Changing climate, changing business practices: lessons from innovative growers

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Acknowledgements

This publication is funded by the Department of Agriculture and Food Western Australia, Grains Research and Development Corporation and the Australian Government’s Climate Change Research Program under the project DAW 000202 ‘Demonstrating adaptation to climate change in the wheat-belt of Western Australia through innovative on-farm and virtual farm approaches’. We would like to thank Dr David Bowran for his support of the project.

Many thanks to WANTFA and to the growers involved for their collaboration on this publication. The information and photographs provided by Dr David Minkey, WANTFA and the photographs provided by Caitlyn West, Farm Weekly are gratefully acknowledged.

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www.agric.wa.gov.au
ISSN 1833 7236
Changing climate, changing business practices: Lessons from innovative growers

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The Climate Challenge

Climate change and increasing seasonal variability are challenging the production efforts of growers in lower rainfall environments of the Western Australian grain belt. Significantly less rainfall than the long-term average has fallen across southwest Western Australia during the past 30 years.

Seasonal rainfall has also become more variable with later starts to the growing season and a general shift to more summer and less winter rainfall. Day and night-time temperatures, particularly in winter and autumn, have gradually increased, while in some areas, the risk of frost in spring has increased.

Meeting the Challenge

To maintain viable cropping enterprises growers require profitable and sustainable ways to successfully navigate these climatic and seasonal changes and the agronomic challenges they generate. Adaptation requires research efforts to strengthen the resilience of farm businesses, including development of new establishment techniques, innovative farming systems and alternative crops that are less susceptible to emerging conditions.

Improved networks of communication, decision-making and knowledge production are also needed. Demonstrations of practical ways in which growers can adapt to seasonal variation and climate change is the aim of the National Adaptation and Mitigation Initiative (NAMI) that includes demonstration sites in the WA grain belt.

NAMI involves a partnership between the Department of Agriculture, Forestry and Fisheries (DAFF), the Grains Research and Development Corporation (GRDC) and research partners, including the Department of Agriculture and Food, Western Australia (DAFWA). The collaborative NAMI project, ‘Demonstrating adaptation to climate change in the wheat-belt of Western Australia through innovative on-farm and virtual farm approaches’, led by DAFWA involves major grower groups across the WA grain belt, as well as the Commonwealth and Scientific Industrial Research Organisation (CSIRO), the University of WA and private consultants.

The underlying philosophy of the project is a two-way communication between growers and researchers so that the on-farm climatic and seasonal issues are dealt with in the most practical, effective and grower-focused way. A major focus of the project is the conservation of soil moisture via fallowing and effective weed control and the use of varietal mixes or ‘shandying’ to reduce the frost risk posed by early sowing. It is logical that being able to adapt to a variable climate now will provide farm businesses with the information, resources and skills to help them cope with future climate in a profitable and sustainable way.
To be sustainable in the future means that farm businesses must have the capacity to maximise profits in good seasons and minimise losses in poor seasons. To achieve the required ability to respond – the required resilience – investments in physical, financial and social capital are required:

- Building infrastructure (e.g., grain and seed grain storage, water storage reserves);
- Undertaking planning (e.g., agistment alternatives and when to use them);
- Providing excess resources (e.g., reserve feed and grain); and
- Developing social capital (e.g., a mutually-supportive network including fellow farmers).

Furthermore, the farm business which is consistently more profitable than its peers will tend to be able to weather the bad years better – to be more resilient.

Each farm business case study described in this publication demonstrates the complexity and diversity of legitimate responses to a highly variable and changing business environment. One dimension of this is climatic variability and change. Each in their own way could be said to be doing the right things well and in a timely fashion.

**Characteristics of Resilient Farm Businesses**

Resilient farm businesses tend to share some common attributes.

- They **Constantly Scan their Environment**. They scan their business environment for relevant changes or trends or emerging opportunities and threats. This includes business issues (prices, costs, demand shifts, supply chain issues), natural environmental issues (weather and climate, biodiversity, invasive species, soil health, salinity); social issues (community attitudes towards animal welfare, organic or “green” products, desire for local products); and regulatory issues (effects of international regulatory changes). Resilient farmers are aware of changes in, and the variability of, their local climate.

