



## Pathfinder Honour: Trainer's Notes

# Agriculture



### Instructions to Trainers / Instructors of this Honour

Thankyou for being involved with this Honour. These notes have been developed to assist in teaching / instructing this honour. We recognise that there is much more information available and we are grateful that you should share your expertise.

Please remember that Honours are designed to develop our Pathfinders in many ways; their interests, their knowledge and their relationship with their Saviour and Creator. Your enthusiasm and creativity will have a huge impact on those doing the honour.

To complete an Honour, the following (where applicable) must be completed satisfactorily:

- Physical and Practical Requirements.
- Honour Workbook.
- Honour Assessment Sheet. *(On SPD Honour Website but Leader's level access is required)*

### Additional Reference Material

Please see references within the text of these notes.

### Acknowledgements

Wikibooks, but be aware that material on any Wikibooks website is beyond the control of the SPD.

Contributions are acknowledged in the text of these Notes.

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## **REQUIREMENT 1: List the components of soil. Why is soil important to plants?**

Soil is a natural complex of organic minerals, inorganic minerals, air, water and living organisms which supply nutrients, moisture and anchorage for plants. There are over 4 billion micro-organisms in a teaspoon healthy soil. Healthy soil is rich in organic matter and microbes that, together with the atmosphere, precipitation and sunshine provide all the needed elements and conditions for strong plant growth.

Typical Soil Composition = Water (25%) + Solid Matter (50%) + Air (25%)

The solid 50% is made up of organic or living matter and inorganic or non living matter.

The organic is made up of living organisms such as bugs, worms and micro-organisms. It is also made up of non living organisms like dead bugs and decaying plant life. The inorganic is made up of rocks and minerals (things that were never living).

## **REQUIREMENT 2. Explain the difference between clay, sand, and loam soils and collect samples as available in your area. List 3 crops that grow well in each.**

The following information sourced from:

[http://en.wikibooks.org/wiki/Adventist\\_Youth\\_Honors\\_Answer\\_Book/Outdoor\\_Industries/Agriculture](http://en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Outdoor_Industries/Agriculture)

### **Clay**

Clayey soils are made from very fine particles which stick together easily. Water does not easily soak through clayey soils, but once it penetrates, the clay holds it well. It must be broken up before it can be used for agriculture. This can be done by mixing it with sand, sawdust, wood chips, lime, or manure. Crops that grow well in clayey soils include celery, wheat, oats, beans, and clover.

### **Sand**

Sandy soils are made from coarse particles. Water soaks into sand quickly, but will not remain there for very long. This can be addressed by adding clayey soil to it. Crops that grow well in sandy soil include melons, cucumbers, peaches, peanuts, and beans.

### **Loam**

Loam is soil composed of sand, silt, manure, and clay in relatively even concentration (about 40-40-10-10% concentration respectively). Loams are gritty, plastic when moist, and retain water easily. They generally contain more nutrients than sandy soils. In addition to the term loam, different names are given to soils with slightly different proportions of sand, silt, manure and clay: sandy loam, silty loam, clay loam, sandy clay loam, silty clay loam, and manural loam. Loam soil is ideal for growing crops because it retains nutrients well and retains water while still allowing the water to flow freely. This soil is found in a majority of successful farms in regions around the world known for their fertile land. Crops that do well in loamy soil include barley, turnips, and potatoes.

Also, for more information, please see 'Soil Texture: From Sand to Clay' by Sara Williams of the University of Saskatchewan. <http://gardenline.usask.ca/misc/soil.html>

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**REQUIREMENT 3. Test the germination of three varieties of seeds - 100 seeds of each variety. Record germination percentage on consecutive days once germination begins.**

Seed trays are ideal for this but you can also use a garden bed or even make a seed box. The important thing is to record the results. See Agriculture Honour Workbook

**REQUIREMENT 4. Explain how plants obtain nutrients and convert them to food. List the 16 elements that plants at least need to live, grow and reproduce.**

Plants produce plant matter from nutrients, water and carbon dioxide. The uptake of nutrients by plants is accomplished through both the roots and the leaves. They use the energy of light. They are called primary producers, meaning that they are able to manufacture complex organic molecules from simple inorganic compounds such as water, carbon dioxide (CO<sub>2</sub>) and nutrients.

Simply explained, the process is as follows. It is called photosynthesis. During the day, a plant receives light from the sun. The light strikes the 'green' cells of the plant and there is a complex process involving carbon dioxide from the air. Glucoses essential for life and growth are produced. Oxygen is returned to the atmosphere.

At night, when there is no sunlight, plants respire like animals do, taking up oxygen and returning carbon dioxide.

Surprisingly, a large proportion of a plant's primary production (approximately 50%) disappears underground, where it grows the root system and feeds soil organisms. Only 50% is used for above-ground growth. Of this, between 10 and 40% is used for growing, depending on plant type, age and kind of harvesting. If the plant is grazed regularly, the grown biomass will be grazed. This amounts to no more than 40%. The remaining 10% is lost by leaf drop. This leaf litter is decomposed by fungi and bacteria, contributing energy to the soil biota, while returning nutrients to the plant.

Plants are known to need at 16 elements to live, grow and reproduce. Typical plant composition is per the following table.

