## Comparative Advantages / Disadvantages of Rotation Crops With Cotton (in relation to the following cotton crop)





|  | COTTON SUMMED OU SEEDS   |   |   | SUMMER COARSE (   | GPAINS   | CHAMED CDAIN I FOUNCE  |  | WINTED DITL SES   |   | GREEN MANURES  |   | PERENNIAL LEGUME WINTER OILSEEDS  |  |   | WINTER CEREALS  | RADE  |  |
|--|--|---|---|---|--|--|--|---|---|--|---|---|--|---|---|---|--|
|  | COTTON   | SUMMER OILSEEDS Sunflowers  | Soybeans  | Maize   | Sorghum  | SUMMER GRAIN LEC   | Pigeon Peas  | WINTER PULSES Chickpeas   | Faba Beans  | Dolichos Lablab  | Vetch   | Lucerne   | WINTER OILSEEDS Canola   | Safflower   | Wheat/Barley/   | BARE Long Fallow  |  |
|  | Slow breakdown, very slow cycle  | Good cash crop.   | Stubble breaks down quickly.  | Good stubble cover.   | Long planting window.  | Stubble breaks down easily.     Good short - term cash crop.   | Has role in cotton IPM as trap   | Has role in cotton IPM as trap  | Stubble breaks down quickly.  | Stubble breaks down easily.  | Has a role in IPM.  | Efficient N fixer.  | Rarely if ever used as rotation crop with cotton.  | Low input crop.   | Triticale/Oats  • Easy to grow cash crop. • Solving time more cligated with   | Can make cotton management  |  |
| General Overview   | of organic carbon. • Highly VAM dependent.   | <ul><li>Poor stubble cover.</li><li>Specialised harvest equipment.</li><li>Can aggravate cotton insect pests.</li></ul> | <ul><li>Good gross margins.</li><li>N - fixing legume.</li></ul>  | <ul><li>Need corn front to harvest.</li><li>Can aggravate cotton insect pests</li></ul>   | <ul><li> Has a role in IPM.</li><li> Stubble can be a problem.</li></ul>   | Chart access 00 days requires  | crop. • Stubble breaks down quickly.   | <ul><li>crop.</li><li>Good cash crop.</li><li>Stubble breaks down quickly.</li></ul>  | <ul><li>Good cash crop.</li><li>Good N fixer.</li></ul>   | <ul> <li>Does not aggravate cotton insect pests.</li> <li>Good N fixation.</li> </ul>                                    | <ul><li>Reduces N fertiliser for cotton.</li><li>Reduces Black Root Rot.</li></ul>                                  | <ul><li>Improves soil structure.</li><li>Harbours beneficial insects.</li></ul>   | Good cash crop.     Improve soil structure.  | <ul> <li>Improves soil structure.</li> <li>Can aggravate insect pests,<br/>particularly mirids/mites.</li> </ul>  | Sowing time more aligned with cotton harvest.     Excellent cotton disease break  | more timely and easier .  • Weed control is critical.   | General Overview   |
|  | Cotton herbicides in failed cotton<br>drastically reduce crop options.   | Can aggravate weed management.  | Can aggravate weed management.  | <ul> <li>Potential plant — back problem with atrazine.</li> </ul>   | <ul> <li>Potential plant — back problems<br/>with atrazine.</li> </ul>   | <ul><li>Can aggravate cotton insect pests</li><li>Highly sensitive to waterlogging.</li></ul>  | Difficult to establish in Southern<br>NSW.   | Foliar disease management critical.   | Can aggravate sowthistle problems.  | Destroy crop before flower/seed set.   | <ul><li>Increase in cotton yield.</li><li>Avoid seed set.</li></ul>   | Field out of production for many<br>months. Long - term option.   | Allelopathic effect on cotton immediately following canola.  | Can aggravate sowthistle problems.  | - exception Fusarium.   | <ul><li>Can reduce VAM levels.</li><li>Potential soil erosion.</li></ul>  |  |
|  |  | Spring and summer planting  |   |   | Spring and summer planting   | Spring and summer planting   | Spring and summer planting windows.  | Plant in late autumn  early winter, according to local  |   | Spring planting window maximises   | Plant from mid - February to late     April. With adequate soil moisture     earlier plantings produce more         | Autumn and spring planting opportunities.   | NSW planting windows start in  | Planting windows extend from  | Very wide planting windows can<br>be achieved by growing a range of   |   |  |
|  | Narrow spring planting window for<br>Bollgard II® cotton.  | windows. Late plantings are preferred for polyunsaturated   | Early summer planting window for best results.  | windows.  | windows.  • Days to flowering depend on  | windows. Suited to double cropping situations.   | • Flowering occurs 60–80 days after emergence.   | recommendations.  • Early planting may lead to  | Short autumn planting windows,<br>check local recommendations.  | vegetative growth. Use a longer season variety to maximise the   | biomass. Best results after wheat, but with timely operations can be  | Best crop growth will occur.     between late spring and early     autumn. Varieties can be highly  | mid - late April and close in mid - late May, depending on region.   | mid June to mid August.  • Day length and temperature determine time to flowering. Later  | varieties.  • Adaptable row configurations to allow inter - sowing of the next  | Not applicable.   | Dianting Overvious   |