- They **Prepare for Potential Disruptions**. That is, they make contingency plans to cope with realistic, if unlikely, scenarios. Late season breaks challenge the growth potential of annual pastures, and hence the carrying capacity of grazing enterprises. A contingency plan would envisage selling or agisting stock upon certain trigger-level shortfalls of rain being reached. A cropping contingency plan may envisage a sowing schedule, if the season break has not yet occurred, where it may dry-seed suitable paddocks, which have low burdens of weed seeds, as the desired planting date approaches and perhaps drop out other paddocks from the schedule. Contingency plans are made for severe drought and its implications.

- They **Build Flexibility** into the farm business. When a disruption occurs, a non-standard approach can be readily used. Flexibility can be acquired at some cost, often relatively low, by deliberately building redundancy into the system. An example is to have the capacity to make last-minute switches in seed type: for example, changing the length of season variety in response to the timing of the break.
This would require the seed to have been purchased and stored in good time. As a result, in the farmer’s environment, a higher proportion of the crop sown in a late break is of a variety more likely to mature before possible heat and water-stress events during seed-fill during late spring. If an early break occurs, the yield potential would be higher than with an unchanged variety.

- They have **Excellent Networks of Personal Communication**. They have lots of rich, mutually-supportive and trusty relationships with fellow farmers, suppliers, service providers and their family and employees. These networks have rich information flows. Social capital is high. People in the networks with needed expertise and information about adapting to climate change are highly regarded. As a result, when an opportunity arises to adopt a new practice the farmer has ready access to information for an informed decision.

- They **Experiment and Innovate**. They do small-scale experiments all the time: to see if it works, or would be a better method. These then help in adapting to changing the future. For example, they do experiments with new varieties of drought tolerant cereals or with summer-growing crops to take opportunistic advantage of potentially increasing summer rains. Then when larger scale changes are called for, they have information and experience concerning the options available. As a result, when the market premium/yield trade-off shifts to favour low protein wheat (or high), they know which variety will work in their setting.

- They **All Know and Share Goals and Values**. The farm family and employees take the time to build mutual understanding about the explicit goals and values used in the farming business. Employees and junior family members add to creativity and flexibility in dealing with a crisis, because they are engaged and motivated. For example, when an unexpected localised flooding occurs, their response is smooth and without panic.

Innovative thinking, careful planning, supportive networks and efficiency and flexibility in production systems are key characteristics of resilient and adaptive farm businesses. Most farm businesses will exhibit some of these characteristics, enabling them to survive under challenging conditions.

The following case studies clearly demonstrate a diversity of enterprise thinking and innovation at work among Western Australian farmers responding to a changing climate. From them we can learn about their motivations to change in response to climate and the rewards that follow.
Conserving raindrops Nicole Baxter

Moisture conservation vital
Following a run of drier than average seasons, grain grower Andrew Thomas and his family have embraced chemical fallowing to conserve moisture and help produce an extra 200 kilograms of wheat per hectare.

Andrew and his family, who farm 11,600 hectares at Pindar about 130 kilometres east of Geraldton, have adopted a year in-year out chemical fallow and wheat rotation across almost half of their cropping program and sow their productive soils to wheat for two consecutive years.

'It also enables earlier dry sowing, which is important for our large program because we don’t have to wait for an early germination of weeds.'

With an average annual rainfall of 300 millimetres and growing season rainfall figures that vary between 90 mm and 220 mm, setting up the farming system to allow crops to make maximum use of every drop of available rainfall is a high priority.

Long-term average wheat yields at the property are 1.3 tonnes/ha. Season 2006 was the Thomas’s worst on record with average yields at just 400 kg/ha, while their best season was 2008 with a yield of 2.4 t/ha on average.

‘Here, it’s all about managing financial and production risk and that’s what the fallow does for us; it minimises that risk because we’re using it for conserving moisture,’ Andrew said.

