

Intensive agriculture in the Top End is relatively new and challenging but offers tremendous potential if developed and managed correctly. Success depends on a thorough understanding of the physical environment, sound crop and animal husbandry, sustainable land use practices and good financial and marketing strategies. Along with this is the need to deal with the raft of state, federal and international regulations and policies that are on the horizon.

Conservation farming and sustainable grazing practices are imperative in moderating the impacts of climate change and the increasingly erratic weather patterns that are predicted for this region. Integrating crops, livestock and pastures into flexible and adaptive farming systems will allow greater utilisation, management and protection of the natural resources of the Top End.

If agriculture is to take advantage of the production and market opportunities that arise and make a real contribution to the increasing global food demand, farming systems must be conservative, sustainable and smart. Adaptive, conservation farming and grazing systems are the only viable choices for dealing with the challenges ahead.

Protecting our soil, rivers and aquifers and maintaining healthy agricultural and natural ecosystems, are as much a global and ethical imperative as producing more food.



**Acidic soil**

Soil with a pH value of less than 7.0. In highly acid soils some nutrients and elements become toxic, while others are unavailable resulting in poor plant growth.

**Acidification**

The process by which soils become increasingly acidic due to leaching of minerals such as Ca, Mg, K and N.

**Aflatoxin**

Any of several related toxic compounds produced by the fungi *Aspergillus flavus* which infects many food crops including peanuts.

**Agricultural biodiversity**

Refers to the variation of life forms within a farming or agricultural ecosystem and is often used as a measure of the health of biological systems.

**Agro-ecosystems**

An agro-ecosystem is the system of organisms, (i.e. plants, animals and microorganisms), their association and interaction with each other and with the agricultural environment. Ecosystems refer to the abundance, distribution, energy, role and progression of organisms within the environment.

**Alkaline soil**

Opposite to acidic. Soils with a pH value greater than 7.0.

**Amelioration of soil**

To correct or improve the condition of the soil through some practice such as liming or cultivation etc.

**Annual**

A plant that completes its lifecycle within one year and then dies.

**Arable land**

Land which is capable of the production of cultivated crops.

**Available water**

The portion of water in the soil which can be used by plants.

**Beneficial insects**

Insects which are natural enemies of crop and pasture pests and thus play a role in reducing pest populations.

**Biological control**

The use of naturally occurring insects or disease organisms to assist in control of pests in crops and pastures.

**Biomass**

Biomass in the agricultural context refers to vegetative matter produced by crops and pastures and is measured in kilograms or tonnes per hectare.

**Bio-security**

A set of preventive measures, laws and practices designed to eliminate or reduce the introduction of exotic plants, insects or pathogens which would damage or negatively impact agricultural or natural ecosystems.

**Boomspray**

Mechanical device consisting of a chemical tank, pump, boom and nozzles designed to apply agricultural chemicals.

**Buffering capacity**

The capacity of a soil to resist changes in pH.

**Build-up (climate)**

A term used to describe the period that coincides with the early part of the wet season when the temperature and humidity increase prior to the onset of the monsoon.

**Calibrate (chemical)**

Accurately measure the output per unit area of chemical from a boomspray or other application device.

**Carbon sequestration**

Any process or system which achieves the long-term storage of carbon dioxide or other forms of carbon to mitigate the effects of global warming. Carbon is captured through biomass production, maintaining forests or establishing forestry plantations. It has been proposed to mitigate the accumulation of greenhouse gases released by the burning of fossil fuels.

**Carrying capacity**

The ability of a unit of land to adequately support a given number of livestock without degrading the resource.

**Cation exchange capacity (CEC)**

The capacity of a soil to exchange cations (positively charged ions) between the soil and the soil solution. CEC is used as a measure of fertility, nutrient retention capacity and the capacity to protect groundwater from cation contamination.

**Combine**

A planter designed to sow a range of crops and pastures in narrow rows, usually less than 500 mm.



**Compaction of soil**

Compression of the soil surface or sub-soil through the movement of stock or machinery leading to reduced water infiltration and restricted root growth.

**Conservation farming**

A broad term referring to a combination of farming techniques designed to conserve soil and water. It usually involves mulch retention and reduced tillage.

**Contour**

An imaginary line connecting points of equal height over the land.

**Contour bank**

A soil conservation bank constructed on or close to the contour to slow and trap runoff water.

**Contour tillage/farming**

A system where tillage or farming is carried out on or near the contour of the land to slow the flow of surface water.

**Conventional cultivation**

A term referring to traditional practices where several tillage operations are carried out and plant residues are incorporated prior to planting.

**Coulter**

A disc used on conservation tillage planters to cut surface mulch and allow tines or furrow openers to pass without blockage.

**Cover crop**

A quick growing crop used specifically as mulch to protect the soil.

**Crust**

A hard soil surface layer that is compacted, and which restricts the entry of water and the emergence of seedlings.

**Cultural management**

The use of agronomic practices to disrupt the lifecycle of pests and disease, such as rotations, cultivation and resistant varieties.

**Cyclone**

A tropical low pressure system associated with rising warm air and clockwise air circulation which generates high velocity winds and heavy rain.