|  | <ul> <li>Following legumes increase<br/>sowing rates by 10% to ensure<br/>adequate plant populations.</li> </ul> | hybrids.  • When selecting fields consider  | <ul><li>Seed is short lived.</li><li>Germination and vigor are lost<br/>after only a few months in storage.</li></ul>   | In NSW under irrigation, medium<br>maturity hybrids usually perform<br>best.  | hybrid maturity but will be less with later plantings in warmer  | <ul> <li>Fewer days to flowering with later<br/>plantings in warmer temperatures.</li> <li>Powdery mildew - check varietal</li> </ul>  | Harvest own seed, seed difficult to get.   | excessive vegetative growth and lodging. Late planting reduces harvest height.  | of flowering (yield potential) and the harvest height.  | days to flowering.  • Well suited to double cropping   | grown between cotton crops.  • Low temperatures restrict winter   | winter — active through to winter dormant.  | <ul> <li>Varietal frost / heat risk.</li> <li>Consider using rollers,<br/>cultipackers or press wheels to</li> </ul> | planted crops mature faster.  Requires very good seed - soil  | crop.  • Follow variety specific  | чиот аррисавте.   | Planting Overview  |
|  |  | bird risks.   |   |   | temperatures.  | resistance.  | Use narrow row spacings to<br>maximise grain yield.  | Suited to double crop situations.   |   | after wheat.   | <ul><li>growth.</li><li>Avoid deep planting as seedlings are weak.</li></ul>  | Strip planting maximises attractiveness to insects.   | improve seed - soil contact.   | contact.  | recommendations to minimise frost risk and maximise yield.  |   |  |
| Planting Temperature   | • 14°C and rising for 3 consecutive days.  | • 10–12°C and rising when heavy frosts have past.   | Does not influence the start of the planting window.  |   | • 16–18°C for 3–4 days and the risk  | • Emergence occurs >10.5°C, but 28–30°C is ideal for crop growth.  | • 18°C and rising. Plant refuge crops within 2 weeks of planting   | Does not influence the start of the   | 2000 1101 11111001100 1110 01011 01 1110  | • 18°C on 3 consecutive days and   | ,   | Autumn, plant for crop<br>establishment before frosts.  | Does not influence the start of<br>the planting window, but late   | Does not influence the start of the planting window.  Front to locate the start of the planting window.  Front to locate the start of the planting window.  Front to locate the start of the planting window. | (pats, grazing varieties), Does   | Not applicable.   | Planting Temperature   |
| (planting depth at 8-9am)  | Slow breakdown, very slow cycle  | Poor ground cover & residual  | planting window.  | 3–4°C drop if watering up.  | of frost has past.      Moderate ground cover for long.  | 28–30°C is ideal for crop growth.  | Bollgard II® cotton.   | planting window.  | planting window.  | rising.  | 23–15°C.  | Spring plant when frost risk<br>passed into good soil moisture.   | planting into cold soils can reduce emergence.   | elongation commences.   | season planting window.   |   | (planting depth at 8–9am)  |
|  | of organic carbon.  • Implications for disease   | organic matter.  • Stalks require flattening or busting   | Stems may be ropey causing<br>problems at harvest and with land   | Good ground cover for short fallows.  | fallows.  • Breaks down more quickly than  | Poor stubble cover.  | Poor stubble cover.  | Poor stubble cover.   | Poor stubble cover.   | Spray out and slash at the start of<br>podding (usually March/April).  | • Can be slashed and incorporated (disced) when green or sprayed,   | Herbicides and deep tillage<br>required for crop removal.   | <ul><li>Easy to sow through.</li><li>Plant in narrow row spacing to</li></ul>  | Poor stubble cover and quick  | Breaks down slowly for slow<br>release of carbon.     Relatively easy to plant into.  | When standing stubble, offers<br>high ground cover, it will protect<br>the soil surface and maximize the                    |  |
| Stubble Management*  | management — prevent regrowth.  Insufficient breakdown in dry winters.   | to aid break down — beware of compaction risks when undertaking these operations.                                       | <ul><li>preparation for cotton.</li><li>Quick break down means stubble is not suitable for long fallow</li></ul>        | Breaks down more easily than sorghum.   | cereals but difficult to incorporate for quicker breakdown.  | Quick break down means stubble<br>is not suitable for long fallow<br>situations.   | Gappy plant stands can lead to<br>woody stems that can be difficult<br>to incorporate.   | <ul> <li>Quick break down means stubble<br/>is not suitable for long fallow<br/>situations.</li> </ul>                      | Quick break down means stubble<br>is not suitable for long fallow<br>situations.                                      | Stubble mulch in contact with the soil breaks down quickly.  | root cut and left on the surface.  • Manure at least 4 weeks before cotton planting.                                | <ul> <li>When stands &gt;12 months old are<br/>removed, a long fallow or irrigation<br/>will be required to refill the profile</li> </ul> | ensure stubble is brittle.     Poor stubble cover and quick  | break down means stubble is not suitable for long fallow situations.  | Bale to handle heavy stubble.   |   | Stubble Management*  |
|  | Cover can be lost in heavy storms.   | When left standing or as stumps<br>damage to equipment such as<br>tyres can occur.                                      | situations.   | High in nutrients; 11 kg N, 14 kg P, 166 kg K /tonne.   | <ul> <li>Late incorporation in conjunction<br/>with a dry winter is known to be<br/>allelopathic to emerging cotton.</li> </ul>  | situations.  | to incorporate.  | Situations.   | situations.   |  | cotton planting.  | Minimal groundcover.  | break down means stubble is not suitable for long fallow situations.   |   | <ul> <li>Excessive trash at planting can<br/>cause variable plant stands.</li> </ul>  | critical, stubble mulch will increase the rate of stubble breakdown.  |  |