All residue retained
Although all residue has been retained since sheep were removed in 1996, poor yields during the past decade have produced minimal ground cover, especially after the second year of chemical fallow. Despite this, Andrew is pleased that none of his topsoil blew away in the intense windstorms during the droughts.

‘It was gratifying to see because some of our soils are pretty light so the small amount of residue we build, we like to keep,’ he said.

After several years of using air seeders set on 180 mm (7 inch) row spacing, Andrew purchased two 15.24 m (50 ft) Ausplow DBS bars set on 300 mm (12 inch) spacing to better handle stubble residue, place seed accurately into a dry seedbed and create a trench to harvest every drop of available rainfall. The machines have also enabled him to achieve the crop establishment and spatial distribution of seed and fertiliser to realise the ideal plant density for his environment.

PROFILE
Andrew, Tarleah, Peter, Margaret and Paul Thomas
LOCATION: Pindar, Western Australia
ANNUAL RAINFALL: 300 mm (long-term average)
FARM SIZE: 11,600 ha (arable)
AREA CROPPED 2010: 8000 ha
SOIL TYPE: Red clay loam, red sandy loam, sand over gravel and red loam
SOIL PH: 4.0 to 5.5 (calcium chloride)
Half the paddocks tested
Soil testing is carried out on about half of the cropped area to a depth of 100 to 200 mm to fine-tune nutrient needs. In general, a full compound fertiliser is applied at 40 to 60 kg/ha, depending on soil type. Before seeding, deep soil cores are collected at Yield Prophet® sites to check starting soil moisture and nutrient levels. Ammonium sulphate and lime are spread where necessary.

It’s unbelievable how well [Saia oats] grow on acidic sandy soils that are low in fertility

Andrew Thomas

‘The bottom line drives everything we do,’ Andrew said. ‘We still make mistakes, but this decade we’ve become better at matching inputs to crop yield potential.’

Canopy management plays an important role at the farm with Andrew using Yield Prophet® to assist decision-making about post-seeding nitrogen inputs. Most seed is sown at 40 kg/ha, but on heavier soils with higher nutrient levels, Andrew said this sowing rate is proving too high.

‘There’s no point growing a thick canopy early in the year, burning up all the moisture and not achieving the grain yield in November,’ he said. ‘Matching inputs to yield potential is critical.’

Saia oats trial underway
If the weed population ‘blows out’ in particular paddocks, Andrew leaves these out of production for two consecutive years and is trialling Saia oats as a tool to help lower the seed bank and build organic carbon levels over time. Although only in his second year of growing Saia oats across 120 ha, he was keen to trial the crop after learning about its ability to aid weed suppression.

For the trial, Saia oats were sown at 15 kg/ha with no fertiliser.

‘It’s unbelievable how well they grow on acidic sandy soils that are low in fertility,’ Andrew remarked. ‘There’s also some anecdotal data that suggest Saia oats can accelerate the movement of surface-applied lime to deeper layers within the soil profile so we’re investigating that as well.’

To prepare a weed-free fallow, usually two applications of a knockdown herbicide are required during the season. Already, the crop has reduced the need for one application of herbicide and Andrew hopes this will delay the onset of herbicide resistance while also improving soil cover.

‘Where seed is sown into residue we’ve noticed the crop is more vigorous and doesn’t seem to suffer as much moisture stress,’ he said.

To kill the Saia oats, Andrew uses a 15.24 m (50 ft) mower; allows the oats to regrow to the seed development stage and then applies a lethal dose of paraquat.

Andrew Thomas estimates chemical fallowing enables the family to grow extra 200 kg/ha of wheat per hectare.

Wheat planted onto a chemical fallow tends to be less susceptible to Yellow spot disease.
Tramlines improving water infiltration at Neridup
Nicole Baxter

Paddock traffic halved
Neridup grain grower Matthew Jones has lowered machinery traffic across his paddocks from about 50 per cent to less than 25 per cent by partially adopting a tramline farming system in a bid to reduce compaction and improve water movement into his soils.