**Degradation of soil**

Physical and chemical damage or a reduction in the soil's productive capacity due to processes such as erosion, acidification, salinisation or weed infestation.

**Desiccant**

Chemical applied to crops to hasten the dry-down period; enables earlier harvesting and reduces seed loss.

**Dhal**

De-husked, split legume seed used in Asian cooking.

**Digestibility**

The percentage of the total plant which can be digested or absorbed by the grazing animal for its metabolism and growth.

**Dispersible soil**

A structurally unstable soil which readily disperses into its constituent particles (clay, silt,

sand) in water. Highly dispersible soils are normally highly erodible.

**Diversion bank**

A soil conservation bank designed to divert water before it reaches a designated site or cropping area.

**Dry matter**

The portion of plants or vegetation which is not water.

**Dryland farming**

Rain-fed production of crops and pastures.

**Emission trading**

The control of greenhouse gas pollution by providing economic incentives for achieving reductions in emissions. Government sets a limit or cap on the amount of a pollutant that can be emitted. Companies or other groups are issued emission permits and are required to hold an equivalent number of allowances (or credits) which represent the right to emit a specific amount.

**Erosion**

The wearing away of the land surface by the action of wind and/or water.

**Evaporation**

The conversion of water to vapour and its subsequent loss from free water bodies or the soil surface.

**Evapotranspiration**

The combined loss of water to the atmosphere through transpiration from plant surfaces and evaporation from the soil surface

**Floodplain**

Practically level land situated close

to a channel which is subject to overflow or flooding.

### **Foliar herbicide**

Herbicide which is applied to the foliage of plants and is taken up through the leaves.

### **Furrow**

A slot or depression created by the passage of planter tines into which the seed is placed. Furrows are also created by cultivation.

### **Genetic engineering**

The direct manipulation of an organism's genes. Genetic engineering uses molecular cloning and transformation techniques to alter the structure and characteristics of genes. In agriculture, genetic engineering is used to change crop characteristics and confer disease and insect resistance and tolerance to herbicides such as glyphosate.

### **Genetically modified organism (GMO)**

An organism whose genetic material has been altered using genetic engineering. DNA molecules from different sources are combined into one molecule to create a new set of genes which is then transferred into an organism, giving it modified or novel genes. Roundup Ready® and BT crops are examples of GMOs

### **Global positioning system (GPS)**

Is a space-based global navigation satellite system which provides three-dimensional (latitude, longitude, altitude) information. GPS receivers access data to locate, map and navigate. GPS is now

widely used in agriculture to guide machinery for increased efficiency.

### **Global warming**

The increase in the average temperature of the Earth and oceans. Temperatures increased  $0.74 \pm 0.18$  °C during the last century. Global warming is caused by increasing concentrations of greenhouse gases resulting from fossil fuel burning and deforestation (Intergovernmental Panel on Climate Change (IPCC))

### **Glyphosate**

Translocated non-selective herbicide used in conservation farming systems. The active ingredient in Roundup® herbicide.

### **Greenhouse gases**

Atmospheric gases that absorb and emit radiation which cause the greenhouse effect. The main greenhouse gases are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Greenhouse gases moderate the temperature of the Earth but increasing greenhouse gas emissions are leading to accelerated global warming.

### **Green manure crop**

Crop grown for the purpose of improving soil fertility and structure and which is returned to the soil.

### **Groundwater recharge**

The process by which surface water moves through the soil and strata to recharge aquifers. It is a vital process for the maintenance of ground water reserves.

### **Growth promotant**

Synthetic hormone administered

to livestock to enhance feed conversion and growth rates.

### **Hardpan**

A compacted and hardened layer of sub-soil which impedes water flow and root growth.

### **Herbicide**

Chemical which is biologically active and used to kill or control the growth or emergence of specific plants and weeds.

### **Herbicide translocation**

A process whereby herbicides are taken up and distributed within the conductive tissue of plants.

### **Hybrid**

Plant or animal resulting from a cross between parents which are genetically different.

### **Immobilisation of nitrogen**

The conversion of N to an organic form in microbial or plant tissue which is unavailable for uptake or use by plants.

### **Improved pastures**

Introduced or exotic pasture species with superior nutritional or growth characteristics to native pastures.

### **Infiltration**

The rate at which water is taken into the soil, usually measured in mm/hr.

### **Inoculum (plant disease)**

The disease organism or its parts that contact the plant and cause the infection.



### **Integrated pest management (IPM)**

Pest management systems which incorporate a range of practices to keep pests below economic injury levels. IPM includes chemical, cultural, biological, physical and quarantine controls.

### **Ironstone gravel**

Gravel nodules high in iron oxides found in many soils in the Top End.

### **Kaolinite clay**

Hydrous, non-expanding clay mineral containing aluminosilicates and having a 1:1 crystal structure.

### **Lateritic soil**

Soils of various textures containing 10 to 50% ironstone gravel in the surface layers or within the profile.

### **Leaching**

The downward removal of nutrients and chemicals in solution through the soil.

### **Legume**

A member of the Leguminosae or pulse (beans and peas) family most of which use *Rhizobium* spp. associations to fix atmospheric nitrogen.

