

Organic Resource Database

Manual

Tropical Soil Biology and Fertility Programme

and

Wye College, University of London

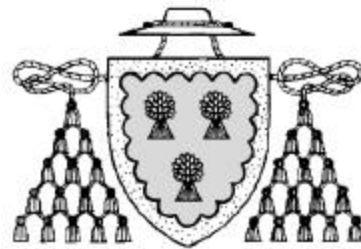
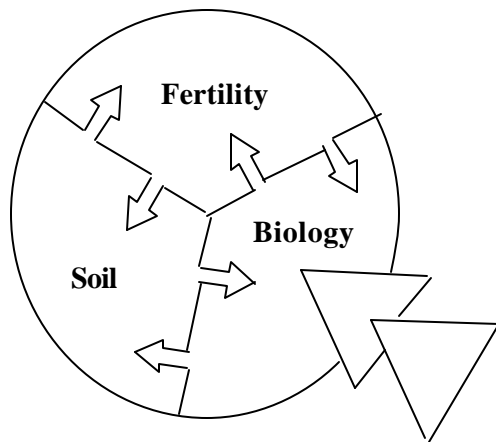


Table of Contents

Table of Contents	2
General Introduction	3
Data compilation	3
Data sharing	3
Structure and organization	5
Forms	5
Tables	5
Queries	6
New Users	6
Contents of the ORD	6
Installation of the Organic Resource Database	7
Acquisition of the Organic Resource Database and its updates	7
What do you have?	7
Installation process	9
Tutorial Exercises	10
New User Tutorial	10
Searching the database tutorial	11
Simple search of the database using an example query	11
Customizing queries	12
Adding other data tables	13
Printing, saving and exporting query results	15
Error messages	15
Appendix 1: Summary and explanation of all database fields	17
Appendix 2: TSBF Biomass transfer decision tree	21

General Introduction

Data compilation

The Organic Resource Database (ORD) is a catalogue of plant and manure resource quality data and is a collaborative project between TSBF (Nairobi, Kenya), the Department of Biological Sciences, Wye College, University of London (UK) and the KARI-Muguga Soil Chemistry Laboratory (Kenya). Initially the database included information from laboratory analysis of materials analyzed at the KARI-Muguga Soil Chemistry Laboratory and information from the scientific literature. More recently data from CIAT (Latin America) and ISBRAM (SE Asia), as well as data from other collaborative projects in East and Southern Africa have been added to the ORD.

This manual is designed to introduce the Organic Resource Database and provide information on:

1. unzipping and installation of the Organic Resource Database
2. tutorials to introduce the different components of the Organic Resource Database

Data sharing

A data sharing agreement ensures that unpublished data is only entered into ORD with the permission of collaborative scientists and is fully referenced within the database. Published data may also be entered but it should be clearly referenced. Scientists, extension workers etc are encouraged to make use of the ORD in their work.

Introduction to the Organic Resource Database

Soil fertility decline continues to be a major problem in many parts of the tropics and subtropics. Additions of inorganic and organic fertilizers can be used to maintain soil fertility, although with the increased cost and reduced availability of inorganic fertilizers, organic materials are being increasingly relied on to sustain crop production. Organic materials from many sources can be used, for example, legume cover crops, multipurpose shrub and tree prunings, green manures, cattle manure and crop residues. The usefulness of these different organic materials as soil amendments or livestock feeds depends on their quality. The quality of organic materials depends on their nutrient concentrations, carbon constituents, and presence of modifying factors such as polyphenols and alkaloids. Considerable research has been conducted in the tropics on the usefulness of these materials as soil amendments and for livestock fodder.

A large pool of data has accumulated over the years from this field of research, but most of the data have not been compiled or synthesized. Cataloguing the available information and making it available to interested researchers can help them in identifying trends in the quality of materials that can be used in selection of materials for various uses. For example, from choosing legume cover crops for the sub-humid tropics to selection of suitable organic resources for green manuring. It can also help them make comparisons of quality parameters of an organic resource from different regions. The quality of the materials can serve as a basis for the selection of the best available materials for a specified purpose. Decomposition and digestibility studies may also provide additional information on how quality relates to nutrient availability for plant and animal nutrition. Potentially such data compilation could be used for species selection in experiments and may eliminate (or minimize) the need for continued laboratory analysis in selection of organic materials for various uses.