Matthew, who farms 1500 hectares of wheat, canola, lupins and peas in a share-farming venture with his parents 50 kilometres northeast of Esperance, said tramline farming magnified the benefits of no-tillage, mainly through a reduction in soil compaction. With less compaction comes improved rainfall penetration, which in turn increases a crop's water use efficiency.

‘When you take a piece of graph paper and work out how much soil you run over through the year, you'll be surprised that every bit does damage and you don’t see how much until you stop doing it,’ Matthew said.

Making the move
With a long-term interest in improving the physical condition of his farm, Matthew could see his soils had softened after 18 years of no-tillage, but his move to tramline farming became more urgent when he realised excess pressure created by repeated machinery traffic over wet paddocks at harvest was hampering yields.

‘On some soils where the chaser bin travelled to and from a set of silos, the crop just wouldn’t perform,’ he said. ‘My immediate thought was to move the farming system onto trams; and the wider I could go the better.’

Matthew’s farm is based on a 12.19 m (40 foot) tramline system with 3.96 m wheel centres.

‘Sprayers that are 36.57 m (120 ft) wide don’t tend to ride well on three metre centres so I decided to go wider,’ Matthew said.

His matched machinery comprises a 12.19 m (40 ft) Cat harvester, a (36.57 m) (120 ft) Miller Nitro self-propelled boomspray unit and a chaser bin with a wheel width of 3.96 m. His two tracked Cat tractors run inside the main trams and his 18.29 m (60 ft) Flexi-coil ST820 tyne seeding rig, set on 305 mm (12 inch) row spacing, has only one wheel on the tramlines.

Sowing efficiency important
Although Matthew recognises a matching system would be ideal, he is concerned that moving to a smaller seeding bar would reduce sowing efficiency, which may in turn lead to lower yields.

‘It’s a compromise at the moment,’ he said. ‘I'm having trouble convincing myself to go back to a 12.19 m (40 ft) bar where I should be so I can set out the tramlines properly and be actually driving on them all the time.’

Using his 18.29 m (60 ft) bar, Matthew estimates he can seed crops at 14 to 15 hectares an hour, while a 12.19 m (40 ft) bar, would drop his rate back to less than 10 ha/h.

PROFILE:
Matthew Jones
LOCATION: Neridup, Western Australia
ANNUAL RAINFALL: 480 mm
FARM SIZE: 1800 ha (1500 ha arable)
SOIL TYPE: Sand over clay, sandy gravel, heavy gilgai country
SOIL PH: 4.7 to 8.2 (calcium chloride)

Although Matthew prefers to use auto-steer, having the tramlines makes it easier if the system breaks down.
Changing climate, changing business practices: Lessons from innovative growers

Tramlines improving water infiltration at Neridup

Changing climate, changing business practices: Lessons from innovative growers

“On some soils where the chaser bin travelled to and from a set of silos, the crop just wouldn’t perform”

Matthew Jones.

“It makes a big difference when I am putting the crop in on my own,” he said. “If I go back to the smaller bar, I would probably need some help.”

Minimal machinery modifications

To move his system onto tramlines, the only major modification Matthew made to his machinery was removing three tynes from his seeding bar to create the 610 mm (2 ft) wide bare tram tracks.

“I didn’t see the point of running a tyne through something that’s going to be continuously driven over,” he said.

For inter-row sowing, Matthew uses 2cm RTK auto-steer, which he ‘nudges across’ by shifting the tractor. While the chaser bin has matching wheel tracks, the driver is required to move the implement off the tramlines when unloading the harvester. A 2.5 m conveyer belt extension added to the edge of the chaser bin to catch the grain from the harvester auger would assist, but at present, Matthew said he was constrained by time and money.

Tramline weed management

Going forward, Matthew’s network of tramlines may also play a bigger role in helping him to control weeds within his continuously cropped farming system. In particular, one modification he is considering is adding a board to the rear of his harvester to help direct chaff from the spinners onto the tramlines in paddocks where weeds have become a problem. He hopes this tactic will not only help rejuvenate his sinking tramlines but also enable him to target weeds more easily during pre-sowing spraying.

Tips for new players

To those considering a move into tramline farming, Matthew encourages extensive and careful planning with a book of graph paper and tape measure in hand.