### **Legume inoculation**

Coating legume seed with a specific culture of *Rhizobium* bacteria to promote effective nodulation and enhance nitrogen fixing.

### **Legume understorey**

Legume pasture grown in conjunction with an annual crop.

### **Ley or ley farming**

Refers to the practice of rotating legume pastures with annual crops to improve soil structure and fertility and provide grazing for stock. The pasture phase is the ley phase.

### **Liming**

Application of lime (calcium oxide CaO) or a similar neutralising material to reduce soil acidity.

### **Liveweight gain**

Increase in animal liveweight when measured from a specific point in time.

### **Major elements or nutrients**

Chemical elements required in the largest quantities for plant growth, i.e. nitrogen, phosphorus, potassium.

### **Methane**

(CH<sub>4</sub>) is the principal component of natural gas and a potent greenhouse gas with a high global warming potential. Ruminant animals are large methane emitters.

### **Micro-nutrient (trace element)**

Nutrients or elements required in minute quantities but which are essential for plant growth i.e. zinc, copper and iron.

### **Mimosine**

Toxic amino acid found in the foliage of leucaena (*Leucaena leucocephala*).

### **Mineralisation of nitrogen**

The conversion of N from an organic form to an inorganic form as a result of microbial

decomposition. It can then be utilised by plants.

### **Minimum tillage**

A system where tillage is reduced to the minimum required to achieve a suitable environment for plant establishment.

### **Monitoring**

Regular inspection of crops to identify insect and disease activity in order to determine whether control measures are necessary. Monitoring is an integral part of integrated pest management.

### **Mulch**

A natural layer of plant residue or live vegetation on the soil surface. Mulch may also be artificial, e.g. plastic or paper.

### **Mutagenesis**

A plant breeding technique in which genetic mutation occurs to confer specific desirable traits.

### **Native pastures**

Natural pastures consisting of original non-introduced plant species.

### **Nematodes**

Microscopic wormlike organisms some of which are parasites of crops and pastures.

### **Node**

Slightly enlarged portion of the stem where leaves, buds or roots arise.

### **Nodulation**

The process by which legume roots are colonised by rhizobium bacteria and nodules are formed.

### **Non-selective herbicide**

A herbicide which is non-specific and controls most vegetation to which it is applied. Glyphosate is an example of a non-selective herbicide.

### **No-tillage**

A system of establishing crops and pastures without prior cultivation. Specialised planters are used and weeds are controlled using herbicides.

### **Noxious weed**

Any plant which is deemed harmful, damaging or causes a loss in production or intrinsic values may be declared noxious. Its control will be determined by relevant legislation.

### **Nutrient**

An element which is taken up and used by plants for growth and reproduction.

### **Organic farming**

Farming without the use of chemical fertilisers and pesticides.

### **Oxalates**

Oxalic acid found in many plants causing gastroenteritis or hypocalcaemia (low blood calcium levels) in livestock. Kazungula, buffel and other pastures may contain oxalic acid. Horses are particularly susceptible to oxalate poisoning.

### **Pasture decline**

A gradual process of productivity decline associated with nutrient immobilisation or loss of productive species.

### **Pasture utilisation**

The proportion of total pasture dry matter consumed by livestock. Usually expressed as a percentage of the total.

### **Percolation**

The downward movement of water through saturated soil.

### **Perennial**

A plant which continues to grow from year to year.

### **Permeability of a soil**

The ease with which water enters and passes through the soil.

### **Pesticide**

Term used for any chemical used for the control of weeds, insects or disease in crops and pastures.

### **pH of soil**

A numerical scale indicating the degree of acidity or alkalinity of a soil with pH 7.0 being neutral.

### **Podsolc soil**

Soils with texture profiles which change from light at the surface to bleached, heavier clay layers at depth. Usually poorly drained and subject to waterlogging in the wet season.

### **Pod-sucking bugs**

Insect pests of the Hemiptera family which have sucking mouth parts and feed on the sap of immature pods and seeds.

### **Precision farming/agriculture**

A system in which new technologies, such as global positioning systems (GPS), sensors, satellites or aerial

images are used to assess, monitor and address crop and soil variation. Information is used to achieve greater precision in planting, fertiliser and pesticide application and accurately predict and monitor crop yields.

### **Presswheel**

Device or small wheel used on planters to assist in covering the furrow, improving seed-to-soil contact and enhancing emergence.

### **Proboscis**

Piercing, needle-like mouth parts of plantsucking bugs and predatory shield bugs.

### **Prussic acid**

Hydrocyanic acid (HCN) formed in sorghum plants as a result of stress or rapid growth. Causes poisoning in livestock.

### **Red earth**

Class of soils which are the massive structured red clay loam and sandy loam soils of the Top End.

### **Reduced tillage**

Synonymous with minimum tillage.

### **Rejuvenation of pastures**

Renovation of “run-down” pastures by undertaking weed control, reseeding, fertilising or other practice to improve productivity.

### **Remote sensing**

The acquisition of information on an object, geographical area or phenomenon, by various techniques to monitor changes in land condition and crop health. It supports data collection on the



ground, ensuring in the process that areas or objects are not disturbed.

