Workflow: Production – Basic Farming Practices

Toolkit 3.1
Land Preparation, Orchard Layout and Infrastructure

target audience

Farm owners and managers.

what it is

When establishing an orchard, you need to meet the fundamental requirements to optimise your 20-30 years' investment in trees within the limitations of the natural resources (soil, water), the characteristics (climate), and the infrastructure at your disposal. These fundamental requirements include:

- Land preparation to ensure that the soil is suitable (chemical/nutrient and physical attributes, drainage).
- Orchard layout to ensure best tree spacing, use of the topography, and to mitigate natural risks such as wind.
- Best cultivar and root stock choices for the location.
- Healthy saplings from a reputable nursery that are correctly planted.
- Infrastructure to ensure that you have the means to sustain the orchard such as water access including average rainfall, bulk water, other water access, irrigation systems, as well as other farm infrastructure you may require (new or existing).

why it is important

Without the utmost care and effort in establishing the abovementioned fundamentals, you will not achieve the commercial and productivity performance over the life of an orchard. All the key performance indicators may be compromised if you take short cuts at this foundation stage, including:

- Lower yield per hectare.
- Poorer quality of fruit, resulting in lower export packout percentage and lower prices.
- Higher costs such as ineffective, excessive water use, or higher fertiliser requirements.
- Higher levels of phytosanitary and general tree and soil health risks.

- Higher operational costs, such as unnecessarily high labour cost because you may have to compensate for sub-optimal basic conditions.
- A shorter lifespan of the orchard.

success factors

- **Planning Well Ahead** – Your new orchard planning and land preparation takes place up to 18 months before actual planting.
- **Natural Resources and Characteristics** – A complete understanding of the natural resources and the climatic conditions you are can either exploit (high soil quality, bulk water resources) or will have to manage (low improve soil), complement (additional boreholes) or mitigate (excessive wind).
- **Land Preparation** – Citrus can be grown in a variety of soils, depending on the acidity range, drainage, depth, and the number of layers of different varieties of soil. Success factors include:
  - Soil analysis based on properly prepared profile pits.
  - Correcting soil where possible prior to planting.
- **Orchard Layout and Orientation** – Key success factors include:
  - Planting to limit wind damage.
  - Contour or flat planting options.
  - Climate, which influences tree growth and size, and in turn spacing and layout.
  - Cultivar and root stock choice and the correct spacing.
  - Environmental impact, including erosion and water runoff.
- **Infrastructure** – Key success factors include:
  - Apart from rain, main water sources include rivers, canals, dams, and boreholes. Do you have enough water? Mature citrus trees need 7-10 kl per hectare, with higher demand in summer. Your plan needs to respect the limitations of the water available, and you need to build in a buffer as a safety measure.
  - The means to deliver water to the trees when you need it. This includes pumps, power, and irrigation.
  - Fencing and security.
  - Buildings.
  - Roads, including access into and through the orchards.

execution steps

1. List and Analyse All the Elements and Factors Related to Natural Resources and Characteristics and Indicate What Action You Need to Take in Each Case.

   Work systematically, starting with a good map (high quality aerial or large topographical map) on which you can make and reference detailed notes. This includes:

- The soil quality – The digging of profile pits and the subsequent soil analysis.
- The lay of the land – Its aspect (N,E,S,W), whether flat or contour.
- Wind direction and speeds – This will determine orchard layout and the need for windbreaks.
- Natural bulk water resources – Dams, rivers to which you have water access and rights, and the quantities available to you.
- Rainfall patterns – Historical, seasonal rainfall trends and extrapolations (conservative forecasts).
- Climatic conditions – Research and document historic climatic data and include these factors into the plan.
- Existing vegetation – Existing neighbouring orchards, windbreaks etc.
- Environmental considerations – Erosion, storm water and rainwater runoff, risk of leaching of fertiliser into ground water or nearby water sources.

2. Soil and Land Preparation of Both the Physical and Chemical Structure
   - Actions resulting from soil analysis that addresses those deficiencies one can ahead of planting.
   - Ripping and ploughing to loosen the soil.
   - Establishing ridges and the access routes between the rows.
3. Cultivar and Rootstock Selection
   - Carefully researched decisions regarding cultivar and rootstock selection. Refer to Toolkit 3.2 – Cultivars and Rootstocks.
4. Windbreaks
   - Anticipate the protection the orchard, and especially a newly planted orchard will require by planting the required windbreaks ahead of time.
   - Consider alternatives to traditional windbreaks (trees or hedging) such as netting or constructed, movable windbreaks.
5. Irrigation Systems
   - Mainlines and sub-mainlines are installed prior to planting. Refer to Toolkit 3.4 – Irrigation.
6. Other Infrastructure
   - Planning ahead, including capital investment, even if current infrastructure may suffice for a period of time.

assessment questions

Please Note: There is no minimum / maximum amount of questions you can add

1.	Have you planned well ahead for new or replacement orchards?
2.	Have you defined and analysed the natural resources characteristics of your farm and the location of the new orchards?

3.	Have you done/do you do thorough soil analysis and land preparation, mitigating those deficiencies that can be addressed prior to planting?
4.	Are your current orchards well laid out (spacing, direction etc.)?
5.	Is the layout of your new orchards well planned?
6.	Have you fully assessed your infrastructure, especially water sources, water quality and irrigation capacity, to ensure that you can sustain your new or newly planned orchards?
7.	Have you made informed decisions regarding rootstock and cultivar selection?

resources

1.	Citrus Production Short Course e-learning programme
2.	CRI Soil Handbook (under development)
3.	Citrus Academy AV module – Introduction to Planting Management
4.	Citrus Academy AV module – Orchard Layout and Planning
5.	Citrus Academy production learning material – Enterprise Selection and Establishment