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Growing Peanuts in the Top End of the NT

(Arachis hypogaea. L)

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INTRODUCTION

Production of peanuts has been sporadic for many years in the Daly River basin, Katherine and Darwin districts. Peanuts will grow all year round. However, to maximise yields and to effectively manage the crop, there are specific planting windows for the wet and dry seasons. At present there is a lot of interest in the production of dry season peanuts. During the 2003 dry season three commercial growers produced approximately 1,700 tonnes of peanuts for Queensland.

During the 1950s and 1960s research concentrated on the early maturing Spanish peanuts that were grown on clay loam soils around Katherine. These varieties were specifically processed for oil.

Later DBIRD investigated the production of higher value confectionary peanuts on the lighter sandy loam soils at the Douglas Daly Research Farm (DDRF). Results suggest that between 3 to 4.75 tonnes per hectare of peanuts can be achieved if correct management techniques are practised.

Figure 1. An irrigated peanut crop in the Douglas Daly district

CLIMATIC REQUIREMENTS

Peanuts (*Arachis hypogaea*) are originally from South America, but are now grown in many tropical and sub-tropical areas. They prefer warm weather and cannot tolerate frost. The optimum temperature for their growth lies between 22°C to 30°C. If the temperature consistently exceeds this range, the plant tends to produce a large bush and low pod yields. This is often the case when peanuts are grown in the wet season. During cool spells (below 22°C) such as experienced in the dry season, the time to maturity is increased. The longer maturation period encourages more efficient transfer of plant resources to kernel production. Hence dry season peanuts tend to be higher yielding and have smaller sized bushes. On average it takes 120 days for a wet season crop and up to 180 days for a dry season crop to mature. Variety also affects time to maturity.

Although peanuts are relatively drought tolerant, the production of quality high yields requires at least 550 mm of rain during the growing season. Considerably more rain than this is usually necessary to ensure reliable yields and quality. A fully irrigated crop requires between 5.5 and 6.5 Mega L/ha (ML) of irrigation water (for crops planted in March/April).

Note: 1 ML = 1,000,000 litres = 100 mm/ha of irrigation.

SOILS

A critical operation in production is the efficient digging of peanuts. The physical characteristics of the soil, particularly the topsoil, are important factors when choosing a growing site. Soils with a loose and friable surface (to 15 cm depth), such as sandy levee or Blain sandy loams are favoured because they are easy to dig and also produce a clean, light-coloured shell. However both sandy and clay loam soils can also be considered. Each soil type will require specific management techniques to maximise sustainable production.

Figure 2. Emerging peanut seedling on a red sandy loam (Blain) soil

During hot periods, sandy and sandy loam soils can dry out quickly and may experience high surface soil temperature. High temperatures (>40°C) can cause problems during crop establishment. Seedling deaths occur from disease and moisture stress. Frequent irrigation is necessary to ensure that adequate moisture is available for the imbibing seed and seedlings. Mulch cover can also insulate seedlings from high temperatures. High temperatures at harvest may also increase the risk of high levels of aflatoxin. Aflatoxin is a fungus that, if conditions are right, will infect the kernel producing mycotoxins. High levels of toxins result in lower prices to the grower. The risk of aflatoxin is significantly reduced in the dry season.

Nutritional levels of Top End soils are inherently low. Trials at DDRF indicate that with the use of adequate fertiliser and mulch crops, soil fertility can be improved considerably.

LAND PREPARATION

Currently conventional tillage is the most common method of land preparation. The benefits of minimal tillage are well documented; however it will require further research to optimise peanut production. A modified minimum tillage technique has been used successfully on the clay loam soils in Katherine. This involved conducting all of the tillage prior to the wet season and managing mulch cover carefully throughout the monsoon period. Prior to planting, the mulch was controlled with glyphosate and seeds were planted directly into the dead mulch. This successfully reduced soil temperatures, conserved moisture and resulted in more viable seedlings compared with those in sandy soils prepared conventionally.