<b>Element</b>	<b>%</b>	<b>Element</b>	<b>%</b>
Oxygen	45	Manganese	0.05
Carbon (from air)	44	Iron	0.02
Hydrogen	6	Zinc	0.01
Nitrogen	2	Chlorine	0.01
Potassium	1.1	Boron	0.005
Calcium	0.6	Copper	0.001
Sulphur	0.5	Molybdenum	0.0001
Phosphorous	0.4		
Magnesium	0.3		

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**REQUIREMENT 5. Name and identify ten common weeds or grasses which affect your farming community, and tell how best to control them using natural or chemical methods.**

Because weeds vary considerably from area to area, it is best to ask advice from people in your area. This includes farmers, keen gardeners, local governments, other government bodies and agricultural associations. Some examples are:

The Cotton Catchment Communities (Australia) CRC:

<http://web.cotton.crc.org.au/content/Industry/Publications/Weeds/WeedIdentificationTools/SeedimagesforidentificationRelativesize.aspx>

Queensland (Australia) Department of Primary Industries and Fisheries:

[http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790\\_8331\\_ENA\\_HTML.htm](http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790_8331_ENA_HTML.htm)

Australian Weeds Committee National Initiative

<http://www.weeds.org.au/>

Weed busters, an Australia wide program

[http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790\\_7012\\_ENA\\_HTML.htm](http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790_7012_ENA_HTML.htm)

Site for identifying weeds in New Zealand

<http://www.landcareresearch.co.nz/education/weeds/>

**REQUIREMENT 6. Identify six common insect pests or diseases which affect agriculture in your area. Tell what plants they usually affect, and how to control or prevent their occurrence.**

The same advice for Requirement 5 applies.

Queensland (Australia) Department of Primary Industries & Fisheries: Listing of 'pests'

[http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790\\_8256\\_ENA\\_HTML.htm](http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790_8256_ENA_HTML.htm)

**REQUIREMENT 7. Understand a weather map and, using a series of maps, determine a four-day forecast for your area. Record the results. How is this knowledge helpful to the farmer?**

For information on Weather and weather forecasts, please check out the following:

Australia

Australian Government: Bureau of Meteorology (BOM) home page:

<http://www.bom.gov.au/index.shtml>

Also at this BOM site: Water & the Land, For Agriculture & Natural Resources Management

<http://www.bom.gov.au/watl/index.shtml>

New Zealand

<http://www.metservice.co.nz/public/index.html>

<http://weather.org/NewZealand.htm>

Fiji

<http://www.met.gov.fj/index.php>

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## **REQUIREMENT 8. What is erosion? How can it be prevented?**

The following information sourced from:

[http://en.wikibooks.org/wiki/Adventist\\_Youth\\_Honors\\_Answer\\_Book/Outdoor\\_Industries/Agriculture](http://en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Outdoor_Industries/Agriculture)

Erosion is the loss of soil by wind, water, or ice by downward or down-slope movement. It can occur quickly on steep ground - especially if there is nothing growing there.

It can be slowed by minimizing the amount of time the land has nothing growing on it. When ploughing, discing, or planting, it is best to make furrows perpendicular to the slope of the ground. Ploughing straight uphill will cause furrows to act as ever-widening ditches that channel the water quickly away, carrying soil with it. Ploughing across a hill instead slows the descent of rainwater and allows it to drop the sediments it picks up rather than carrying it off.

In addition to this, contoured banks are used to minimise erosion and retain moisture. These banks are comprised of heaped soil and follow the contour of the land in a horizontal plane.

## **REQUIREMENT 9. Visit a farm, interview the farmer about his farm and photograph or obtain brochures of machinery used for the following purposes. Describe their use and function.**

These will vary quite a deal according to the area you live in and the crops that are grown and a farm visit should be invaluable for this information. Remember that farmers are busy people and make the necessary arrangements. It is best that leaders accompany Pathfinders on farm visits. For the interview, make sure the Pathfinders prepare questions and include such things as why he is a farmer, what he loves most about farming and the many variables such as weather and prices.

### **a. Cultivating**

Cultivating is the process of stirring and pulverizing the soil, either before planting or to remove weeds and to aerate and loosen the soil after the crop has begun to grow.

### **b. Zero Tillage**

By definition, zero tillage seeding is a one pass operation which places seed and fertilizer into an undisturbed seedbed, packs the furrow and retains adequate surface residues to prevent soil erosion.

### **c. Planting**

Planting is the process of placing the seeds in position where they are to grow

### **d. Harvesting**

Harvesting is the process of collecting a crop when it reaches maturity.

### **e. Irrigation, if applicable**

Irrigation is the artificial application of water to the soil to assist in growing crops. It is used to cover shortfall in rainfall. It may be also used to protect plants against frost.

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### **REQUIREMENT 10. List the advantages and disadvantages of zero tillage agriculture.**

Some obvious advantages are that the retained surface organic material protecting the soil, reduces soil water losses, decreases evaporation losses, decreases erosion and over time may improve the soil.

Some disadvantages are the cost of changing to a new system and the use herbicides for weed control, which, if not used wisely could lead weeds to becoming herbicide resistant.

The above is very simplistic, so for more information, do a web search or better still, talk to people involved in agriculture.

### **REQUIREMENT 11. Maintain a log and take photos for one of the following:**

**a. Make the plans and do the principle work from preparation and planting to harvest of a farm crop of at least a quarter of a hectare.**

**Or,**

**b. Assist in planting, cultivating and harvesting at least four different crops.**

This requirement is often part of daily life for those who live on a farm. Remember to maintain a log and take photos.