| Standing Stubble   | Need to cut below cotyledon node to prevent regrowth.  | • Exacerbates cotton diseases.  | Exacerbates cotton seedling     diseases  | Narrow rows allow inter — planting of cotton.   | Twin rows or narrow rows allow<br>inter - planting of cotton.  | May exacerbate cotton diseases.  | May exacerbate cotton diseases.  | May exacerbate cotton diseases if double cropped.   | May exacerbates cotton diseases if double cropped.  | May exacerbate cotton diseases.  | May exacerbate cotton diseases.   | May exacerbate cotton diseases.   | Beware of allelopathy to cotton in<br>double crop situations .   | Well suited to no - till situations.  | Very well suited to no - till situations.   | Highly desirable for most stubble<br>types, particularly early in the   | Standing Stubble   |
| _  | Estation (ogiowa).   |   |   | p.m.n.g or oottori.   | planting of outfoll.   |  |  | Shallow rooted.   |   |  | Deep rooted.     Reduces soil strength.   |   |  | Very deep and aggressive tap  | Refer Cotton CRC note      Higher root density than grain   | fallow period.  • Potential for erosion.  |  |
| SOII STRIICTURA  | Deep rooted.      Will dry and graph sail.   | Very deep rooted, can make use of nutrients at depth.      Has a 'conditioning' effect.                                 | Improves soil structure.     More frights topped.   | Deep rooted.     Can increase sell organic metter.  | Deep rooted.     Soil can be hard to till.   | Shallow rooted.     Do not penetrate compacted   | Deep rooted.     Has a 'conditioning' effect.  | <ul><li>Snallow rooted.</li><li>Leaves behind moisture lower in<br/>the profile for use by the following</li></ul>          | Moderate rooting depth.     Has a 'conditioning' effect.  | Moderate rooting depth.  | • Can increase soil organic matter  | Soil structure improved to depth.   | Will dry soil profile.     Improves soil structure.  | root.  • May penetrate hard layers.  • Causes does grapking   | legumes.  • Will dry soil profile causing deep cracking.  | No improvement in soil structure  | Soil Structure   |
|  |  | <ul><li> Has a 'conditioning' effect.</li><li> Can bust compacted layers.</li></ul>                                     | More friable topsoil.   | Can increase soil organic matter.   | Soil can be hard to till.  | layers.  |  | crop.   | Poor root penetration into sodic soil:  |  | setting soils.  |   | More friable top soil.   | <ul> <li>Causes deep cracking.</li> <li>Surface tilth blocky and inferior to<br/>wheat.</li> </ul>  | Improves soil structure   | root activity). • Reduce soil O.M.  |  |
|  | Yields decline when soil salinity<br>is 6–10 dS/m or water salinity is   | Yields decline when soil salinity   | Yields decline when soil salinity   | • Yields decline when soil salinity is  | s • Rapid yield decline when soil  | Violate de Personal de la Companya d | Sensitive to sodicity  | Yield declines when soil chloride<br>is > 600 mg/kg or soil sodium is   | Yield declines when; soil chloride  | Sensitive to Sodicity  | • Yield declines when soil FCe >3.0   | Yield declines when soil ESP at   | Yield declines when soil chloride  | Considered to have similar  | Barley yield declines when soil   |   | Reactions to colinity  |
| Reactions to salinity (ECe) and/or sodicity  | >2.3 dS/m.   | exceeds 4–5 dS/m.  • More tolerant than sorghum.  | exceeds 2.0 dS/m. • Relatively low tolerance.   | >2.5 dS/m or water salinity is >1.1 dS/m. • Relatively low tolerance.   | salinity increases from 2–5 dS/m. • Less tolerant than wheat.  | <ul> <li>Yields decline when soil ECe is</li> <li>&gt;2dS/m.</li> </ul>  | (waterlogging). • Sensitive to salinity.   | >500 mg/kg or soil ESP at the surface is >1 or in the subsoil is  | >500 mg/kg or soil ESP at the surface is >5 or in the subsoil is  | (waterlogging).  • Moderately sensitive to salinity.   | dS/m. Yield declines at the rate of   | 0 6 1 0 1 0 1 0   | is >1200 mg/kg or soil ESP at the surface is >3 or in the subsoil is >6.   | tolerances to cotton. In the US, yields decline when soil ECe >9 dS/m.  | chloride is >800 mg/kg, bread<br>wheat at >700 mg/kg and durum<br>wheat at >600 mg/kg.  | May assist in leaching salts.   | Reactions to salinity (ECe) and/or sodicity                                  |
|  | Seedling sensitivity 2–3 dS/m.      IRMS assists chemical selection  and above add big-                          |   |   | Bollgard II® refuge crop option.  |  |  |  | <b>20.</b>  | >10 or soil ECe >1.6 dS/m.  |  |   | Supports strong populations of  | Supports strong populations of   |   |   |   |  |