To achieve this data compilation and synthesis the Tropical Soil Biology and Fertility Programme (TSBF) and Wye College, University of London initiated the "Organic Resource Database" in 1995. The aim was to catalogue plant (and manure) quality, decomposition and digestibility data in a form that could be easily accessed by researchers.

Structure and organization

The database has been written in Microsoft Access, a specialized database program. The ORD has been designed for easy entry, storage, searching and analyzing of data.

Forms

Forms are used to present information and to link to other pages within the database.

Tables

Information entered through the data entry forms are stored in tables (spreadsheets). Data may be entered directly into tables, but to minimize typing errors, data entry through use of forms is preferred. Data are stored in the following tables:

- **Data table** is the main table containing organic input quality and climate data. It also contains information on the methods used in analysis of quality parameters.
- **Soils table** contains information primarily on soil nutrients and pH of the areas where the organic resource samples were collected.
- **Species table** contains a list of all the genera and species found in the database. It also specifies whether a given species is a legume or a non-legume.
- **Decomposition table** contains decomposition and digestibility data of the organic materials.
- **Reference table** contains a list of persons whose data is used in the database.
- **Climate table** contains data on climate factors such as rainfall of the areas where the organic resource samples were collected.

A list of all the fields contained in the main tables is given in Appendix 1.

A unique “record number” identifies each record and this is a common field on all tables. This facilitates entry of information of one record in different tables. Thus the record number links a given record to all the tables that contain information concerning the record. This makes it possible to run a query that includes fields from different tables.

Queries

Queries are used to search data stored in the various data tables. They are used to obtain absolute values, averages, variances, count, sums etc. of data contained in tables. Queries are useful in selecting records that meet a specified criteria, for example, to list all entries where %N is greater than 2.5%. Some pre-designed queries have been included in the ORD such as the “Standard Query” and the “TSBF decision Tree”. The “TSBF Decision Tree” is a collection of several queries designed to select organic materials for various soil management purposes depending on their quality parameters. The decision tree is shown in Appendix 2. The “Yes” or “No” buttons contain queries that specify conditions. When these buttons are clicked, the queries run and result in a list of organic resources that meet the criteria specified in the query.

New Users

A new user tutorial has been included to guide people through the database, the stages of data entry, data searches using queries and how to produce reports.

Contents of the ORD

At present the ORD contains data on quality parameters for over 2200 records covering at least 32 plant families. These are mainly plant and manure samples. Of the plant materials, 1584 records are legumes. Over 900 of the records are results of analysis done in the Soil Chemistry laboratory at KARI-Muguga while the rest are from the literature. The number of records is expected to rise as more data is added from the laboratory and from the literature.

Installation of the Organic Resource Database

Acquisition of the Organic Resource Database and its updates

The ORD is available from two sources,

1. From TSBF

Please contact us through the address/email given on page 8 requesting the database.

2. From the ORD webpage

The database can be downloaded from the following webpage,

<http://www.wye.ac.uk/BioSciences/soil/>

Before downloading the database you will need to apply for a password. This allows us to monitor who is downloading the database and so we can provide information about new releases and improvements to you when they are available.

What do you have?

On the discs accompanying this manual you will find 3 files,

1. ORDvx-x.zip - contains all existing data entered into the database and can be used for searching the data
2. pkunzip.exe – for unzipping the zipped files
3. ORDmanual.doc – an electronic copy of this manual

If your computer does not have Winzip then the enclosed file pkunzip.exe can be used to unzip the file. Updated versions of ORD can be requested from TSBF and will be available

twice a year. If you add data to the database please return a copy of the updated database to TSBF so we can update the master copy with the new data for circulation to all users.

ORD has been designed to be user friendly and self explanatory through the ORD manual and New User information pages contained within the database. If you experience problems using the database or require any clarification please contact TSBF, our details are:

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PO Box 30592

Nairobi

Kenya

Tel: +254 2 622 584

Fax: +254 2 622733

Email: tsbinfo@tsbf.unon.org

In addition any comments on the Organic Resource Database will be gratefully received to enable continued improvement in the data contained and the usability of the database.

What do you need?