### **Residual herbicide**

Herbicide which is soil-acting and controls germinating weeds over an extended period.

### **Rhizobia**

Bacteria which colonise the roots of legumes and are capable of fixing atmospheric nitrogen for the benefit of the plant.

### **Rhizome**

Underground stems formed by many plants as a means of vegetative spread.

### **Rilling (erosion)**

Small intermittent channels only centimetres deep which usually occur as a result of runoff on newly cultivated land.

### **Rotation**

A management system where crops and pastures are grown in alternate years to control weeds, insect pests and diseases and maintain soil structure and fertility.

### **Row-crop planter**

A precision planter designed to sow crops in discrete rows of 0.5 to 1.0 m. Usually used in maize, cotton and peanut production.

### **Ruminant (or enteric) fermentation**

Fermentation that takes place in the digestive systems of ruminant animals such as cattle and sheep etc. Ruminants have a special stomach (rumen) that allows them to digest

tough, fibrous plants and grains through a microbial fermentation process.

### **Runoff**

Rainfall in excess of the infiltration rate which is lost as surface flow.

### **Satellite imaging**

The capture of images of the Earth by satellites to provide visual information on crop, land and natural resource condition and change. Satellite imagery is the basis for precision farming information systems.

### **Sediment**

Suspended soil particles which are carried away in runoff water and are deposited further down the slope.

### **Seed-firming wheel**

A term given to a specific type of presswheel which presses the seed lightly into the bottom of the furrow rather than compacting soil on top of the seed.

### **Seed inoculation**

Application of a specific rhizobium culture to legume seeds to induce nodulation and nitrogen fixation.

### **Selective herbicide**

A herbicide which controls a specific group of plants but is inactive against others, i.e. grass herbicides.

### **Semi-arid tropics**

A term given to a tropical area in which there is a distinct dry period which severely limits plant growth.

### **Soil microbes**

Beneficial and harmful species of bacteria, fungi and other

microscopic organisms which are a part of the soil's ecology.

### **Soil structure**

The physical arrangement of soil particles into units or aggregates.

### **Sowing point**

The part of the planter which physically engages the soil creating a furrow into which the seed is placed.

### **Stocking rate**

The number of stock units run on a particular area of land.

### **Strip cropping**

Growing crops in an arrangement of strips that serve as protection against wind or water erosion.

### **Stubble**

Plant residue left over from a crop

### **Supplemented cattle**

Cattle which are provided with mineral or fodder supplementation to overcome temporary deficiencies in nutrition.

### **Surfactant**

Chemical additive which improves the dispersion, spreading and wetting action of herbicides or other chemicals.

### **Sustainable**

Term used to describe agricultural practices which allow continued and viable production without degrading natural resources.

### **Tahini**

Paste made from sesame seed.

**Tillage**

Cultivation or mechanical working of the soil.

**Tilth**

The physical condition of the soil as related to ease of tillage, fineness of seedbed and impedance to seedling emergence.

**Tindall clay loam**

Class of sandy clay loam and clay loam red earth soils with structured B horizon. Agriculturally important and found in the Katherine-Daly Basin.

**Tine**

Shank on a planter or cultivator to which sowing or cultivating points are attached.

**Tippera clay loam**

Similar soil type to Tindall but has a massive hard structured B horizon.

**Top End**

Northern-most area of the Northern Territory of Australia (above 16°S) in which the production of dryland crops is possible during the wet season.

**Trace elements (micro-nutrient)**

Elements or nutrients required by plants in minute quantities but which are essential for healthy plant growth.

**Trafficability**

Refers to the ability to travel or drive over the land in order to carry out some operation, i.e. cultivating, spraying or sowing.

**Transition period**

The period between the dry season and the onset of the wet season when sporadic storms cause spoilage of dry feed.

**Trap-cropping**

The practice of growing a sacrifice crop to encourage insect pests which may later be chemically or physically controlled.

**Tropics**

The geographical region between the Tropics of Capricorn and Cancer.

**Vector**

Insect, fungus, nematode or other organism which transmits disease.

**Water holding capacity**

The amount of water a soil can hold and make available for plant use. Sands and clays have low and high water holding capacities, respectively.

**Waterlogged**

Saturated with water. Conditions detrimental to plant growth. Common problem in some soils during the wet season.

**Waterway**

A structure designed to collect runoff water from diversion and contour banks and carry it safely to a discharge area or natural water course.

**Wetting agent**

Synonymous with surfactant.

# Appendices

## APPENDIX I – DECLARED WEEDS

For information on how to identify and control declared weeds contact the Weed Management Branch of NRETAS by phone or email (08 8999 4567, weedinfo.nretas@nt.gov.au).

### Schedule of classes

- A/C
- B/C
- C

A	To be eradicated	Reasonable effort must be made to eradicate the plant within the NT
B	Growth and spread to be controlled	Reasonable attempts must be made to contain the growth and prevent the movement of the plant
C	Not to be introduced to the Territory	All Class A and Class B weeds are also considered to be Class C weeds.

\*Area to which declaration applies is all of the Northern Territory unless otherwise stated.