| Insects  | <ul> <li>and stewardship*.</li> <li>Aggravate Helicoverpa spp.</li> <li>High cost of insect control.</li> </ul>  | Supports strong populations of  | <ul> <li>Supports strong populations of<br/>generalist insect predators.</li> <li>Host for Helicoverpa spp.,</li> </ul> | Supports strong populations of generalist insect predators.   | Bollgard II® refuge crop option.     Supports strong populations of  | <ul> <li>Supports strong populations of<br/>generalist insect predators.</li> <li>Host for mirids, Helicoverpa spp.</li> </ul>   | Bollgard II® refuge crop option.     Bollgard II® trap crop in Central   |   | Supports strong populations of<br>generalist insect predators through   | Supports strong populations of<br>generalist insect predators.   | Supports strong populations of  | generalist insect predators.  • Trap crop for mirids.   | general insect predators and aphic parasitoids.  | Supports strong populations of general insect predators.     Host for cutworm, <i>Helicoverpa</i>   | Supports strong populations of<br>general insect predators.   | Stubble retention and no - till   | Insects  |
| (Insecticide options are limited for crops other than                                | Control volunteers to prevent carryover of pests from one  | general insect predators.  • Host for <i>Helicoverpa</i> spp., mirids, whiteflies.                                      | mites, green vegetable bug and whiteflies.  | <ul> <li>Host for H. armigera and spider<br/>mites. Early crops can increase<br/>risk of cutworms. Late crops can</li> </ul>            | generalist insect predators.  • Host for <i>H. armigera</i> . Late crops can increase risk of wireworms  | and green vegetable bug.  Insect damage is a key   | Queensland.  • Highly attractive to <i>Helicoverpa</i> spp. during flowering.  | <ul> <li>Highly attractive to <i>Helicoverpa</i> spp. during flowering.</li> <li>Generally unattractive to</li> </ul>       | winter and early spring.  • Host for cowpea aphid and   | Host for cutworm, wireworm,<br>cowpea aphid, mirids, green<br>vegetable bug, thrips and                                  | generalist insect predators.  • Host for <i>Helicoverpa</i> spp.  | Late season trap crop for<br>Helicoverpa spp. — larvae fail to<br>emerge from it.   | Host for aphids and <i>Helicoverpa</i> spp Occasionally attacked by wireworms.                                       | spp. (especially during budding/<br>flowering), aphids, mirids and  | <ul><li> Host for wireworms and thrips.</li><li> Provides overwintering shelter for</li></ul>   | help to retain populations of ants<br>foraging weed seeds, spiders and<br>other soil dwelling beneficials.                  | (Insecticide options are limited for crops other than                        |
| cotton)  | season to the next.  • Pupae bust Bollgard II® as required in the RMP.   |   | Extremely susceptible to attack from whiteflies.  | increase risk of wireworms next spring.   | and the second s | contributor to grain quality downgrades.   | Host for mites.  | beneficial spp.   | Helicoverpa spp.  | Helicoverpa spp.   |   | Hay making controls mites, aphids and mirid nymphs.   | Can aggravate: mites, mirids, aphids, rutherglen bug.  | mites.  • Aggravate: thrips, rutherglen bug.  | green vegetable bugs.   | 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3   | cotton)  |
| Weeds/Herbicides   | Roundup Ready Flex® and Liberty Link® cottons are  | Select fields with low incidence of   |   | Combination of herbicides and   | Combination of herbicides and  | Poor competitor with weeds. Select fields with low broadleaf   | A range of herbicides can be use   | Poor competitor with weeds.  Select fields with low weed burdens.   | Vigorous seedling growth  | Highly competitive once established.   | When planted late, weeds are controlled with manuring.  | Once established is very competitive.   | Vigorous seedling growth<br>provides excellent weed  | Mar   |   | Diam III T  |  |
| Observe plant back periods for herbicides.   | alternative options for weed control.  |   | Once established, the crop competes well with weeds.  | crop competition tends to reduce weed burdens.  Opportunity to use alternative  | crop competition tends to reduce weed burdens.  • Opportunity to use alternative   | weed burdens as herbicide  | under Off Label Permits.<br>www.apvma.gov.au.  | <ul> <li>Limited herbicide options for<br/>broadleaf weed control. Balance®</li> </ul>                                      | provides excellent weed competition.  • Select fields with low broadleaf  | Higher WUE than lucerne.     Select fields with low weed   | Timeliness of manuring prevents<br>vetch volunteers becoming  | Aids nutgrass control through drying soil profile.  | competition.  • Conventional canola has limited  | <ul> <li>Narrow row spacings assist with<br/>weed suppression (and maximize<br/>yield potential).</li> </ul>  | Wide range of herbicide options<br>for broadleaf and grass weed   | Planned long fallows may allow<br>use of some residual herbicides.     Uncontrolled wheel traffic may                       | Weeds/Herbicides   |
| Use integrated weed management   | •Specific management tactics may be required for cotton volunteers.  | planting but limited options in crop.  Consider how to control  Valuators in follow and                                 | Consider how to control<br>volunteers in fallow and     Subsequent cotton crops   | Modes of Action (not Group M or Group A) for grass weed control.  |  | Low tolerance of Group B, Group<br>C and Group I residues.      Average and late as a fairing.   | Use inter - row cultivation to<br>assist weed control.     Slow coodling growth means not                                      | is only for use post plant, pre crop<br>emergence. Balance® may reduce  | weed burdens as herbicide options are limited.  | burdens as herbicide options<br>are very limited — trifluralin and   | problematic.  • In early plant situations, select   | Herbicides are available but<br>products for broadleaf weeds can  | options for broad leaf herbicides use.   | Late broad leaf weeds can be a problem, particularly sowthistle.  | control.  Consider carefully when using residual herbicides.  | 1   | (Observe plant back periods for  |