ORD has been written in Microsoft Access and users will require MSAccess 2.0 or higher to run ORD. If your computer does not include the MSAccess software you will need to purchase this from a local supplier. The system requirements for installing MSAccess 2.0 or higher are as follows:

- An IBM-compatible computer with 80386 or higher processor
- 22 Mb of free hard disk space
- at least 8 Mb RAM
- MS-Dos 3.1 or later
- Microsoft Windows 3.1 or later

Installation process

To install the database you first need to unzip the files. If you have Winzip on your computer this can be done by following these steps,

1. Open Windows Explorer or Windows NT Exploring
2. Double click on the zip file to start the Winzip program
3. Select the directory you want to extract the database to
4. Click on extract

Alternatively if you do not have Winzip then the following procedure should be followed.

3. Using Windows Explorer or File Manager copy the files from the floppy disc to a suitable directory on your hard drive.
4. Click on the zipped file and drag it onto the unzip.exe file
5. The computer will open a DOS window entitled Finished PKUNZIP once the unzipping has finished, cancel this window
6. The database will now be unzipped in the directory c:\windows, find the file and copy it to the working directory you want to use for the database. The file ORD\vx-x.zip unzips to ORD\vx-x.mdb.
7. To load the database, double click on the file name in Windows Explorer (File Manager) or open the file through MSAccess

Once the database is open, click on the OK button to accept the copyright terms and you will see the 'Welcome to the Organic Resource Database' screen. You are now ready to follow the New User Tutorial within the ORD and to follow the exercises in the next section of this manual.

Tutorial Exercises

There are two tutorials covering the different aspects of the database these are,

1. New User Tutorial
2. Searching the database tutorial

New User Tutorial

1. Click on the **New User** button
2. After reading **New User Page 1** click on **Next**
3. After reading **New User Page 2** click on **Next**
4. After reading **New User Page 3** click on **Open Query**
5. Delete the Note box by clicking on the **OK** button

The demonstration query has several components,

Field – this is the data field from the database that you want to search

Table – this tells Access in which table to look for the data

Criteria – allows the user to customize the search

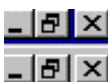
The example search is set to look for all records for *Leucaena leucocephala* and report the plant part, %N, %P, %lignin, source name, year, title and journal/book of publication. We will learn more about designing queries in a later section.

6. To run the query click the **red exclamation mark**,



in the toolbar at the top of the screen.

7. To close the output sheet and return to the New User Page 3 click the lower of the two crosses in the upper right hand corner of the screen,



8. Click the **Next** button to move to New User Page 4
9. Click the **Leucaena query** button for a fuller search using the same search criteria as described above
10. Close this in the same way as step 7 above
11. Click on the **Nitrogen query** to see the output when the results are averaged. We return to designing queries in more detail later.
12. Close this in the same way as step 7 above
13. Click the **Next** button to move to New User Page 5
14. To view the various output forms available within ORD click on the **View Graph, View Table** and **View Report** buttons. To return to New User Page 5 close the output screen as described in Step 7.
15. Click **Close** to return to the initial welcome screen

Searching the database tutorial

We will now look at how to retrieve data from the database, customize searches and print out the results. To do this we will use an existing query in the database.

Simple search of the database using an example query

1. From the Welcome Screen click on the **Search Data** button.
2. Click on the **New Query** button. Close the queries guidelines window as this is for more experienced users.

Below the tool bars you will see a box called **tblData**, by scrolling down, using the scroll bars on the right hand side of the box, you will see all the **field** headings for the entries in the tblData (Data Table). In the lower half of the screen is a pre-designed search (**Query**). The query is in design view and it is in this format that you design your own queries. The query uses fields from the tblData to search the database, the fields in this query are, Genus, species, plant part, %N and %P. Below **Field** you will see **Table** this tells the search which table to look in for the selected field. Ignore **Show** and **Sort** for now, we will return to them later, under **Criteria** you will see “Sesbania”, this limits the search to only Sesbania entries in the Data Table.

3. To run the query click the **red exclamation mark**,



The query produces a datasheet view of the search results. The five fields specified in the query are listed as column headings with the query results under these headings. You will notice that not all entries have data entries for the five headings, more specifically for %N and %P. This is because in this simple search we asked for all Sesbania entries. In the next query we will refine the query and conduct more specific searches of the data.

4. Click on the view icon,



on the far left hand side of the toolbar, this returns you to the design view.