### Schedule class A/C\*

Botanical name	Common name
<i>Acacia catechu</i>	Cutch tree
<i>Acacia nilotica</i>	Prickly acacia
<i>Alternanthera philoxeroides</i>	Alligator weed
<i>Andropogon gayanus</i>	Gamba grass
<i>Annona glabra</i>	Pond apple
<i>Asparagus asparagoides</i>	Bridal creeper
<i>Asphodelus fistulosus</i>	Onion weed
<i>Barleria prionitis</i>	Baleria
<i>Cabomba</i> spp.	Cabomba
<i>Chrysanthemoides monilifera</i>	Bitou bush/boneseed
<i>Cryptostegia</i> spp.	Rubber vine
<i>Dalbergia sissoo</i> (Area: N of 18° S latitude)	Dalbergia
<i>Datura ferox</i>	Longspine thornapple
<i>Echium plantagineum</i>	Paterson's curse
<i>Eichhornia crassipes</i>	Water hyacinth
<i>Jatropha curcas</i>	Physic nut
<i>Lycium ferocissimum</i>	African boxthorn
<i>Martynia annua</i>	Devil's claw
<i>Mimosa pigra</i> (Area: S of 14° S latitude)	Mimosa, giant sensitive plant
<i>Nassella neesiana</i>	Chilean needle grass
<i>Nassella tenuissa</i>	Mexican feather grass (Class A) All of the NT
<i>Nassella trichotoma</i>	Serrated tussock
<i>Parthenium hysterophorus</i>	Parthenium weed
<i>Prosopis</i> spp.	Mesquite
<i>Rubus fruticosus</i> agg.	Blackberry
<i>Salix</i> spp. except <i>S. babylonica</i> , <i>S. X calodendron</i> & <i>S. X reichardtjii</i>	Willows (except weeping willows, pussy willow and sterile pussy willow)
<i>Ulex europaeus</i>	Gorse
<i>Ziziphus mauritiana</i>	Chinee apple, Indian jujube

### Schedule class B/C

Botanical name	Common name
<i>Acanthospermum hispidum</i>	Star burr, goat's head
<i>Alternanthera pungens</i>	Khaki weed
<i>Andropogon gayanus</i>	Gamba grass
<i>Argemone ochroleuca</i>	Mexican poppy
<i>Calotropis procera</i> (Area: S of 16 °30' S latitude)	Rubber bush
<i>Carthamus lanatus</i>	Saffron thistle
<i>Cenchrus echinatus</i>	Mossman River grass
<i>Emex australis</i>	Spiny emex
<i>Hymenachne amplexicaulis</i>	Olive hymenachne
<i>Hyptis capitata</i>	Knob weed
<i>Hyptis suaveolens</i>	Hyptis
<i>Jatropha gossypifolia</i>	Bellyache bush
<i>Lantana camara</i>	Common lantana
<i>Lantana montevidensis</i>	Creeping lantana
<i>Leonotis nepetifolia</i>	Lion's tail
<i>Mimosa pigra</i> (Area: N of 14 ° S latitude)	Mimosa, giant sensitive plant
<i>Mimosa pudica</i>	Common sensitive plant
<i>Opuntia</i> spp. (Area: S of 18 ° S latitude)	Prickly pears
<i>Parkinsonia aculeata</i>	Parkinsonia
<i>Pennisetum polystachion</i>	Mission grass
<i>Pistia stratiotes</i>	Water lettuce
<i>Ricinus communis</i>	Castor oil plant
<i>Salvinia molesta</i>	Salvinia
<i>Senna alata</i>	Candle bush
<i>Senna obtusifolia</i>	Sicklepod
<i>Senna occidentalis</i>	Coffee senna
<i>Sida acuta</i>	Spinyhead sida
<i>Sida cordifolia</i>	Flannel weed
<i>Sida rhombifolia</i>	Paddy's lucerne
<i>Stachytarpheta</i> spp.	Snake weeds
<i>Tamarix aphylla</i>	Tamarisk, athel pine
<i>Themeda quadrivalvis</i>	Grader grass
<i>Tribulus cistoides</i>	Caltrop
<i>Tribulus terrestris</i>	Caltrop
<i>Xanthium occidentale</i>	Noogoora burr
<i>Xanthium spinosum</i>	Bathurst burr

(Includes all class A and class B invasive weeds)

### Schedule class C

Botanical name	Common name
<i>Acroptilon repens</i>	Creeping knapweed
<i>Ageratina riparia</i>	Mistflower
<i>Amaranthus dubius</i>	Chinese spinach
<i>Ambrosia artemisiifolia</i>	Annual ragweed
<i>Ambrosia psilostachya</i>	Perennial ragweed
<i>Austroeupatorium inulaefolium</i>	
<i>Baccharis halimifolia</i>	Groundsel bush
<i>Boerhavia erecta</i>	
<i>Brachiaria paspaloides</i>	Common brachiaria, Thurston grass
<i>Chromolaena odorata</i>	Siam weed, Christmas bush