| strategies to reduce risks of resistance and shift to dominance of tolerant species. | <ul> <li>Residual cotton herbicides in<br/>failed cotton drastically reduce<br/>crop options.</li> </ul>         | volunteers in fallow and subsequent cotton crops.   | subsequent cotton crops.  | Limit atrazine rates to avoid plant back problems.  | Limit atrazine rates to avoid plant back problems.   | <ul> <li>Mungbean seed lots containing<br/>weed seeds can be difficult to sell,<br/>incurring substantial discounts.</li> </ul>  | Slow seedling growth means poor early competitor with weeds.   | <ul> <li>N fixation in some situations.</li> <li>Low tolerance of Group B, Group C and Group I residues.</li> </ul>         | • 1 m row spacings allow shielded spraying/inter - row cultivation.   | Spinnaker® (APVMA Permit no. 9885).  | burdens as herbicide options are limited.   | <ul> <li>Difficult to control lucerne ratoons/<br/>volunteers in cotton.</li> </ul>   | Herbicide tolerant varieties are<br>available but beware of long plant<br>backs to cotton.                           | Limited herbicide registrations.  | residual herbicides.  | cotton regrowth and volunteers.   | herbicides)  |
|  | Upland varieties are resistant.  | • Decrease.   | • Decrease.   | Decrease.   | • Decrease.  | • Decrease.  | • Decrease.  | • Decrease.   | • Decrease.   | • Decrease.  | • Decrease.   | • Decrease.   | • Decrease.  | Decrease.   | • Decrease.   | Decrease if cotton residue incorporated.  | Bacterial Blight   |
|  | prevent build up.  Risk is related to variety V rank.  |   |   |   |  |  |  |   |   |  |   |   |  |   |   | incorporateu.   |  |
| Verticillium Wilt  | reduces carryover.   | <ul><li>May decrease with resistant<br/>sunflower varieties.</li><li>Most hybrids resistant.</li></ul>                  | May increase — listed as a host in USA and in Queensland.   | Decrease.   | • Decrease.  | Decrease — not listed as host.   | Decrease — not listed as host.   | Decrease — not listed as host.  | Decrease — not listed as host.  | Decrease — not listed as host.   | Decrease — not listed as host.  | May Increase — Listed as a host<br>in USA and isolated from roots in  NSW   | Decrease - not listed as host.   | May increase — listed as host in QLD.   | Decrease — not listed as host.  | Decrease in weed free fallows<br>(many weeds are hosts).  | Verticillium Wilt  |
| Seedling Disease   | are at higher risk.  • Survive in crop residues —  | Most hybrids resistant.      Decrease.  | Survive in crop residues —  | Decrease.   | • Decrease.  | Survives in crop residues.   | Survives in crop residues.   | Survives in crop residues. Incorpo-   | - Survives in crop residues.  | Survives in crop residues.   | Survives in crop residues.  | May increase unless crop  | • Decrease.  | • Decrease.   | • Decrease.   | Decrease if cotton residue  | Seedling Disease   |
| Phytophthora Boll Rot  | Incorporate early to minimise risk.  • Early incorporation of crop   | Decrease — not listed as host.  | Incorporate early to minimise risk.  • Decrease — not listed as host.   |   | Decrease — not listed as a host.   | Incorporate early to minimise risk.      Decrease — not listed as host.  | Incorporate early to minimise risk.     Decrease — not listed as host.   | rate early to minimise risk.      Decrease — not listed as host.  | Incorporate early to minimise risk.  • Decrease — not listed as host.   | Incorporate early to minimise risk.  • Decrease — not listed as host.  | Incorporate early to minimise risk.      Decrease — not listed as host.   | May increase — listed as a host   | Decrease — not listed as host.   | May increase — listed as a host   | Decrease — not listed as host.  | • Decrease if cotton residue  | Phytophthora Boll Rot  |
| Alternaria Leaf Spot   | residues may reduce carryover.     Early incorporation of crop   | Decrease.   | Decrease.   | Decrease.   | Decrease     Tot listed as a riost.  | Decrease.  | Decrease.  | • Decrease.   | Decrease.   | Decrease.  | Decrease — Not listed as nost.      Decrease.   | in Qld.  • Decrease.  | Decrease.  | in Qld, WA.  • Decrease.  | • Decrease.   | • Decrease if cotton residues   | Alternaria Leaf Spot   |
| Black Root Rot   | residues may reduce carryover.      Increase.  | Non host. Requires repeated use of non hosts in the rotation to   |   | Non host. Requires repeated use of non hosts in the rotation to   | Non host. Requires repeated use of non hosts in the rotation to  |  | • Increase.  | • Increase.   | • Increase.   | • Increase.  | Biofumigant when incorporated   | • Increase.   | Decrease with repeated use.     Can be used as a biofumigant   | Decrease with repeated use  | Decrease with repeated use  | • Decrease in weed — free fallows   | Black Root Rot   |