In the %N column in the criteria row add **>0** and rerun the query (click the red exclamation mark). You will see that the gaps in the %N column have gone, this is because have only searched for %N figures greater than 0 i.e. where there is a value entered in the database. The same procedure can be repeated for %P to list only entries that have both %N and %P data values.

5. Return to design view and click on the Totals icon,



on the lower toolbar. This adds a totals row with the words **Group by** below the Table row. Go to the totals row in the %N column and click on the cell, this produces a pull down menu button, click on this once. Choose **Avg** (average). Repeat for the %P column and run the query. The query returns an average value for each Sesbania species and plant part.

Customizing queries

By clicking on the cell and using the pull down menu for any of the cells in the design view of the query you can refine the search or add further columns depending on your requirements.

Adding other data tables

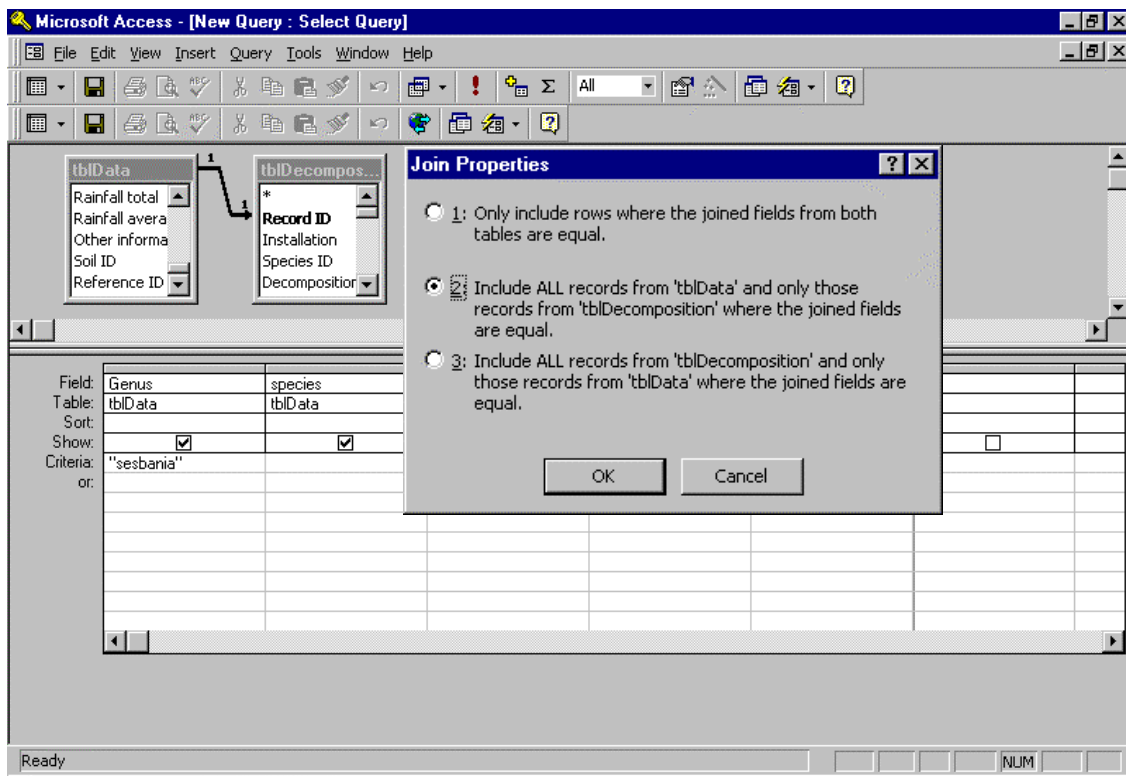
The example above only uses data from the data table, the other tables (decomposition, references and soils) are not searched. As an example we will add the decomposition data table and design a query to look at decomposition in Sesbania.

1. Click on the Show Table icon on the lower toolbar,



this produces a list of the tables available to search. Double click on the **tblDecomposition** and **Close** the Show Table box. You will now see the **tblData** and **tblDecompositon** linked together at the top of the screen. Double click with the left mouse button on the thin black line between the two tables and on the Join Properties box highlight No. 2 'Include all records from tblData and only those from tblDecomposition where the joined fields are equal' (Fig. 1), Click **OK**. This ensures that you when you change the query parameters you can still search all the data in tblData.