“You can do it in your head and think you’ve got it right, but you won’t find out if it is correct until you drive the machinery into the paddock,” he said. “I know the first time I tried to work it out in my head and removed the tyne I thought needed to go, the trams ended up nowhere near where they needed to be. I was one or two tynes out.”

On some soils where the chaser bin travelled to and from a set of silos, the crop just wouldn’t perform

Matthew Jones.

Some of the 610 mm (2 ft) wide tramlines are sinking so he is considering directing stubble from the harvester’s spinners onto each track.

Note the wheel marks created when working machinery in wet conditions.

To set up the seeding rig for tramline farming, Matthew removed three tynes to make the trams.
Innovative Western Australian farmers, the Wooldridges of Arthur River, are responding to a drying and more variable climate by using Pasture Growth Rate (PGR™) technology to assist with management decision-making. Through Pastures from Space™, satellite data can be used to produce PGR™ when combined with climate and soil data.

Pastures from Space™ uses satellite images to estimate pasture biomass with 97 per cent accuracy and provides them with the information needed to plan for climate related contingencies and build flexibility in production systems. By using information from Pastures from Space™ about the season to come, the Wooldridges adjusted their stocking rate early in 2010 and minimised their losses in the driest winter on record.

At the start of each season Brad Wooldridge adjusts the area cropped and the grazing pressure. He has found that early organisation of agistment or grain purchases often provides a safety valve for a season turning sour, as indeed 2010 became. His plans to lower the stocking rate were implemented early in the 2010 season – PGR™ technology assisted with timely, informed decision-making.

He sees value in periodical forecasts of the dry matter production over the growing season. Each week during the season, he calculates the feed intake required for his flocks (per head per day) and compares this with the pasture growth rate estimates (PGR) (kg DM/ha/day). These revised estimates of PGR are derived using new information from Pastures from Space™ (see Science Behind the Story box).

The decision to move stock through the paddocks is guided by Pastures from Space™ information. He grazes sheep in rotation to best utilise pasture and works to ensure ewes are pregnancy tested and dry sheep are sold.

Key points
- Ready access to information can pay off with improved business sustainability and profitability.
- PGR™ technology and Pastures from Space™ provides information needed to plan for climate related contingencies and build flexibility in production systems.

Profile
Brad and Tracy Wooldridge
LOCATION: Arthur River, Western Australia
PROPERTY SIZE: 1260 ha
ENTERPRISES: a mixed cropping/sheep farm system, cropping about 70% of the arable area and using additional off-farm agistment.
MEAN ANNUAL RAINFALL:
1907-1975: 495 mm, 1976 - 2009: 423 mm

Science Behind the Story box:
- Pastures from Space™ uses satellite images to estimate pasture biomass with high accuracy.
- The technology provides timely information to manage climate risks.
- Decision-making is informed by satellite data, climate, and soil information.

(PGR) is an important indicator for pasture management. Its accurate prediction helps farmers adjust their stocking rates and production strategies.

The map shows Arthur River and its surrounding areas, highlighting key locations such as Mandurah and Bunbury.
Using information from Pastures from Space™, he has done paddock level trials to estimate the benefits to pasture growth from applying liquid nitrogen during August. This has led to the practice of spraying when conditions suit to assist weaner growth in spring. As the timing and distribution of early growing season rainfall becomes clearer, he may respond by:

- changing his cropping program;
- arranging off-farm agistment;
- putting nitrogen on pastures ahead of an expected June deficit; or
- purchasing stock feed.

He says the idea is to pay close attention not only to tools offering real-time information but also to developing contingency plans for a timely and effective response.

In parallel with his wool sheep, he has a programme to develop a flock of meat sheep based on composite ewes crossed with Suffolk and also Merino/Suffolk cross ewes crossed to Dorper or another meat breed. He is evaluating the relative economics of this alternative enterprise.

Brad also sees the importance of building flexibility in his annual cropping program – allowing him to maximise gains and minimise losses when prices, costs and climate are challenging. Potential exists for his meat sheep operation to extend across the farm if the economics, including labour considerations, stack up.