| Fusarium Wilt  | Increase — especially growing  | reduce incidence.  • Increase in crop residues — a  | • Increase in crop residues — a   | reduce incidence.  • Increase in crop residues — a  | reduce incidence.  • Increase in crop residues — a   | • Increase in crop residues — a  | • Increases in crop residues — a   | May increase as saprophyte on   | May increase as saprophyte on   | • Increase in crop residues — a  | green.  • May increase as saprophyte on   | May increase as saprophyte on   | crop.  • May increase as saprophyte on   | <ul><li>Not a host.</li><li>May increase as saprophyte on</li></ul>   | <ul><li>Not a host.</li><li>May increase as saprophyte on</li></ul>   | (some weeds are hosts).  • Decrease with repeated bare  | Fusarium Wilt  |
| Sclerotinia  | low F rank varieties.  • Increase.   | saprophyte.  • Increase.  | saprophyte.  • Increase.  | saprophyte.  • Decrease.  | saprophyte.  • Decrease.   | saprophyte.  • Increase.   | saprophyte.  • Increase.   | crop residues.  • Increase.   | crop residues. • Increase.  | saprophyte.  • Increase.   | crop residues. • Increase.  | crop residues. • Increase.  | crop residues.  • Increase.  | crop residues.  • Increase.   | crop residues.  • Decrease.   | fallows.  • Decrease.   | Sclerotinia  |
| VAM  | Highly VAM dependent.  | Highly VAM dependent.   | Highly VAM dependent.   | Highly VAM dependent.   | Highly VAM dependent.  | Very highly VAM dependent.   | Highly VAM dependent.  | Highly VAM dependent.   | Very Highly VAM dependent.  | Very highly VAM dependent.   | VAM host, unknown dependency.   | Encourages VAM.     Highly VAM dependent.   | Independent — does not<br>encourage VAM.   | Encourages VAM.     VAM dependent.  | Encourages VAM.     Low VAM dependence.   |   | VAM  |
|  |  |   |   |   |  | • Inaculate with _ Group L strain  | • Inoculate with – Group J.  |   |   |  |   | Little N may be available to first  |  | viiii deperident.   | Low vivil depositionide.  | following crop.   |  |
| Nutrition  |  | Low N requirement compared to cotton.   | • Inoculate with – Group H, strain CB1809.  | • May require the addition of the   |  | <ul> <li>Inoculate with – Group I, strain<br/>CB1015.</li> <li>The main nutrients required are</li> </ul>  | • The main nutrients required are P and Zn. Where Colwell P <40  | CC1192.   | <ul> <li>Inoculate with – Group F.</li> <li>The main nutrients required are P and Zn. In low P soils apply</li> </ul> |  | • Inoculate with – Group E.   | cotton crop — slow release over a long time period.  • Hay making removes large   | Similar N requirement to high<br>protein wheat.  | Recycling of deeply leached<br>nutrients where soil moisture  | Can utilize N leached to depth.   | <ul><li> Mineralisation of N in the topsoil.</li><li> Leaching of salts, prevents their</li></ul>                           | Nutrition  |
| P=Phosphorus<br>K=Potassium  |  | • Removes more K than N /tonne of seed.   | • N fixation depends on effective inoculation, low soil N at planting   | <ul> <li>May require the addition of high<br/>amounts of N, P and K fertiliser.</li> <li>Due to rapid, early uptake of K, do</li> </ul> | May require high amounts of N     Check soil N before adding N.  | P and Zn. In low P soils apply 5  – 10 kg P/ha, higher for irrigation. Responsive to Zn when soil is   | ppm, apply 10–20 kg P/ha. In high pH soils apply Zn.• Huge responses to Iron have been   | unless Colwell P is <6–8 mg/kg.<br>Very responsive to Zn when soil is   | 15–20 kg P/ha. Responsive to Zn when soil is <0.8 mg/kg. Apply at   | 10 – 15 kg P/ha. In high pH soils  | • The main nutrient required is P. In low P soils apply 9–14 kg P/ha.   | quantities of nutrients, particularly K.  | <ul> <li>High S requirement.</li> <li>More responsive to P than either cotton or wheat</li> </ul>                    | allows root exploration. In particular S.  • May require N and P fertilizer   | Requires N and P fertiliser     More responsive to P than cotton.  Page 1 of the legislation of the leg | accumulation in the topsoil.  • Nutrients may be leached beyond   | Nutrition (Ensure levels of P, K, S and trace elements, especially Zinc, are |
| S=Sulfur<br>Zn=zinc  |  | • Efficiency of N use depends on S  |   | not rely on foliar applications.  |  | Responsive to Zn when soil is <0.8 mg/kg.  | recorded under irrigation at Breeza, NSW.  | <0.8 mg/kg.   | least 5 kg Zn/ha on these soils.  | apply Zn.  |   | Likely to respond to P fertilizer at<br>rates of 10–20 kg P/ha/year + 5 kg<br>P/ha/hay cut.   | <ul><li>cotton or wheat.</li><li>Requires the addition of Zn where soil tests indicate Zn is low.</li></ul>          | inputs similar to wheat where there is a full profile of soil moisture and or irrigation.   |   | <ul><li>the cotton root zone .</li><li>May cause Zn deficiency in next crop (VAM).</li></ul>                                | adequate)  |
|  |  |   |   |   |  |  | N fixation depends on; effective   | ve inoculation, low soil N at planting, lo  | w salinity and low sodicity in the tops   | oil, absence of waterlogging, and will   | Il be proportional to crop biomass.   |   |  | 5gauori.  |   |   |  |
| N fixed (kg N /ha) ** <sup>2</sup>   | Nil.   | Nil.  | 70–280.   | Nil.  | Nil.   | 20–83.   | 0–38.  | 0–100.  | 50–190.   | 125–90.  | 65–255.   | up to 200. (12 mths)  | Nil.   | Nil.  | Nil.  | Mineralisation - environment dependant.   | N fixed (kg N /ha)** <sup>2</sup>  |