Alternatively, sandy soils may benefit from use of a “green manure” cover crop over the wet season. This is incorporated prior to the monsoon period to allow for breakdown of the large amount of organic matter produced. Final seedbed preparation can begin in late February provided the ground is well drained and trafficable. The incorporation of large amounts of mulch assists with soil structure, fertility and weed control over the wet season.

The two tillage techniques are converse to each other. It is impossible to incorporate bulky green manure crops and leave the planting bed with low levels of surface mulch suitable for planting as suggested in the minimum tillage technique. As farming systems develop it is likely a combination of sustainable tillage techniques will evolve.

Figure 3. Conventional ground preparation prior to planting peanuts

Planting on mounds or forming beds is a matter of choice. In some situations mounds are required for drainage purposes and to facilitate digging. In light soils this is less critical and may not be necessary.

In the initial year of cropping, it is important that the area be cleared of all sticks, stones and stumps. Such material will damage digging and threshing machinery and can cause delays in harvesting and reduction in yield. The land should be levelled to facilitate consistent depth control at digging. For these reasons, peanuts are not generally recommended in new paddocks.

PLANTING SPECIFICATIONS

A consistent and evenly established planting is the foundation for a successful crop. Attention to detail is extremely important during planting. This is achieved by minimising seed damage (handle seed like eggs). Planting depth should be at least 5 cm; ensure good seed to soil contact and adequate soil cover over the row. Adjust depth to suit moisture conditions; use irrigation (if available) to pre irrigate soil, ensure the soil is moist to 40 cm initially. If dry conditions are unavoidable plant deeper (up to 8 cm maximum). Seeds should be planted at between 12 and 18 seeds per metre. Plant at the high rate for irrigated situations and the lower rate for dryland farming. Established populations should be between 100,000 (dryland) and up to 160,000 (irrigated) plants per hectare. Standard row spacing is 90 cm. Row spacing can be as narrow as 75 cm; however most harvest machinery is designed for a 90 cm row spacing.

VARIETIES

There are several broad groups of peanuts depending on the type of growth of the plant. The two common growth types are a prostrate (often called a Runner) and a more erect plant (often called a Bunch or Virginia).

The industry is now focussing on the varieties sought by the market. The new varieties are selected for higher levels of oleic acids. This greatly enhances their shelf life and therefore their value. Many new varieties have become available and it is difficult to recommend a variety until some stability has occurred. Check with the DBIRD agronomist or the Peanut Company of Australia for suitable varieties for your area. Trials are being undertaken during 2002 to 2004 to determine the performance of the newer varieties.

INOCULATION

Peanuts are legumes and the rhizobia, which grow in nodules on their roots, can supply all the plants' nitrogen requirements. Legumes “fix” nitrogen, which is available for subsequent crops. To fix nitrogen successfully the seed requires inoculation. Annual inoculation is good insurance and is worthwhile for the minimal cost of inoculant. Inoculant is mixed in a peat medium. It is usually added to the seed in the planter box. It can also be mixed with water and sprayed into the furrow at planting.

PLANTER TYPE

Current experience suggests that a vacuum distribution mechanism is the most accurate seed metering mechanism, as it handles seed gently and provides accurate seed distribution within the row. Rotary cone and other seed delivery mechanisms often do not distribute seed uniformly and can damage seed.

TIME OF SOWING

There are three scenarios in which commercial peanuts would be grown:

1. Wet season crop non irrigated (rainfed)
2. Wet season supplementary irrigated
3. Dry season fully irrigated

Under rainfed growing conditions, the crop should be planted as soon as adequate soil moisture is available in early December. This planting date will ensure that the crop matures soon after the end of the wet season while the soil is still moist, soft and easy to dig. Peanut seedlings are quite hardy, if sown into adequate moisture. When seed is planted at the correct depth, seedlings can emerge and seedlings establish, even in the absence of good rains following planting. Whilst it is possible to grow a crop without irrigation the vagaries of the season determine the yield potential. Due to this, high yields and good quality peanuts are much harder to achieve when relying solely on rainfall.