<i>Clidemia hirta</i>	Koster's curse, soap bush
<i>Coix aquatica</i>	Job's tears
<i>Croton hirtus</i>	
<i>Datura</i> spp.	Thornapples
<i>Digitaria fuscescens</i>	Common crabgrass
<i>Digitaria insularis</i>	
<i>Diodia sarmentosa</i>	
<i>Echinochloa glabrescens</i>	Barnyard grass
<i>Echinochloa stagnina</i>	
<i>Egeria densa</i>	Dense waterweed
<i>Elodea canadensis</i>	Canadian pondweed
<i>Equisetum ramosissimum</i>	Horsetail, scouring rush
<i>Equisetum</i> spp.	Horsetails
<i>Eriocaulon truncatum</i>	
<i>Eriocereus martinii</i>	Harrisia cactus
<i>Eriochloa polystachya</i>	Carib grass
<i>Fimbristylis umbellaris</i>	Globular fimbristylis
<i>Hybanthus attenuatus</i>	
<i>Hyptis brevipes</i>	Lesser roundweed
<i>Ischaemum timorense</i>	Centipede grass
<i>Kochia</i> spp.	Burning bush
<i>Kochia scoparia</i> (all except subsp. <i>Trichopyla</i> )	
<i>Lagarosiphon major</i>	Lagarosiphon
<i>Leptochloa chinensis</i>	Red sprangletop, feathergrass
<i>Leptochloa panicea</i>	Sprangletop
<i>Limnocharis flava</i>	Yellow burrhead, yellow sawah lettuce
<i>Miconia</i> spp.	Velvet tree
<i>Mikania cordata</i>	
<i>Mikania micrantha</i>	Mile-a-minute
<i>Mimosa invisa</i>	Giant sensitive plant
<i>Myriophyllum spicatum</i>	Erasian watermilfoil
<i>Orabanche</i> spp. (all except <i>O.minor</i> and <i>O.cernua</i> var. <i>australiana</i> )	Broomrape
<i>Paederia foetida</i>	Lesser Malayan stinkwort
<i>Piper aduncum</i>	
<i>Rhodomyrtus tomentosa</i>	Downy rose myrtle
<i>Rotala indica</i>	Toothcup
<i>Sacciolepis interrupta</i>	
<i>Salvinia cucullata</i>	Salvinia
<i>Salvinia natans</i>	Salvinia
<i>Schoenoplectus juncooides</i>	
<i>Scirpus maritimus</i>	
<i>Sorghum halepense</i>	Johnson grass
<i>Spermacoce mauritiana</i>	
<i>Striga angustifolia</i>	Witchweed
<i>Striga asiatica</i>	Witchweed
<i>Striga</i> spp. (all non-indigenous)	Witchweed
<i>Trapa</i> spp.	Floating water chestnut
<i>Xanthium</i> spp.	Burrs

The Weed Risk Management (WRM) process is currently being used to evaluate existing weeds on this list as well as new invasive species. *The Northern Territory Weeds Management Act 2001* determines weed management responsibilities.

## APPENDIX 2 – COMMON INSECT PESTS OF CROPS AND PASTURES

Insect	Crops affected	Important comments
Wireworms & false wireworms	Sorghum, maize, pastures and legume seed crops	Damaging at establishment and seedling stage. Determine numbers & activity with bait. Use seed treatment or in-furrow chemicals. Presswheels reduce pest mobility.
Earwigs	Range of crops and pastures	Damaging at establishment period & seedling stage.
Scarab beetles	Range of crops and pastures	Occur at establishment period & seedling stage.
Locusts and grasshoppers	Sorghum, maize, legumes and pastures	Young hoppers damage establishing crops. Adults damage vegetative and maturing crops.
Helicoverpa (heliiothis) caterpillars	Wide range of crops and pastures	Active all season, particularly damaging at flowering, grain and pod development. Chemical control if at damaging level.
Armyworms and various caterpillars	Wide range of crops and pastures	Sporadic pests of vegetative parts. Large numbers will damage crops.
Bean pod borer	Mungbean, soybean and other legume crops	Feed on flowers and the maturing pods. Difficult to control when inside the pod. Early detection necessary for control.
Sesame leaf roller	Sesame	Feed on leaves, flowers and maturing pods.
Sorghum midge	Grain sorghum	Feed on florets and immature seeds preventing development of grain. Resistant varieties are available. Chemical control at flowering. Not serious in dryland but damaging in irrigated crops.
Plant hoppers, aphids, thrips and mirids	Range of crops and pastures	Damage crops by sucking sap and transmission of plant diseases.
Pod suckers i.e. green vegetable, riptortus & other shield bugs	Grain legumes and legume pastures	Suck sap from immature pods and seed. May cause significant damage to grain and pasture legumes. Must be detected at flowering and early pod stage for effective control.
Stem borer moth	Rice	Larvae chew through and feed within the stem damaging head & reducing grain fill.
Leaf roller	Rice	Larvae eat and roll leaves into tubes in which they later pupate.
Caseworm moth	Rice	Feed on leaf surface.



