

Farm Planning: Identifying your most productive land.

A guide for landholders on the North Coast of NSW



Why develop a farm plan?

There are parts of every property where the costs of maximising yield can exceed the long-term returns. It is useful to assess the potential of each part and consider how it might best contribute to the whole farm.

The potential of any particular section of land will depend on four main factors: **slope, aspect, soil and climate**. These factors will determine how much effort will be required to maintain grasses or plants less suited to the site.



Good farm planning will have production as well as biodiversity benefits.

A farm plan that works with the natural tendencies of the land will reduce weed control costs and erosion damage and allow you to focus limited financial resources where they will be of most benefit. Each land parcel can then contribute as it best can, and the whole will be more resilient to climatic extremes.

Developing a basic farm plan

To start you will need an aerial photo of your property showing vegetation and farm infrastructure. For a small property of less than

40ha, an image from SIX Maps (<https://maps.six.nsw.gov.au/>) or Google Earth would be suitable. Save the image of your property to a thumb drive and have it printed to A3 size at a copy shop.

Larger properties may need to order a large image from the NSW Department of Lands (<http://www.lpi.nsw.gov.au>) or request one from their local council.

Once you have an aerial image of your property, layers of clear plastic sheeting (e.g. Graftix Clear-Lay Acetate – available online) can be placed over the image so that you can start to mark out your plan with coloured white board pens. Mark your boundaries in black and watercourses in blue as this will help orientate the map.

Slope and aspect

Traditionally, land has been classified on slope alone, but this is only part of the story.



A western facing slope in mid spring showing distinct bands of moisture.

In the picture above, there are three clear bands of moisture. Through repeated dry springs, the

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grass species have changed with tough natives dominating the hill, Rhodes grass on the mid slope and moisture loving Kikuyu at the base.

At another time of year or on another aspect, differences in grass and moisture are more difficult to see but still significant. A western slope must deal with the full drying effect of the hot afternoon sun. East facing slopes are cooler. South facing slopes are more sheltered and retain moisture longer.

In all cases, the dominant grass or vegetation will be determined not by the good times, but by the harshest seasons.

Cattle amplify the effect by spending more time on succulent grasses and less time on fibrous grasses on steep slopes. The consequence is overgrazing on flatter areas leading to opportunistic weeds such as fireweed, while under grazing of steep slopes encourages woody weeds like lantana. Incorporating these factors into a farm plan reduces work and improves the resilience of the property.

Slope and aspect together influence what parts of the property are most stressed by dry periods. **Put another way, slope and aspect reflect a drying order in the landscape.** Exposure to westerly winds will also affect drying order unless trees or taller ridges shelter the paddock.



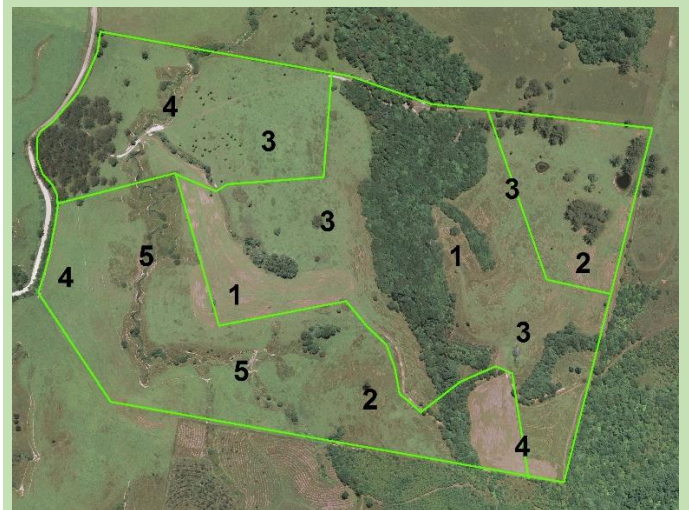
Shelterbelts provide shade for stock, and protect stock and pasture from exposure to hot dry winds.

Step 1: Mark drying order on your map

Narrow hillcrests and steep slopes (above 20°) with northerly or westerly aspects are prone to high temperatures and drying winds. Often the soils are shallow and eroded. Mark these areas on your property plan with the number 1. Notable exceptions are basalt crests, which tend to produce deeper and more fertile soils. Mark these with the number 2.

Label broad crests and gentler north facing slopes with a number 2 unless they are sheltered from dry westerly winds in which case they are marked 3. Broad exposed flats are marked with a 3. Southerly slopes exposed to drying winds are also likely to be around this stage in the drying order.

Flats and southerly slopes, which are at least partly sheltered from drying westerly winds, are a 4 in the drying order. Finally, mark flats or valley floors with a 5 if they are well sheltered from drying winds or if they exhibit signs of poor drainage.



An example farm plan marked with drying order. Existing paddock fences are in green.

You have now drawn up a general guide to drying order on your property. The next step is to make adjustments based on your experience and local knowledge of your property. If you are sure one location dries before another, then change the numbers until you are satisfied.