Fig. 1: Join properties screen



2. In the %N column click on the tblData cell and then on the pull down menu on the right hand side. This lists the two tables that are linked together. Click on **tblDecomposition** and click on the %N cell and then on the pull down menu on the right hand side. The list now is from all the data headings in the tblDecomposition, scroll down until you get to **N k** after 140 days (the dry matter decomposition rate constant), click on it. Repeat these steps for the %P column (P k after 140 days). To finish the query delete Sesbania from the criteria row in the first column, delete the >0 in the criteria cell in the P k after 140 days column and click the **Totals** button (S) to cancel the **Group by** function. Run the query. The search will list all plant species and the plant part where there is N decomposition data.

Printing, saving and exporting query results

To print query results, first run the query and then print as usual from the toolbar.

To save the query, return to design view, click **File , Save as**, highlight ‘within the current database as’ and give your query a new name, click **OK**.

To export the query results, first run the query and then click **File , Save as**, highlight ‘to an external database or file’, click **OK**. From the **Save as type** menu choose **Microsoft Excel 97 (*.xls)**, choose a file name and press save. Go into Excel and check that the results of the query have been saved. Alternatively you can highlight the required text and cut and paste it into another document.

This section has taken you through the stages of constructing a query, changing the parameters, producing averages, ranges etc and adding in other data tables. These are the steps you need to know to find any data you need from the database.

Error messages

1. The object you referenced in the Visual Basic procedure as an OLE object is not an OLE object

The above is an example of an error message you may encounter when going through the data entry forms in the database. This may happen when you have tried to go ‘back’ to a previous form and you are not able to. In such a case, you will need to start data entry again. Click the ‘OK’ button, click the ‘halt’ button and close the form by clicking on the lower cross in the top right hand corner and start data entry again.

Appendix 1: Summary and explanation of all database fields

Data addition forms: Plant identification, quality, place of collection and climate information

Column heading	Full description
Record ID	Unique record identity number
Installation	Installation number to identify each set of merged data
Species ID	Unique species identity number
Genus *	Plant genus
species *	Plant species
Family *	Plant family
Common name	Common name of plant species
Habit *	What type of plant is it
Legume ?	Is the plant a legume?
Plant part analyzed*	Which part of the plant has been analyzed
Phenological Stage *	What stage of development was the plant at sampling
Synonym	
Accession Number	Accession number of the plant species
CIAT Number	Centro Internacio nal de Agricultura Tropical number
ILCA Number	International Livestock Centre for Africa number
CSIRO/CPI Number	
IFRL Number	
Variety/ Origin	
Site	Field site of plant/manure origin
District	District of plant/manure origin
Country	Country of plant/ manure origin
Longitude/Latitude	GPS reading of the site
Altitude	Altitude (metres above sea level)
Temp min	Minimum monthly temperature
Temp max	Maximum monthly temperature
Temp average	Average monthly temperature
Rainfall min	Minimum monthly rainfall
Rainfall max	Maximum monthly rainfall
Rainfall average	Average monthly rainfall
Manure	Is the sample an animal manure (Yes/No)
Specify animal *	If it is which animal is it from
Manure type *	What is the type of manure
Management *	How was the manure managed
Other organics	Has any other organics been added to the manure
Length of storage	How long has the manure been stored
%N	% Nitrogen
%Protein	% Protein (determined by N-Kjeldahl)
%Carbon	% Carbon
Carbon Method *	The method used for carbon determination
%SolubleN	% Soluble nitrogen
%P	% Phosphorus