### APPENDIX 3 – COMMON DISEASES IN CROPS AND PASTURES

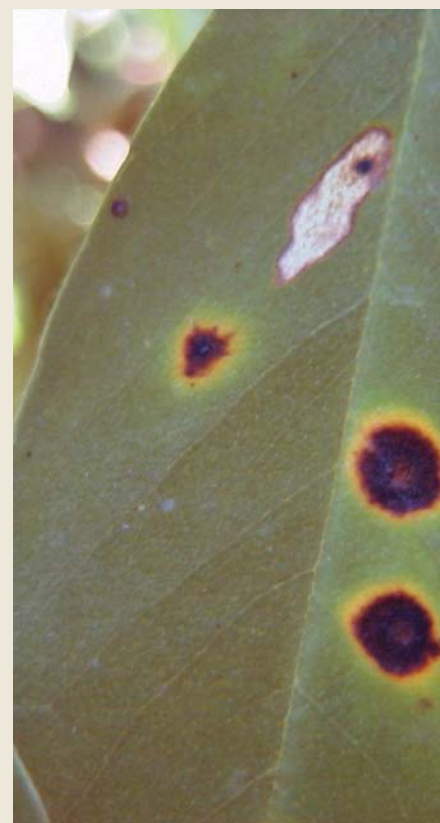
Disease	Crops affected	Important comments
Charcoal rot	Sorghum	Occurs under moisture stress in susceptible varieties. Crops lodge as a result. Use tolerant varieties and reduce stress with mulch.
Stem rots and blights	Sorghum, maize, legume crops and pastures	Occur under moisture stress and high temperatures. Can kill seedlings. Use tolerant varieties and maintain mulch.
Crown rots	Peanut	Favoured by excessively wet conditions and plant injury. Improve drainage and avoid plant damage.
Damping-off, i.e. seed and root rots	Most crops and pastures	Damage seed or roots of seedlings under prolonged waterlogged conditions. Improve soil drainage, use rotations and fungicidal seed treatment.
Head and grain moulds	Maize, sorghum, millet	Occur in prolonged moist conditions after grain maturity. Sow at correct time and use openheaded varieties.
Leaf spots and blights	Most crops and pastures, serious in rice and peanut	Organisms survive in infected volunteer plants and stubble. Use crop rotation and resistant varieties. Apply fungicides to high value crops like peanut. Control volunteer plants.
Bacterial leaf blights	Most crops and pastures, serious in legume crops	Diseases survive in infected seed and plant material. Favoured by rainy weather. Use resistant varieties and crop rotation.
Viral diseases	Maize, peanut and most crops and pastures	Spread by sap-sucking insect vectors such as aphids, white fly and leafhoppers. Control insects and use virus-free seed.
Little leaf	Most legume crops and pastures	Spread by insect vectors such as aphids, white fly and leafhoppers. Control insects.
Rusts	Sorghum, maize, legume crops and pastures	Minor diseases at present. Controlled by crop rotation, cultural practices.
Powdery mildew	Mungbean & other crops	Minor but damaging to susceptible varieties in the dry season under irrigation.

APPENDIX 3 CONTINUED –  
COMMON AND SCIENTIFIC NAMES OF PLANT DISEASES

Grain Sorghum	
Grain mould	<i>Aspergillus flavus</i>
Assoc. head mould	<i>Fusarium</i> sp. <i>Penicillium</i> sp., <i>Curvularia</i> sp. <i>Drechslera</i> sp.
Leaf spot	<i>Bipolaris sorghicola</i> , <i>Drechslera</i> sp.
Tar spot	<i>Phyllachora sacchari</i>
Grey leaf spot	<i>Cercospora sorghi</i>
Upper stalk rot	<i>Fusarium moniliforme</i>
Charcoal rot	<i>Macrophomina phaseolina</i>
Bacterial leaf streak	<i>Xanthomonas campestris</i> pv. <i>holcicola</i>
Bacterial leaf spot/streak	<i>Pseudomonas</i> sp.
Rust	<i>Puccinia purpurea</i>
Red stripe	Johnson grass mosaic virus
Sesame	
Leaf spot (small)	<i>Cercospora sesami</i> ( <i>Mycosphaerella sesami</i> )
Pod/stem/leaf spot	<i>Corynespora cassiicola</i>
Ashy stem blight	<i>Macrophomina phaseolina</i>
Leaf spot (large)	<i>Pseudocercospora sesami</i> ( <i>Mycosphaerella sesamicola</i> )
Powdery mildew	<i>Oidium</i> sp.
Little leaf	Tomato big bud phytoplasma
Mungbean	
Leaf spot	<i>Cercospora cruenta</i>
Wet rot, blight	<i>Choanephora cucurbitarum</i>
Ashy stem blight	<i>Macrophomina phaseolina</i>
Damping-off, stem rot, base rot and leaf blight	<i>Rhizoctonia</i> sp., <i>Sclerotium rolfsii</i>
Powdery mildew	<i>Sphaerotheca fuliginea</i> ( <i>Oidium</i> sp.)
Bacterial leaf spot	<i>Xanthomonas campestris</i> pv. <i>phaseoli</i>
Little leaf	Tomato big bud phytoplasma
Zonate leaf spot	Undet. ( <i>Agonomycetales</i> )
Maldonado	
Blight, patch death	<i>Rhizoctonia solani</i>