He takes an active approach to developing and maintaining personal networks. These include not only fellow farmers, suppliers and service providers, but Department of Agriculture and Food, WA (DAFWA) and CSIRO researchers. All these people have helped him improve his planning capacity and his knowledge base for decision-making on his farm. By giving presentations about his decision-making practices to audiences of fellow farmers, he promotes two-way information exchange about his innovative approaches.

With support from their networks in the local community and continuing advice from the previous generation, the Wooldridges are positive and engaged with the many challenges arising in their farming business. They have a clear set of goals for the business and family, based on much discussion and planning, valuing education, and being open to new ideas and innovations. As grandmother Wendy attests, there is a family tradition of planning for succession, according to the strengths and interests of each family member.

**Conclusion**

Many farming businesses embody the resilience demonstrated by the Wooldridges. By planning ahead and adjusting to seasonal variation, they are on a path leading to long-term adaptation to future climate challenges.

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**Science Behind the Story**

The Pastures from Space program provides estimates of pasture production during the growing season by means of remote sensing. Satellite data is used to accurately and quantitatively estimate Pasture Biomass or Feed On Offer (FOOT™) or combined with climate and soil data is used to produce Pasture Growth Rate (PGR™) estimates. Pastures from Space (http://www.pasturesfromspace.csiro.au) is a joint project of CSIRO, Department of Agriculture and Food Western Australia and the Western Australian Land Information Authority (Landgate).

Brad Wooldridge uses Pastures from Space to get an estimate of Pasture Growth Rate (PGR™) (kg DM/ha/day) which he can use to calculate stocking rate. He has developed an empirical relationship between rainfall and annual Dry Matter Production (DM) for his farm. He uses this to calculate the possible Stocking Rate for the season:

\[
\text{Stocking Rate} = \frac{\text{DM Production (kg/ha)}}{500} - 1500
\]

This translates into a working rule that for every 10 days the season breaks before or after May 12, the Stocking Rate is increased or decreased by 1 Dry Sheep Equivalent (DSE), up to a maximum of 18 DSE/ha. This, in turn, follows from a projected increase or decrease of about 0.5 t/ha DM per 10 days.

These concepts were originally developed from work by Mike Hyder and Mike Grimm of DAFWA. Brad Wooldridge has discussed them in depth with Gonzalo Mata of CSIRO, Steve Gherardi of DAFWA and his consultant.
New sheep breeds show promise for future climate
David Gray and Meredith Fairbanks

The Ditchburns of Kukerin manage a mixed-farming system – running sheep for meat and wool in conjunction with cropping activities. The stubbles and the non-arable parts of the landscape provide a substantial annual source of feed, necessarily augmented in the long dry summer period and during the cold winter. In the face of new farming challenges, including a drying and more variable climate, adapting new technology has been the key to improved sustainability and profitability of their farm business.

increased severity of droughts have reduced yields, sheep feed and hence cash flow. There have also been challenges in the form of changes in price relativities, especially a continuing relative increase in the real price of sheep meat compared with a static or slightly declining real price of wool; and a continuing relative increase in the cost of farm labour, given that many farm workers have been attracted to the mining industry.

These challenges prompted the Ditchburns to investigate other sheep breeds. They wanted a breed that would be productive, easy to care for and more drought tolerant than the traditional Merino.

They chose the Afrino breed because it offered sustainable lamb production in increasingly tougher climatic conditions – a significant departure from the typical production of mainly mid-micron wool.

The Afrino requires no mulesing and had a lower incidence of fly strike, resulting in labour and maintenance cost savings. The sheep were bred using Artificial Insemination and Embryo Transplant technology.

Like many other mixed farmers they have also been early adopters of so-called ‘lick feeders’. These are self-feeders which slowly release cereal grains to avoid overeating by sheep and the resulting acidosis. Lick feeders reduce labour requirements for sheep feeding, allowing more focus on cropping activities and associated machinery maintenance.

