

MAKING THE FARMING SYSTEM WORK

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Cotton production is the most intensive of all the broadacre industries in Australia, and the science behind the production of cotton is extensive. The openness and free flow of information between and within every sector of the industry is the envy of other industries, and one of our greatest strengths. We are generally regarded as the most advanced cotton producers in the world. We operate in a totally deregulated and unsubsidised system, and have done so since before I grew cotton.

Ironically, the leader of the free enterprise world is now the largest subsidiser of producers in the world, and the last great bastion of communism appears to be toeing the WTO line much more than the USA, at least as far as her subsidies to cotton growers are concerned.

In the light of this gross market distortion, how does the Australian producer make the farming system work, stay financially viable, be sustainable, and meet the community's expectations of us as significant users of water, land, and chemicals? We have a world-class team of scientists supporting us in areas such as soils, agronomy, diseases, weeds, insect control, plant breeding and water management. We have to integrate forecasts on weather, climate, the cotton market and the Australian dollar with our own production, with tools such as cottonLOGIC, entomologic, hydrologic, nutrilogic, soilpak, spraypak, weedpak, machinepak, AWM and IPM, yield maps, soil maps, and EM surveys, whilst managing runoff, deep drainage, spray drift, insect and weed resistance, disease, staff, consultants and contractors. "How do we utilise this mass of information efficiently and practically? What observations can you relate to the audience from your own or others experiences in developing farming systems?" was the brief I was given.

In a well-balanced system, each facet of the farming system integrates with each other, and no one area can be viewed in isolation. Just as in any team, if any one sector under performs, the whole team will suffer, and planning is essential. Industry Development Officers do an excellent job of extension and research

For many years, the focus in soils has been on nutrients and structure. Nutripak is an excellent tool, and the plant's nutritional needs are generally well understood. Consultants and fertiliser company reps have good data, and integrate well in the industry. However, soils aint soils, and every field is different. There is quite a wide range of rates of the major nutrients used, and this relates to

perceptions, history, soil health, and soil structure. IDO's regularly hold soil pit field days, which are well attended.

The advent of controlled traffic using GPS has been a major benefit in improving soil structure (soilpak), and predicted developments in this area in the next twelve months should see it much more widely adopted.

When planting into cereal stubble, dryland growers have for years seen unexplained differences in vigour and growth, and decreases in insect, disease and physical damage. Northern areas have found they can grow a commercial crop of wheat and return to Roundup Ready cotton quite successfully, but southern growers must grow a sacrificial cereal crop and manage their program very well. Dave Kelly's work shows significant value in this approach, and having seen the value in dryland, I think the uptake of this will increase in future. Industry recommendations are that cotton should be grown only every alternate year as soils get older, and this will be a perfect fit for this.

Soil health has become an area of great interest over the last few years, particularly with the advent of Verticillium wilt, Black Root Rot, and now Fusarium.

Soils are 'living' due to the presence of a large number of micro- and macro-organisms. In fact there are more organisms in a handful of soil than there are people on earth! There are large (10 billion bacteria / kilogram soil) and diverse (>40,000 known species) populations of microorganisms in soils. In the top 10 cm of a fertile soil there may be more than 2 tonnes per hectare of microorganisms. Many of these microorganisms cannot be isolated or even detected because of limitations with current technology, but estimates from various sources indicate that microorganisms including bacteria may be amongst the most diverse organisms on earth and that up to one quarter of the earth's biological matter consists of microorganisms (Jong 1989)! As such soil microorganisms play a significant role in the function of biological systems including farming systems. (Margaret M. Roper, Farming Systems Forum, 2001)

A crop is a disturbance to a natural system. (David Nehl, CRC Review 2002) We need to understand that cropping, particularly continuous cropping, is not a natural system. Even a rotation is not a natural system, but has long been recognised worldwide as a necessary aspect of sustainable and viable farming systems. On our farms, we believe we have seen a distinct improvement in soil health and structure, profitability, and a decrease in weeds and diseases since we moved to rotations with legumes and cereals.

There is evidence that black root rot can be controlled with rotations, and although there is no evidence at this stage that Fusarium can be, a solid rotation program will most likely be the one measure that

will prevent or delay the severe onset of other pathogens. As we push our production systems to the limit of the plant's ability to yield, have the interaction that is the strength of our industry, and draw water from streams that flow through other cotton areas, the development and spread of other pathogens is quite possibly inevitable. Healthy soils are resilient and resistant. While some of our cotton soils are extremely strong, others take a lot of effort to maintain. There is no silver bullet, and with the incredible numbers and complexity of our soil microorganisms, I'm not sure that we will ever be able to be totally prescriptive.

Weeds have been an issue for farmers since time immemorial. Weeds are a host for pests and diseases. As cotton growers, we have used mixtures of pre-emergents, lay-bys, chipping, and now over the top sprays have caused a revolution in how we handle our problem weeds. The new weedpak manual is an excellent tool, and documents some of the yield costs involved in using mixes of pre-emergent on weedy fields. Its integration with cottonLOGIC will make it an invaluable tool.