| Total N removed at harvest ***   | 9–13 kg /bale.   | 38–42 kg /tonne.  | 67 kg /tonne.   | 16 kg /tonne.   | 16 kg /tonne.  | 35–40 kg /tonne.   | 35 kg /tonne.  | 30–35 kg /tonne.  | 35–40 kg /tonne.  | No harvest.  | No harvest.   | 28 kg /tonne dry matter   | 35 kg /tonne   | 25 kg /tonne  | Wheat & triticale 21 kg /tonne. Barley 20 kg /tonne. Oats 17 kg /tonne.   | Not Applicable  | Total N removed at harvest ***   |
|  |  |   |   |   |  | Multimode  | - Cimilar annuit   | Hectare contracts usually   | - Louis set-like  | Growing costs are strongly   | • Growing costs (~\$100/ha) are   | . Have a see to see the see   | Book X   | Secondary benefits to cotton the major focus.   |   | - Cook of word  |  |
| LCOHOHHCS  | High gross margins (\$/ha and \$/ML) in most seasons.  | Good cash crop, relatively low<br>establishment and growing costs.  |   | High establishment costs but<br>lower growing costs than cotton.  | <ul> <li>Use of grain storage assists with<br/>grain marketing.</li> </ul>   | <ul> <li>Mung bean buyers focus on</li> </ul>  | <ul> <li>Similar growing costs to<br/>chickpeas.</li> <li>Investigate marketing early as</li> </ul>                            | available. • Good cash crop.  | Lower establishment costs than chickpeas.     Premiums for human  | <ul><li>influenced by irrigation.</li><li>Costs are offset by; N fixation, increasing pools of plant available</li></ul> | offset by; N fixation, increasing pools of plant available P, K and Zn, reducing Black root rot,                    | Hay can be produced and sold     Both quantity and quality     influences hay profitability.  | Rarely if ever grown in<br>the northern cotton system     flowering and oil yields can be                            | <ul><li>major focus.</li><li>Birdseed, oil and meal markets segments (different varieties).</li></ul>   | only).  • Seasonally dependant but fairly reliable.   | <ul> <li>Cost of weed management must<br/>be attributed to the following crop.</li> <li>No opportunity cropping,</li> </ul> | Economics (Refer to NSW DRI Green Marsin                                     |
| (Refer to NSW DPI Gross Margin<br>Budget on NSW DPI Website)                         | Careful risk management is needed to avoid excessive cost.   | <ul><li> Usually grown under contract.</li><li> Seasonal conditions can strongly influence oil yields.</li></ul>        | establishment costs.  • Usually grown under contract.   | Range of target markets — all usually grown under contract.   | Relatively high break even yield due to low value /tonne.  |  | export demand is erratic – grain may be unsalable.   | <ul> <li>Capacity to produce break even<br/>yields in drought seasons.</li> <li>Profitability can be affected by</li> </ul> | consumption markets • Hectare contracts only  | P, K and Zn, increasing the soil's capacity to hold water and better   | increasing the soil's capacity to hold water and better root  | Acts as a strong sink for mirids     — potential to reduce insecticide  | reduced by spring heat. Juncea canolas have greater adaptation to  | • Poor returns due to low yields are common.  | than winter legumes.  | particularly where residual herbicides are used.  | (Refer to NSW DPI Gross Margin<br>Budget on NSW DPI website)                 |
|  |  |   |   |   |  | pulses.  |  | approach to disease management.   | occasionally available.   | root development in the following cotton crop.   | development in the following cotton crop.   | costs across the farm.  | North Western NSW.   | Investigate marketing early as demand is erratic.   | High fertiliser input for maximum yields and quality.   |   |  |
| Water requirements ET ****   | 7.4 ML/ha 100%   | 55–75 %   | 85–115 %  | 85–125 %  | 55–90 %  | 25–50 %  | (Usually not irrigated).   | 25–45 %   | 45 %  | 40% (to establish)   | 25%   | 125–170 % (depends on cuts)   | 20–40 %  | (Usually not irrigated).  | 40–50 %   | Not Applicable.   | Water requirements ET****  |
|  |  | Schedule on 75–90 mm deficits<br>in self mulching soils, targeting  |   |   |  | Requires approx. 50 mm of water/   |  |   | Tolerant to waterlogging. In northern areas a single  |  | Not usually irrigated when grown  |   |  | • Roots dry soil to 2m. Pre-irrigation  |   |   |  |
| Influence Confinence   | Field design is important.   | budding and flowering or petal drop.  | Avoid watering up for best inoculation results.      Peak water demand starts at  | Requires shorter irrigation<br>intervals than cotton — check<br>system capacity.  | Key growth stages for scheduling irrigations are; mid to late tillering,   | week during flowering and pod fill • Time first irrigation ~7 days prior   | <ul> <li>Avoid watering-up. Pre-irrigated<br/>or plant into good rain moisture to<br/>ensure uniform establishment.</li> </ul> | <ul> <li>Spray irrigation may favour foliar diseases.</li> <li>Avoid watering-up.</li> </ul>                                | irrigation at early pod fill may be all that is required.   | Tolerant to waterlogging.     Well suited to irrigation. Fully irrigated crops produce more dry                          | <ul><li>between wheat and cotton.</li><li>May require an early irrigation to aid establishment when grown</li></ul> | May dry soil to depth (several metres).   | Can compete for water and  | following safflower penetrates to about 1m leaving dry band from  | Usually only watered once.     Reduces run-off and erosion.   | Water conservation but may  |  |