Key Points
- New adaptive technologies hold promise for farmers challenged by climate uncertainty.
- New, more hardy, sheep breeds like the Afrino can help build resilience in mixed farming systems susceptible to a drying climate.
In September 2010, the Ditchburns held their first stud sale of Afrino rams along with their traditional Merino stud sale. In the midst of one of the worst years for crop and pasture yet experienced in WA, the sale was nevertheless quite successful. Of the 13 pure-bred Afrino rams on offer, eight were sold at an average of $1,600 and a further four sold after auction. Their stud Merinos also sold well, considering the season, averaging $905.

**Conclusions**

Progressive farmers like the Ditchburns have taking the initiative in responding to climate challenges by:

- Introducing to their farming system the drought tolerant Afrino sheep, which not only produces wool but also better weight gain and carcases than the Merino;
- Successfully developing a new enterprise stud, breeding the low maintenance Afrino sheep (clean breech – no mulesing) that requires less labour and hence expense.

**Science behind the Story**

The Afrino breed was developed at the Carnarvon Agriculture Research Station in South Africa. Afrino foundation genetics consist of 50% SAMM, 25% Merino and 25% Ronderib Afrikaner (a white-woolled Fattail). The breed is performance-tested and designed to thrive in tough pastoral conditions. They were bred to provide hardiness, fertility and growth. They grow white-woolled fleeces with 17 – 21 micron with 99% C.F. The wool has been accepted locally as being identical with merino wool.

The Afrino produces a lamb with good carcase characteristics. They do well in tough marginal and pastoral areas in which traditional merino flocks have been run. Rams are classed on growth and wool quality, whereas ewes are classed on fertility factors: establishing a pregnancy, unassisted lambing, successful, and fecundity. In a dual purpose flock in a tough low rainfall zone where there is an emphasis of say 70% meat to 30% wool, the production in terms of kg of lamb per ha is a crucial statistic. The quality of the fertility is therefore important in this style of flock.

They are clean-faced, clean-limbed and clean-breeched, not requiring mulesing. The wool cut per head is lower than the Merino, by about 1.3 kg, with fewer low quality tailings, but otherwise identical.
Rainfall has been declining relative to the long-term average over the past 30 years in the Western Australian wheatbelt. Kojonup has seen a decline in annual rainfall of about 40 mm over the past 30 years. To adapt to a variable climate, the McGregor’s of Kojonup have used perennial pastures for summer feeding, rotational grazing to preserve annual pastures and moved cattle when food on offer (FOO) is conservative.

Originally from Scotland, Jim and Pam McGregor have a strong sense of their reliance upon and mutuality with nature. Strongly committed to sustainable farming, they aim to balance the nutritional needs of their grazing herd with the productive capacity of pasture. They look at the amount and quality of pasture on offer and plan the grazing to best match the herd’s needs. They could see the value of perennials and wanted to find out more.

They have been trialling perennials as part of the species mix including Tall fescue (*Festuca arundinacea Schreb.*); Phalaris (*Phalaris aquatica*); Cocksfoot (*Dactylis glomerata*) and Rose Clover (*Trifolium hirtum*), lucerne, chicory, perennial rye and Setaria. Annual species, including subterranean clover and annual rye grass, are also part of the mix. They are looking at alternative, more economical methods for introducing perennials into the mix of species.

One idea is to strip sow perennials, preceded by strip spraying to prepare the way for establishment. They want a more cost-effective way of establishing a mix of annuals and perennials compared with first establishing a perennial dominant paddock, and allowing regression to an annual/perennial mix. Year-to-year climate variability adds to the complexity in determining the “right balance” of pasture species.

They have been examining different recovery periods after grazing to see the effect on perennial survival and colonisation. From initial investigations it became evident that perennials may only need to be established once, and their survival may depend on appropriate grazing management. They explain that managing perennials requires a completely new paradigm and willingness to change with the promise of improved productivity and resilience.
Grazing management of perennial pastures makes a difference

The management approaches applied in these trials also underpin management of their pastures. These methods are:

- **Planned Grazing.** They try to improve management of perennials and their planned grazing system aims to maintain cover on the paddocks all year round, improving water infiltration and limiting wind erosion. Jim McGregor visually judges when a mob should be shifted to a recovered paddock. He explained that the length of recovery since the last grazing depends upon the time of year and growing conditions. During autumn and winter, growth is relatively slow so recovery periods range up to two to three months. Faster growth at the height of spring generally means faster moves, but this is tempered by a need to build up a stockpile for summer rations. He explained that the grazing herd is moved at a FOO level that may be regarded as early by some observers used to sheep. However, he believes that there is a level of green matter cover which optimises pasture growth through optimum leaf area index and photosynthesis.

