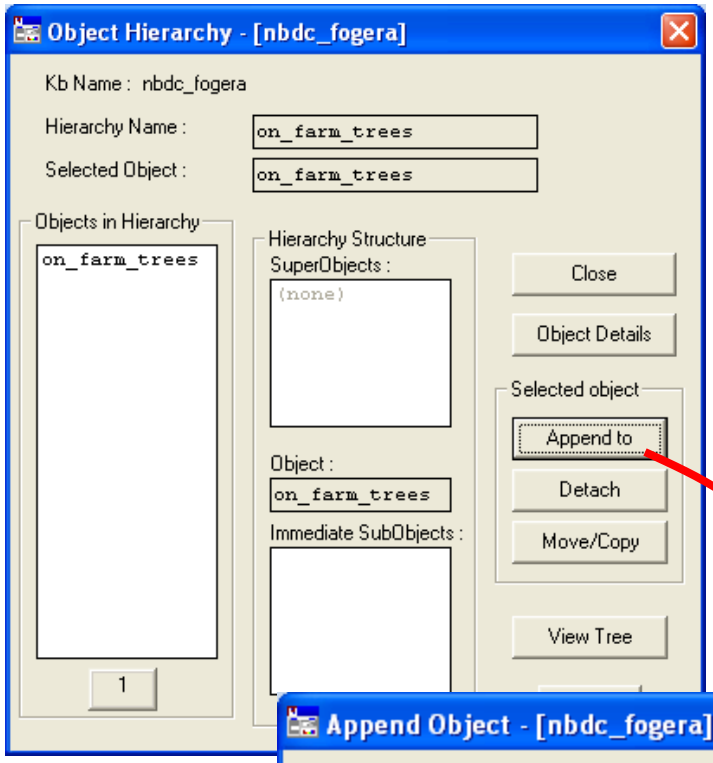
Object hierarchies (7)

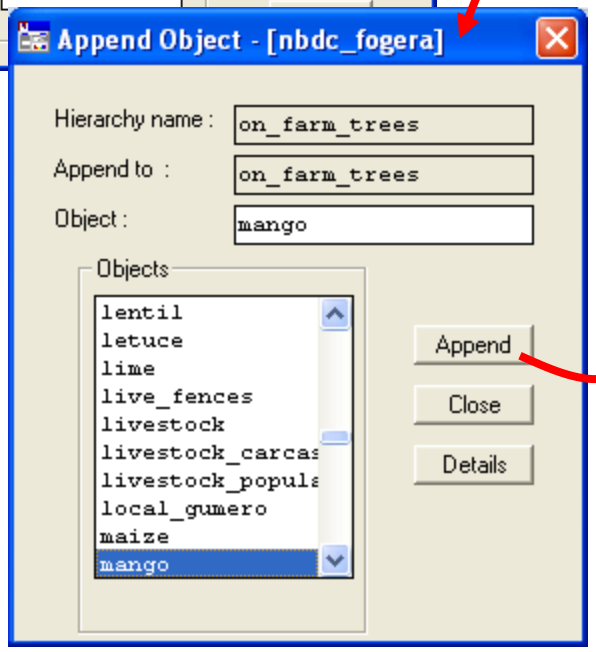


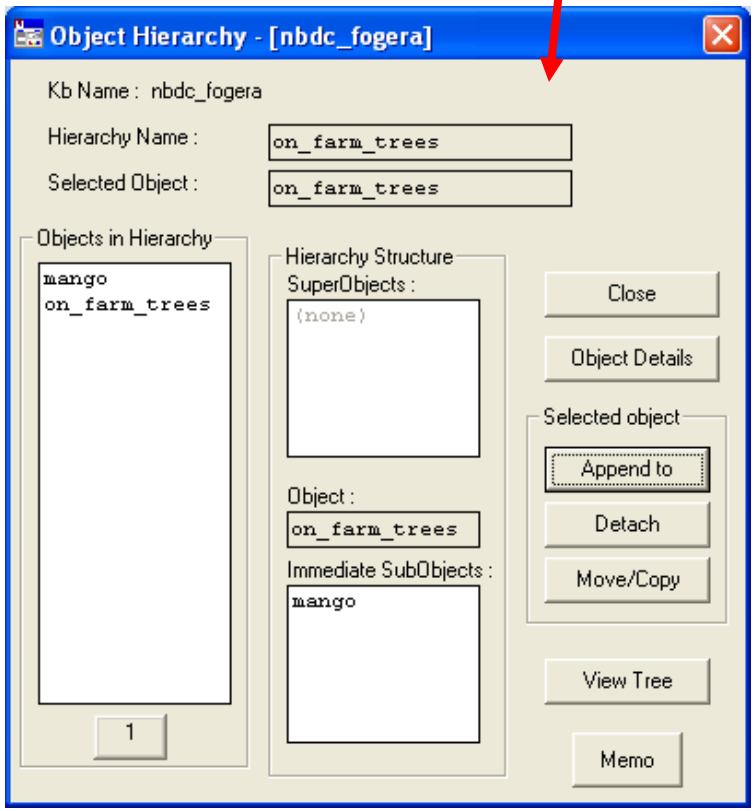
- Object hierarchies provide additional information about object terms in the ‘formal term details’ box.


Current knowledge base : nbd
File
KB
Diagram
Tools
Help
New Kb ...
Open Kb
Save Kb
Save Kb As ...
Save Topic as Kb
Close Kb ...
Select Kb ...
Freeze Open Kb
Calendar
Boolean Search
Memos
Formal Terms ...
Sources ...
Statements ...
Derivations
Synonyms ...
Object Hierarchies ...
Knowledge Categories ...
Topics ...
Topic Hierarchies ...
Make a selection ...
Choose object to be root of the new hierarchy
medicinal_trees
milk
mixed_compost
morning_light
naturally_regenerated_fibrous_rooted_t
naturally_regenerated_grar_seedlings
naturally_regenerated_tree_seedlings
nech_grar
niger
on_croplands_soil_surface
on_farm_trees
on_grassland_soil_surface
OK
Cancel
Object Hierarchies - [nbdc_fogera]
Object Hierarchies
aromatic_trees
bird_disseminated_trees
boundary_hedge_trees
cereal_crops
charcoal_trees
community_forest_trees
compost_potential_trees
construction_wood_trees
crop_species_sitel
crop_species_site2
crop_species_site3
cropland_deadfence_trees
cropland_single_trees
New
Delete
Object Hierarchy - [nbdc_fogera]
Kb Name : nbdc_fogera
Hierarchy Name :
on_farm_trees
Selected Object :
on_farm_trees
Objects in Hierarchy
on_farm_trees
1
Hierarchy Structure
SuperObjects :
(none)
Object :
on_farm_trees
Immediate SubObjects :
Close
Object Details
Selected object
Append to
Detach
Move/Copy
View Tree
Memo
How to create a new object hierarchy

- Select ‘on_farm_trees’ from the object list on the left
- Click ‘Append to’
- Select ‘mango’ from the list and click append
- Click OK







Knowledge categories

- Knowledge categories are there to help you organise your knowledge base according to location specific statements
- It is another way of making statements explicit in their meaning
- It is a way to add extra conditionality
- You need to create the knowledge categories before appending statements to them

Create a new knowledge category or edit an existing one by going to Knowledge Categories in the main KB menu