Centrosema species	
Leaf spot	<i>Cercospora</i> spp.
Stem rot	<i>Macrophomina phaseolina</i>
Leaf blight	<i>Rhizoctonia solani</i>
Soybean	
Purple stain of seed	<i>Cercospora kikuchii</i>
Pod lesion, leaf spot	<i>Cercospora</i> sp.
Mould	<i>Choanephora cucurbitarum</i>
Flower blight	<i>Colletotrichum truncatum</i>
Seed rot	<i>Fusarium compactum</i>
Seed contaminant	<i>Fusarium proliferatum</i>
Ashy stem blight, pod and stem lesions	<i>Macrophomina phaseolina</i>
Rust	<i>Phakopsora pachyrhizi</i>
Bacterial wilt & blight	<i>Pseudomonas</i> spp.
Stem rot	<i>Pythium</i> sp., <i>Sclerotium rolfsii</i>
Bacterial pustule	<i>Xanthomonas campestris</i> pv. <i>glycine</i>
Little leaf	Tomato big bud phytoplasma
Peanut	
Kernel mould	<i>Aspergillus flavus</i>
Crown rot	<i>Aspergillus niger</i>
Early leaf spot	<i>Cercospora arachidicola</i>
Leaf spot	<i>Cercosporidium personatum</i>
Stem rot	<i>Macrophomina phaseolina</i>
Bacterial wilt	<i>Pseudomonas solanacearum</i>
Rust	<i>Puccinia arachidis</i>
Wilt	<i>Pythium myriotylum</i>
Stem rot	<i>Sclerotium rolfsii</i>
Maize	
Southern leaf blight	<i>Bipolaris maydis</i>
Grain mould	<i>Fusarium chlamydosporum</i>
Grain mould	<i>Fusarium proliferatum</i>
Java downy mildew	<i>Peronosclerospora maydis</i>
Tropical rust	<i>Puccinia polysora</i>



## APPENDIX 4 – SOILS OF THE NORTHERN TERRITORY

There have been different classification systems used in the Northern Territory and Australia to describe soils. The Great Soil Group classifications (such as red earths and yellow earths) were used along with a factual key (for example, gradational and duplex soils) from the 1970s through to the 1990s and old reports refer to these soil classes. Since 1996, however, all states and territories have adopted the Australian Soil Classification.

The Australian Soil Classification describes fourteen soil orders across Australia with further subdivision under these broad groups. Some of these have not been described in the NT. The major soil orders across the territory are listed below.

For further information on the Australian Soil Classification refer to the link below.  
<http://www.clw.csiro.au/aclep/asc/asc.htm>

### The Australian Soil Classification (Isbell 2002)

#### Common across the NT

##### Kandosols

Soils without structure (formerly red and brown earths). Widespread across the Top End, Sturt Plateau, Tenant Creek and southern regions of the NT.

##### Rudosols

Very shallow soils or those with minimal soil development. Includes very shallow rocky gravelly soils across rugged terrain such as the Arnhem Plateau to the formless sands of the Simpson Desert.

##### Tenosols

Weakly developed or sandy soils. Commonly shallow (slightly more developed than Rudosols), although they can include the deep sand dunes of beach ridges, granitic soils and deserts where they develop some small change at depth.

##### Hydrosols

Seasonally wet soils. Top End floodplains, swamps and drainage lines including mangrove and salt marsh environments.

##### Chromosols

Soils with an abrupt increase in clay content from the top soil to subsoil. Restricted to small occurrences across plains and relict alluvial plains.

##### Dermosols

Structured soils. Common across the Tindal area and Daly River Basin.

##### Calcarosols

Soils with calcium carbonate often formed on limestone. Restricted to small pockets in Central Australia, Victoria River District (including Gregory National Park) and Katherine and Mataranka Districts.

##### Ferrosols

Iron rich soils generally formed on basalt. Restricted to volcanic

landscapes of the Victoria River District and to a smaller extent in the Roper River Catchment.

##### Vertosols

Cracking clay soils which may or may not be poorly drained. Common across coastal floodplains of the Top End, the Barkly Tableland and alluvial plains of the Victoria River District.

#### Uncommon across the NT

##### Sodosols

Soils high in sodium with an abrupt increase in clay content from the top soil to subsoil. Dispersive. Restricted to small occurrences in the southern region.

##### Anthrosols

Soils resulting from human activities. Common in urban environments, industrial areas and mine sites.

##### Kurosols

Soils with an abrupt increase in clay content from the top soil to subsoil, strongly acid at depth.

##### Organosols

Soils with high organic matter. Restricted to very small occurrences in peat swamps of some Top End floodplains. One known occurrence is on the edge of a back swamp of the Finnis River.

##### Podosols

Soils with organic materials and aluminium with or without iron. Restricted to coastal heath areas along the Australian coastline.

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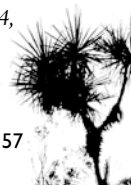
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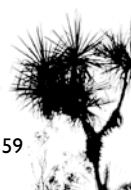
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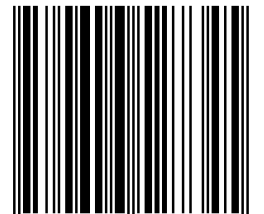


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