- **Easy Handling Cattle Management.** He uses a system of calls which the cattle recognise, and to which they respond readily, minimising the time taken to shift them from paddock to paddock. They are trained for frequent moves, to which they are generally very compliant.

Both of these key approaches are facilitated by a system of interconnecting smaller-than-normal paddocks, each of which terminates at jointly-accessible watering points. When the McGregor’s acquired the property, they increased the number of paddocks by a factor of about four.

The McGregor’s approach to soil fertility also reveals their capacity to both think deeply about their challenges and to engage in innovation. They are currently monitoring soil health in the context, not only of the standard measures of pH, available phosphorous, potassium and nitrogen, but also of microbial activity, regarded as underpinning the cost-effective use of fertilisers. They have also used ground mineral fertilisers, on occasion, rather than only conventional ones.

In their environment, Jim McGregor is addressing the challenge of the persistent presence of onion grass/guildford grass. Some regard this weed as being evidence of lower than optimal soil fertility. Where it has become wide-spread, it competes for nutrients and space. He is trying to create an environment that is unsuitable for these plants to survive and flourish.

One method of control in a permanent pasture is to graze down the grasses hard in late winter or early spring first by cattle, then preferably by sheep, and then knockdown with a herbicide. If a crop is grown in the paddock then normal methods of weed control are used before cropping.

He also tries to manage perennials so that they can serve their valuable role in responding to summer rains and variable climate. The need to hand feed may be reduced by their presence, and can be very useful for the young stock during the dry time. Chicory and lucerne especially have proved useful.

He monitors the grazing pressure on paddocks with an established perennial component so that pastures are not over-grazed. This proved important in 2010, as the dry winter and early spring were followed by good late October (15 mm) and November (36 mm) rains. The perennials responded to these rains with good pasture production to augment otherwise low quality, standing annual pasture.

The MacGregors are strongly committed to breeding cattle that will do well in a predominantly grass-fed, spring – flush environment and use performance measurement under the BreedPlan process. This approach to cattle management, selection and sale presentation has under pinned their stud cattle enterprise from its inception.

Jim MacGregor (left) and Jamie Hart, livestock agent, review the MacGregors’ selection of young bulls prior to their stud sale in early February.
Science behind the Story
The interest in perennial pastures in south-western Australia was initially due to the growing realisation that farming systems based solely on annual crops and pastures are not sustainable in many regions. Farmer experience and research have shown that incorporating well adapted perennial pastures into these systems can improve production, protect natural resources and build the capacity of these systems to adapt to future production and environmental challenges.

Perennial pastures have two key attributes: firstly they have a deep root system which enables them to use water and nutrients from deeper soil layers than annual plants and secondly, they can extend the growing season at both ends when conditions are favourable.

Potential production benefits from perennial species include: out-of-season green feed, increased carrying capacity due to improved seasonal distribution of feed and pasture use, ability to reduce or replace supplementary feeding in autumn, ability to increase production from land with a low carrying capacity, ability to turn-off animals at target live weights all year-round, reduced wool faults and maintenance of wool fibre diameter and staple strength, reduced fodder conservation, increased winter feed, opportunity to rest annual pasture paddocks and after the break of the season.

Soil conservation benefits include: increased water use and reduced deep drainage to ground water, maintenance of plant cover in summer to reduce wind erosion, increased perennial cover for waterways.

Further reading:
Moore, G., Sanford, P. and Wiley, T. 2006, Perennial pastures for Western Australia, Department of Agriculture and Food Western Australia, Bulletin 4690, Perth.
Changing climate, changing business practices: Lessons from innovative growers