You will probably see on your plan that a single paddock can contain several different drying orders. This means that in harsh times, parts of the paddock will suffer more from moisture stress and other parts from stock pressure.

Soils and climate

Soil and climate have a big influence on productivity and are actually inter-related. Soil forms from weathered rock, is eroded into deep sediments and then slowly transformed by plant life.

There are many different properties of soil, but for the purposes of paddock planning, the key factors are parent rock and rainfall infiltration rate.

The parent rock that forms the soil not only determines the nutrient availability and acidity, but also has a big influence on its ability to store water. However, erosion and hard seasons can degrade the top soil so that rain does not easily infiltrate and instead tends to runoff.

Soil on the North Coast can vary widely, even over the space of a few meters and can be difficult to characterise, especially over a whole property. One approach is to use a combination of simple indicators.

Class	Texture	Infiltration	Indicator plants
"A" good	Loam, crumbly clay	Good	<i>Kikuyu</i> <i>Microlaena</i> <i>Hoop pine</i>
"B" fair	Cracking clay	Fair	<i>Rhodes grass</i> <i>Paspalum</i> <i>She-oak</i>
"C" limited	Dusty clay, shallow, sandy	poor	<i>Carpet grass</i> <i>Spotted gum</i> <i>Iron bark</i>

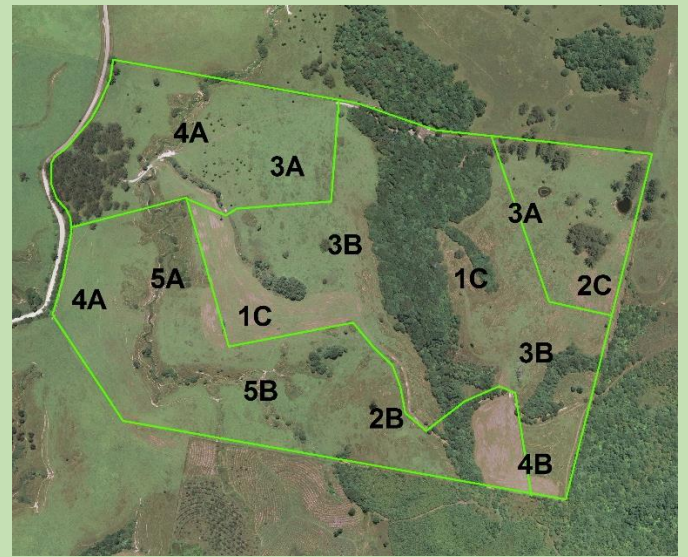
Some common soil indicators for the North Coast.

To use this indicator table you will need to walk over your property with a notebook and a large bottle of water. You should do this at least 3 days after rain. The aim here is to find general soil limitations and the table is just an aid. Sometimes one indicator will match and another will not so you will have to decide between them.

Poor infiltration occurs when you gently pour water on dry soil and the water beads or pools without really penetrating. Good infiltration occurs when the water absorbs into the soil in a few seconds.

Step 2: Mark soil class on your map

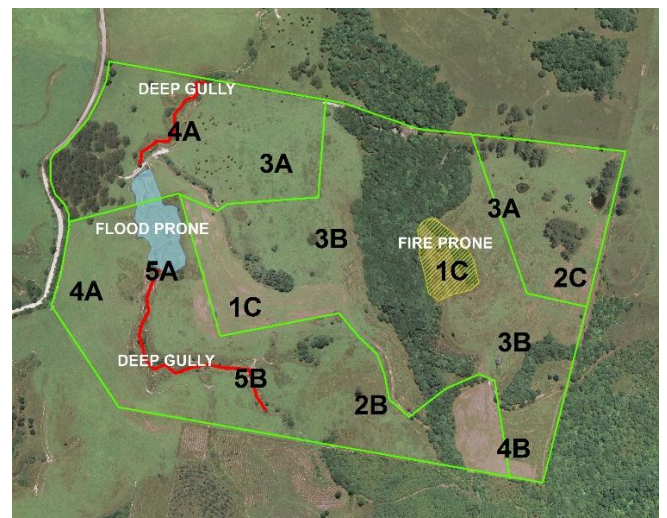
Mark a soil class on your property plan next to each drying order number.



A farm plan with drying order and soil class.

You should now have a plan that is starting to reflect the potential of the land. Areas marked 1C tend to dry out early and have soil limitations encouraging poor grasses and woody weeds. Areas marked 5A retain moisture and have good soils and are likely to retain better grasses but may be over grazed by stock.

Before looking at management options, it is necessary to add the effect of climate extremes like flood, storms and fire. Mark areas prone to flooding with cross-hatching. Label deep gullies and areas most vulnerable to rapid fire fronts (i.e. steep and dry without a firebreak or buffer zone).



Your farm plan now shows drying order, soil class and problem areas. This provides you with a quick overview of your property and allows you to make informed decisions about future investments.