If irrigation is available, planting and harvest time do not depend on rainfall. Planting from early December to mid January prior to the wet season is satisfactory. Irrigation can ensure optimum conditions for planting and harvest.

In the dry season the recommended planting date is as soon as practical after the end of the wet season. This usually ranges from late February to late March. Adjust planting dates to avoid heavy rain. Planting beyond early April usually results in lower yield potential.

FERTILISER

To establish a fertiliser program a recent (less than three months) soil sample is required. Fertiliser programs take into account many site factors, such as paddock history, soil profile and availability of irrigation as well as a soil test. Advice from a local agronomist should be sought to help determine the nutrient requirements of a particular site.

Some fertilisers, such as gypsum, contain more than one essential nutrient, such as sulphur and calcium. All fertiliser suppliers should be able to forward an analysis of their products to aid with calculation of crop fertiliser requirements. It is important to take into account the additional nutrients present in fertilisers.

Due to the growth and nutrient uptake characteristics of peanut roots, broadcasting and incorporating macro nutrients some weeks before planting is preferable to banding at planting. If the soil test is extremely low or if it is a virgin site a pre-mixed fertiliser such as Sulcote Di Ammonium Phosphate (DAP) with trace elements can be banded at planting in small amounts (50 kg/ha). This will help seedlings develop an initial root system and seek the broadcast fertiliser.

The developing and filling peanut pod draws large quantities of calcium (Ca) directly from the soil. This Ca must be supplied in a soluble form to the area where pods are developing to ensure a high quality yield. Gypsum ($CaSO_4$) must be top-dressed over the rows at early flowering, 35 days after planting at the rate of at least 500 kg/ha. Virginia type cultivars require more Ca than runner type cultivars. The use of local dolomite to supply magnesium and some of the Ca requirements can also be considered. Lime is relatively insoluble in alkaline soils. As alkaline soils are common in the Katherine/Daly basin, it is usually not recommended as a substitute for gypsum.

Table 1. Suggested levels of macronutrients required for two common soil types

Nutrient	**Sandy soil, kg/ha of nutrient required**	**Clay loam soil, kg/ha of nutrient required**	**Fertiliser options to supply nutrient**
Phosphorous (P)	50	40	Super phosphate (single, double, triple). Custom blends available with K.
Potassium (K)	60	40	Muriate of Potash. Potassium sulphate. Custom blends available with P.
Sulphur (S)	40	10	S is supplied by single super, gypsum and other sulphated compounds. Unless S levels are very low (less than 1 mg/kg) these products should provide adequate levels of S.
Calcium (Ca)	150	50	Gypsum. Dolomite.
Magnesium (Mg)	7.5	1	High rates (>2 kg) use Granomag. Low rates (<2 kg) use Magnesium sulphate. If dolomite is used for Ca then additional Mg fertiliser will not be required.

Micro nutrients such as zinc (Zn), copper (Cu) and molybdenum (Mo) are usually in short supply for optimum crop growth in most Top End soils. Several products can supply these nutrients. One option is to incorporate super phosphate, Zn, Cu and Mo as a pre-mixed fertiliser. Blended fertilisers need less handling; however they can often be more expensive per tonne than when applying these nutrients separately.

Table 2. Suggested levels of micronutrients required for two common soil types

Nutrient	Sandy soil, kg/ha of nutrient required	Clay loam soil, kg/ha of nutrient required	Fertiliser options to supply nutrient
Zinc	4	0.5	Zinc mono hydrate (not suited to foliar application). Zinc Chelate. Zinc hepta hydrate.
Copper	4	0.5	Copper sulphate. Copper chelate.
Manganese	1	Not usually required	Manganese sulphate. Manganese chelate.
Molybdenum	0.3	Not usually required	Sodium molybdate.
Boron	1	0.3	Solubor.
Iron	1	Not usually required	Iron sulphate. Iron chelate.