| Occasion comments  | Use soil water monitoring devices<br>to improve WUE.   | <ul><li>Spring planted crops require more<br/>water.</li><li>Sensitive to waterlogging.</li></ul>                       | flowering. • Stretching irrigations can reduce  | Water stressed crops more prone to disease — mycotoxin  | flowering and 10–14 days later in early grain fill.  | to flowering.  • Avoid irrigation after mid pod fill to prevent late flowers.  | Very sensitive to waterlogging,<br>particularly in early stages of   | <ul> <li>Avoid watering-up.</li> <li>Avoid irrigation at flowering. Refill profile before flowering.</li> </ul>             | Avoid irrigation before flowering     leads to rank growth and low     vields   | matter /ML and fix more N/tonne or dry matter than dryland or partially  |   | May require irrigation to keep  | Lan compete for water and labour.  | <ul><li>1–2m, preventing deep drainage in subsequent crops.</li><li>Can aggravate phytopthora/</li></ul>  | Improves infiltration.     Can compete for water and labour (depending on winter rains)   | increase deep drainage potential.   | Irrigation Comments General  |
|  |  | <ul><li>Sensitive to waterlogging.</li><li>Spray irrigation may favour disease.</li></ul>                               | grain yield and protein.  | contaminated grain is unsalable.  |  | Very sensitive to waterlogging.  | development.   | Avoid irrigating water stressed crops.  | Spray irrigation may favour foliar diseases.  | irrigated crops.   | diseases.  • Very sensitive to waterlogging.  |   |  | alternaria in safflower.  | (depending on winter rains).  |   |  |
|  |  |   |   |   |  |  |  | Very sensitive to waterlogging.      Harvest when grain moisture is   |   |  | Can be slashed and incorporated  (disced) when green or sprayed   | Interval between cuts is influenced<br>by variety, seasonal conditions and  | moisture content is 8% or windrow  | ,   |   |   |  |
|  |  | Harvest when grain moisture is 9% to minimise admixture.  | Harvest when grain moisture is 15% and dry grain to 12% to minimise harvest losses and avoid.                           | 12%.  | 13.5%.   | Harvest when grain moisture is<br>12% to minimise splitting, cracking<br>and colour downgrades   | 13%.   | and colour downgrades.  | <ul> <li>Harvest when grain moisture is<br/>14% to minimise splitting, cracking<br/>and colour downgrades.</li> </ul> | Spray out and slash at the start of<br>podding (usually March/April).     Manura of local 4 weeks before                 | (disced) when green or sprayed, root cut and left on the surface.  • Manure at least 4 weeks before                 | irrigation availability.  | when 40–60% of seeds have changed colour.  | •Harvest when grain moisture content is 8%  | Harvest when grain moisture content is 12.5% for wheat and harley or 12% for pats and triticals.  |   |  |
| Harvest issues   | Specialised equipment.   | 'Head snatchers', sullivan reels<br>and sunflower trays assist with   | minimise harvest losses and avoid weather damage.  • Thin seedcoat makes seed   | Grain drying equipment is recommended for autumn harvests.  | <ul><li>Can tolerate weathering.</li><li>Desiccation stops crop water<br/>use and may allow more timely</li></ul>  |  | <ul> <li>Desiccating may aid harvest.</li> <li>Rotary harvesters give best<br/>results. Use very low drum speed</li> </ul>     | Desiccating may aid harvest.     Draper fronts are popular. For   | <ul><li>Windrowing may aid harvest.</li><li>Open front headers give best</li></ul>                                    | cotton planting to minimise disease risks.   | cotton planting to minimise disease risks.  | months, this likely to be when  | <ul><li>Windrowing allows earlier harvest</li></ul>  | for wheat to minimise losses.   | barley or 12% for oats and triticale.  Growers should confirm receival standards with their local grain   | Not Applicable.   | Harvest issues   |
|  |  | harvest.  | susceptible to damage.  | Need corn front to harvest.   | harvest.   | minimise losses.   | (350–400 rpm).   | conventional fronts, use low drums speeds (300–500 rpm).  | results. Use slow drum speeds (400–600 rpm).  |  | <ul> <li>Timely farming operations<br/>essential especially with<br/>continuous cotton.</li> </ul>                  | the stand is at 10–30% bloom. In milder conditions new shoots may   | (7–10 days) and is preferred where there is risk of spring   | seed from cracking.   | merchant prior to harvest.  |   |  |
|  |  | unweathered residues can lead to all  | lelopathic effects.   |   | _I   |  |  | Peoples MB, Constable GA and Gault  | ` ,   | umes add nitrogen to irrigated cotto   |   | be seen before flowering.  Text Colours   | storms.  | I   |   | 1   |  |
| 1  | N fixation can be restricted by wa A crop will take up approximately   | ter stress and nodulation. twice the amount of N as that remove   | ed at harvest.  |   |  | Pest Management Guide CRC Note "Sowing Cotton into Standing  |  | urnal of Experimental Agriculture 38, 25  | 53-260.   | -  |   |   |  | tion Orange - (   | Cautionary note   | Red - Potential   | Disadvantage   |

<sup>\*\*\*\*</sup> Average water requirements as a % of cotton usage These figures are a guide only. Note regional differences. Storage and transmission losses may significantly increase these values. ET = Evaporation and transpiration by plant.

\*\*\*\* Refer to Cotton Pest Management Guide

\*\*\* Refer to