The use of Roundup Ready cotton where glyphosate is the chemical of first choice for fallow weed control means we will have a species shift in weeds to those that are tolerant to glyphosate. We can also expect resistance. The continued use of high rates has a high cost in yield, and probably soil health. Chippers are increasingly difficult to contract, and OH&S issues means their use is going to decline.

The answer lies in rotations and technology_rotations of crops to reduce seed banks, and rotation of chemicals to reduce species shift and resistance, and the use of smart sprayers. Probably the worst weed in Australian cotton is nutgrass, and it is generally not evenly spread across the field. The areas can be logged onto maps with GPS, and these areas only sprayed with expensive chemicals, or sprayed automatically at each machine pass with cheaper alternatives.

Technology such as the Australian developed Rees Green Target Selectable Sprayer hold much promise in controlling weeds, reducing herbicide impact on crops and soil health, reducing resistance and species shift, and making cotton growing more profitable and sustainable.

Our area, the Darling Downs, was the worst affected in the late 90's by increasing heliothis numbers, spiralling spray costs, and extreme community and financial pressure on cotton growing. In response to this crisis, a Heliothis Working Group was set up with funding from the Queensland State Government, with cross industry representation. The most successful initiative of this group was to set up two pilot Area Wide Management areas. The reasons for our success were the dedication of the IDO's, the support of grains and cotton, and the fact that we were going to go out of business if we kept doing what we had always done. There are now around 26 AWM groups, and they are excellent discussion, research and information dissemination vehicles. Integrated Pest Management is as logical

as rotations, and without tools such as this, we will lose our independence to the major chemical companies and GM providers.

After a difficult start, most growers have embraced Ingard cotton. The improvement in its' performance has come about from the work of the plant breeders and researchers, and the hard won knowledge gained by the growers on how to manage this new crop. A major part of its' success lies in the rotation of softer chemicals in all crops, and the build up of beneficials brought about by the introduction of IPM.

Growers need sustainable, profitable, alternative production systems to the GM based systems. These GM systems will form the backbone of our industry in years to come, but without alternatives, the profitability we have enjoyed will be transferred directly to these companies. Groups such as the MacIntyre AWM group are leading the way in this area and AWM will form the backbone of the whitefly effort in Central Queensland.

Water and water management have become major issues of our industry. It has direct relationships with yield, quality, insects, nutrition, deep drainage, salinity, and the way we are viewed by the community, which eventually has an impact on our freedom to farm. Trickle and overhead, and Water Use Efficiency in furrow irrigation is receiving much attention. On our irrigation farm, we use furrow and overhead with LEPA (socks) and LESA (sprinkler). The LEPA system seems to have some outstanding advantages although, as with any system, the machines must be designed to the proper capacity in the first place. The incorporation of hydrologic into cottonLOGIC will be a great tool, particularly in systems with flexibility. Being able to control the quantity of water applied per irrigation, and the ease of keeping the soil moisture at a desired level, will be a key to controlling many diseases, make more efficient use of water, and allow much more efficient and flexible rotation systems.

Precision Agriculture was the glamour area of the 90's, but didn't deliver. I believe it is about to make a resurgence and has some great value. We purchased one of the first GPS grain yield monitors in the country and were astounded at the yield variability within paddocks. We changed our management to what is probably now called a zonal approach to try to lift our poorer areas to that of the best.

In all but the very best soils, there are differences across the field_ differences in structure, colour, clay content, organic matter, deep drainage, EM, cut and fill, and weeds. Many cotton yield maps I have seen have variations of 100 percent. Why do we give all zones the same water and fertiliser, why do we spray expensive chemicals on the whole field for small areas of nutgrass or mites? Why don't we break the field into zones or smaller field units? Why do we even farm the low yielding areas? Boyce's Australian Cotton Comparative Analysis shows that the average farm needed 6.93 b/ha just to cover

operating expenses over the last 3 years, and 6.96 b/ha to cover all expenses. A few leading farmers and AWM groups with the assistance of the IDO's are beginning to look at this.

So how do we make our farming system work? We need to have a long-term plan. Issues such as yield, quality, rotations, weeds, diseases, insects, resistance, WUE, deep drainage, and sustainability need to be considered in relation to each other, as together they make the farming system profitable.

Our industry has base skills that are the envy of other industries, and a network of IDO's and consultants that have no equal in Australia. Our researchers have provided us with the tools to compliment our own judgement and observations, which makes our yields amongst the highest in the world. Conferences such as this, field days that are held in every valley, and the unrestricted flow of information are the lifeblood of our industry.

Our industry has grown dramatically over the last 20 years. As we mature, we will be required to spend more time considering rotations (crop, herbicide, and insecticide), tools such as cottonLOGIC, opportunities such as zonal farming, and precision application of water. We are spending more time considering the quality that is going to be required of our product in the future, considering who our real customer is and trying to understand their needs, and showing the community that their expectations of our operations are being met.

This is all part of "Making the Farming System Work."

References:

Margaret M Roper 2001 Farming Systems Forum.
David Nehl 2002 CRC Review

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