Note: Tables 1 and 2 are only intended as a generic guide. Professional advice and a recent soil test are necessary prerequisites for a fertiliser program. Allowances will have to be made for varying percentages of nutrients in fertiliser options.

Micronutrients can also be applied as foliar sprays (sulphate or chelate) or applied through irrigation water (fertigation). Other micronutrients such as iron (Fe) or manganese (Mn) could also be lacking in sandy soils. A soil test will determine if they are required.

CALCULATION OF FERTILISER REQUIREMENTS

Example

For a sandy soil with low levels of K it has been calculated that 60 kg/ha of K will be required for this soil. Muriate of potash has been chosen as the desired fertiliser to supply K to the crop in this example.

- K content in the purchased muriate of potash is 45% K.
- Total K required is 60 kg/ha.

Formula

$$\frac{\text{Total amount of nutrient required}}{(\text{Percentage of nutrient in product} \div 100)}$$

In our example

$$\frac{60}{45/100} = \frac{60}{45} \times 100$$

$60 \div 0.45 = 133$ kg/ha of Muriate of potash which will supply 60 kg of K/ha.

WEED IDENTIFICATION AND CONTROL

See " Weed control in peanuts in the Top End of the NT" Agnote number C 10.

DISEASE IDENTIFICATION

See "Common diseases of peanuts in the Top End of the NT" Agnote number I62.

CROP WATER USE AND IRRIGATION

Peanuts are often referred to as drought tolerant. To obtain a high yielding economically viable crop, irrigation management is critical. Excess water can be as damaging as too little water. While total wet season rainfall is usually more than adequate, its distribution can be variable and dry spells can occur at any time. Irrigation is the only means of avoiding water stress during these periods. The optimum irrigation strategy will depend on seasonal and soil conditions and the stage of crop growth.

Observations to date suggest that during dry periods, about 35 to 40 mm should be applied every seven days while the plant is at peak growth. Irrigation amount and frequency will vary according to the season, time of planting, crop phase and soil type and irrigation system design. A moisture-monitoring device will greatly assist decision making during the season. Specific advice on irrigation management and moisture monitoring can be obtained from DBIRD agronomists.

Figure 4. Irrigating peanuts using a centre pivot irrigation system

OUTLINE OF PEANUT IRRIGATION REQUIREMENTS

a) Establishment and seedling phase

Peanut seeds and seedlings are tolerant of low soil moisture; however, establishment and early growth will be improved by adequate soil moisture. Water stress also renders the seedlings more susceptible to attack by fungi such as *Aspergillus niger*. Very high temperatures and water stress can result in high seedling losses (up to 60%). Once the seedlings are established irrigation should not be excessively applied. This will force the plants to develop an extensive root system. Short water stresses during this period are usually not detrimental to production.

b) Flowering

Once flowering has begun irrigation is most important. Many studies have shown significantly reduced yields if the plants are stressed after flowering. Adequate soil moisture during the flowering period (40 to 80 days after planting) ensures prolific flowering and pod set.

c) Pod-filling to maturity

During pod fill and right up to harvest the plants should not be stressed at any stage. Water stressed plants are subject to attack by *M. phaseolina* or *A niger*, while drying of the top soil during this period can encourage *A. flavus* infection of pods. Refer to Agnote N° I62 “Common diseases of peanuts in the Top End of the NT” for more information on these diseases.

d) Pre harvest

Efficient pod recovery is dependent on healthy plants with strong pegs from moist, friable soil. Harvesting water stressed plants from dry soil results in poor pod recovery, and has often been the cause of poor yields in peanut crops in the NT. Therefore, prior rainfall or irrigation is essential to ensure efficient digging of peanuts.

e) Post harvest

Harvest should be timed to avoid any sort of rainfall whilst the plants are being dug and threshed.