How to use your farm plan

The advantage of your farm plan is that it now broadly shows the strengths AND weaknesses of your property. Your limited financial resources can be devoted to improving the better areas while reducing damage in the areas of naturally limited potential.

It would be ideal in the long term to individually fence markedly different areas for individual management. In the short term, paddocks with strong and weak areas can be managed in a compromise that gets good value from productive areas without generating costly problems in vulnerable areas.



Fencing allows for the individual management of paddocks based on their strengths and weaknesses.

The following general advice is aimed at providing ideas and should always be tempered by your local knowledge and observation.

Identifying land use options

Areas marked 5A are likely to be highly productive, particularly in dry periods such as early spring. Fertiliser and pasture improvement is justified as long as the area is not flood prone. In wet periods, stock can damage the soil by churning and compressing the soil.

Areas marked 1C or 2C are likely to dry out early and are vulnerable to woody weeds or fire. These areas are best grazed before they hay off, but not in the late spring when native grasses are seeding. Encouraging native grasses will make these areas more nutritious and more resilient to fire and drought.

Stock access to stream banks and deep gullies should be limited to reduce erosion. Often these are good sites to allow native revegetation as this will reduce weed control costs in the long term.

Areas marked 2A, 2B, or 3B are primarily limited by moisture availability. If exposed to westerly winds these areas are likely to benefit from a shelterbelt or windbreak. Shelterbelts not only extend pasture growth in dry spring periods but also increase the proportion of green feed with a much higher nutrient value.



A new shelterbelt planting on the Eastern Dorrigo.

Areas marked 3A will tend to be summer mainstays while areas marked 4A may be good areas to encourage more winter active grasses.

Areas marked 3B or 4B have less productive soils. If the problem is poor water infiltration, it may be worth applying organic fertiliser such as poultry manure though over time this may reduce runoff into dams. If the soil is less productive for some other reason it will be worth getting more detailed soil tests to identify a specific remedy.

In most cases "C" class soils are eroded or degraded and any fertiliser or additions are likely to have limited effect. In areas marked 2C or 3C encourage productive but hardy grasses like Paspalum or Rhodes grass by excluding stock during seed set in late summer. Limit grazing to encourage complete ground cover.

Areas marked 4C or 5C might productively grow *Microlaena* which is winter growing and tends to flower in autumn. Areas marked 1C are limited by moisture and soils but could productively support Wallaby or Kangaroo grass both of which flower in late spring.

The establishment of regeneration areas or shelterbelts are also likely to be more successful if you consider drying order (Refer to the species selection guide in Further Reading). Areas marked 2 or 3 will be more suited to dry sclerophyll species while areas 4 and 5 are more suited to wet sclerophyll or riparian species. Areas marked 1 will be suited only to the toughest species especially if the soils are poor which is usually the case.

Adapting your plan over time

Any change in land management will have its own consequences and may take a few years of fine-tuning to settle in. It is important to implement your plan in manageable bites ensuring the success of each stage before moving on to the next.

The aim is for savings in recurrent costs to finance the next stage of the plan; however, climate can be highly variable. In particular, bad years can lead to severe reversals and financial strain. Broad scale change is tempting but can make the overall plan vulnerable to collapse. Gradual change should make your property more resilient to climate impacts and strengthen the incentive to complete the whole plan.

Other aspects of farm planning

Farm planning is best when it includes broader aspects such as fodder reserves (hay and silage) drought planning, flood reserves, financial planning and succession planning. All of these need to integrate with your property plan but do not be intimidated. These plans can be developed in stages and each will add to the resilience of your property and to your satisfaction in the long term.

You may not achieve all the goals you set but having integrated plans means you are much more likely to achieve accumulated progress rather than deterioration and that is something to be proud of!



Further Reading

Property Planning Handbook

NSW Department of Primary Industries, 2012.

<http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/property-planning-book>

North Coast Climate Change Projections

NSW Office of Environment and Heritage, 2014.

<http://www.climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/North-Coast-Climate-Change-Downloads>

A Guide to Species Selection for Revegetation Projects in the Coffs Harbour LGA

Craig Stehn, 2015. Coffs Harbour City Council.

Towards Sustainable Grazing – Professional Producers Guide

Warren Mason, 2003. Meat and Livestock Australia.

<http://www.mla.com.au/Research-and-development/Environment-sustainability/Sustainable-grazing-a-producer-resource>

Financing Your Farm – a practical guide to financial growth

Alan Blackburn, 2006. Australian Bankers Association.

Adapting Agriculture to Climate Change

Ed by Chris Stokes & Mark Howden, 2010. CSIRO Publishing.

NSW Department of Primary Industries - Pasture and Rangelands webpage

<http://www.dpi.nsw.gov.au/agriculture/pastures>

For more information on the Jaliigirr Biodiversity Alliance go to:

<http://www.greateasternranges.org.au/our-partners/ger-regional-partnerships/jaliigirr-biodiversity-alliance/>

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