%K	% Potassium
%Ca	% Calcium
%Mg	% Magnesium
%Lignin	% Lignin
Lignin method *	Method used to determine lignin content
%ADF	% Acid Detergent Fibre
ADF method *	Method used to determine ADF content
%NDF	% Neutral Detergent Fibre
NDF method *	Method used to determine NDF content
%Cellulose	% Cellulose
%Hemi-cellulose	% Hemi-cellulose
%DM	% Dry Matter
%CF	% crude fibre
%Ash	% Ash
%NDF-N	% Neutral Detergent Fibre Nitrogen
%ADF-N	% Acid Detergent Fibre Nitrogen
%Na	% Sodium
%S	% Sulphur
Fe	Iron content (ppm)
Cl	Chlorine content (ppm)
Mn	Manganese content (ppm)
Cu	Copper content (ppm)
Zn	Zinc content (ppm)
I	Iodine content (ppm)
Other components	Enter any analysis not covered in the data entry forms
Additional methodology	Enter additional methods used not covered in the data entry forms
%Total Soluble polyphenols	% Total soluble polyphenols
Method (for total polyphenol) *	Method used for total soluble polyphenols
Insoluble polyphenols (TAE)	Insoluble polyphenols in %Tannic Acid Equivalents
Insoluble polyphenol method *	Method used for Insoluble polyphenols
Tissue/extract ratio	Ratio of plant material to extractant
Extractant *	Extractant used in polyphenol analysis
Protein Binding Capacity	in mgBSA/mg
%Total CT	Condensed tannins (Includes proanthocyanidins)
ECT	Extractable condensed tannins (mg g ⁻¹)
ECT-vanillin	Vanilin-HCl extractable condensed tannins (mg g ⁻¹)
PBT	Protein bound tannins (mg g ⁻¹)
FBT	Fibre bound tannins (mg g ⁻¹)
Tannin components	BCT: Bound condensed tannins; ECT: Extractable condensed tannins (mg g ⁻¹)
Other components	
Tannin Method	
Other methods	
L:N	Lignin to Nitrogen ratio
PP:N	Polyphenol to Nitrogen ratio
(L+ PP)/N	Lignin plus polyphenol to Nitrogen ratio
C:N	Carbon to Nitrogen ratio
Treatment *	Drying treatment prior to analysis
Sampling time *	When the sample was picked

Lab reference number
Other information

Enter the lab number for the sample entered
Any comment can be added here

Soil data addition form: Soil classification, soil texture, soil nutrients

Column heading	Full description
General soil description	The soil type, e.g. sandy loam
USDA soil classification	The USDA soil classification
FAO soil classification	The FAO soil classification
Sampling depth	Soil sampling depth (cm)
pH	Note: all the below fields are self explanatory
%Sand	
%Silt	
%Clay	
% Total C	
% Total N	
Mineral N	
%Sulphur	
%Al saturation	
CEC	
pH of CEC method	
% Base Saturation	
Exc. K	
Exc. Ca	
Exc. Mg	
Bray P	Bray method for soil P
Olsen P	Olsen method for soil P
Resin P	Resin method for soil P
Bicarb-EDTA	Bicarb.-EDTA method for soil P
NaOH (0.1M)	NaOH method for soil P
HCl (1M)	Dilute HCl method for soil P
Conc. HCl	Concentrated HCl method for soil P
Kerr and Stieglitz	Kerr and Stieglitz method for soil P
Mehlichz	Mehlichz method for soil P

Decomposition data addition form: In vitro, in vivo, leaching tube and litter bag data

Column heading	Full description
Choose the decomposition method used *	Choose experimental method used
Initial amount added to soil (DM)	Initial addition of dry matter to soil/litter bag
Initial amount added to soil (DM)	Initial amount of nitrogen added to soil/litter bag
Particle size added to the soil	Particle soil of organic material added to soil/litter bag
1 week DM loss	Cumulative dry matter loss after 1 week. Note: Add the values for week 2 to 32
1 week N loss	Cumulative nitrogen loss after 1 week. Note: Add the values for week 2 to 32
1 week P loss	Cumulative phosphorus loss after 1 week. Note: Add the values for week 2 to 32
Animal *	Type of animal used in the experiment
% IVDMD	% in vitro dry matter digestibility
% IVOMD	% in vitro organic matter digestibility
% OMD	% organic matter digestibility
% DMD	% dry matter digestibility
% NDFD	% neutral detergent fibre digestibility
% ADFD	% acid detergent fibre digestibility
Comment/method	Digestibility method used
% Hemicellulose Digestibility	Hemicellulose digestibility (%)
% undegradable N	Undegradable N (%)
% Nitrogen digestibility	Nitrogen digestibility (%)
% Lignin digestibility	Lignin digestibility (%)
a	rapidly washed out fraction (%)
b	slowly degraded fraction (%)
c	degradation rate constant (% per hour)
Lag-time	lag till degradation of b (hour)

Appendix 2: TSBF Biomass transfer decision tree