HARVESTING

a) Crop maturity: When to dig?

The peanut is an “indeterminate” plant. This means that the flowering and fruiting of the crop occur over a long period of time. Flowering is not closely correlated with environmental triggers such as day length. Therefore the assessment of maturity can be difficult. Determination of maturity is critical in the harvesting process and requires close observation by the grower. The current method employed is to hand dig and shell a sample of peanuts (about 300 pods) and observe the darkening of the inside of the shell. When at least 60-75% (depending on the cultivar) of the pods are a dark brown inside the shell, the crop is ready to dig. Advice from DBIRD should be sought if further information on maturity assessment is required.

b) The harvesting operation

Harvesting is a critical operation and significant yield losses result from inefficient harvesting. The proper operation is as follows:

A digger/inverter is used to dig, shake and expose the nuts to the air by inverting the bush. Firstly, a blade is driven horizontally through the ground at constant depth, about 10 cm, to cut the taproot below the nuts and to loosen the topsoil and nuts. Accurate depth control is essential. The cutting blades (one per row) are either mid-mounted or 'sprung' for stumps, or mounted in front of the invertor on the three-point linkage. Usually two planted rows will be dug and windrowed to form one inverted row for the thresher. Because harvesting is a slow process and the timing of digging and threshing is critical, a grower must ensure that the planted area is matched to the capacity of the harvest machinery and labour.

Figure 5. Digging peanuts with a digger inverter

The inverted plants are then 'cured' in the sun until they reach suitable moisture for threshing. This drying process takes two to four days, depending on ambient temperature, humidity and air movement. It is essential that the plants do not get too dry before threshing or the pegs will become brittle and nuts will fall off before entry into the thresher. Kernels will split if the moisture is low and will decrease the price considerably. Optimum moisture content at this phase of the harvest is between 14 and 20%. Modern threshers can thresh plants at around 20 to 30% moisture content. The threshing process usually begins two to four days after digging and separates the nuts from the plants. At this stage the nuts are called a “wet, dirty” sample. The sample is then pre cleaned and dried if necessary.

Pre cleaning is strongly recommended before drying in the silos. Some producers also pre-clean a second time after drying. As well as aiding the drying process, pre cleaning reduces the levels of foreign objects, dirt and immature pods; decreases freight costs and increases final price per tonne.

Post harvest drying is recommended. This is usually done in silos or drying bins. Drying time varies according to the humidity and temperature experienced at the time. Adjust wind volume so it does not remove more than 0.5% moisture per hour. Additional heat is not usually required in the NT. Dry down to approximately 13-14% moisture (nut and shell moisture combined). This will ensure good shelling characteristics and quality of the final product. On average 1 to 2% moisture will be lost during transport to Queensland.

Field storage may be necessary. If so, the storage area should be water proof, vermin proof and preferably with good ventilation control. Quantity of storage, speed of delivery from the paddock and efficient pre cleaning and drying determine the speed at which the harvesting process can progress. All of these steps are critical to achieving the highest quality peanuts possible.

Figure 6. Loading peanuts for delivery to Kingaroy

MARKETING

There is a very strong demand for peanuts. Australian growers supply a fraction of the local domestic peanut market. A crop contract is usually obtained from the sheller when ordering seed at the beginning of the season. Prices are relatively stable and are predetermined pending quality assessment on delivery. There are no shellers/processors in the NT. Hence all produce is freighted to Queensland for shelling and processing.

CONTACT INFORMATION

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WARNING

Legal restrictions in the NT prohibit the feeding of any foliage (leaves, stems) from the peanut crop including the use of grazing, hay and residues to feed livestock if chlorothalonil has been applied as a fungicide against leaf diseases at any point during the growing season (read the label on the fungicide packet).

Please visit us at our website:

www.nt.gov.au/dpifm

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