Agricultural Competitiveness White Paper Submission - IP311
Pristine Forage Technologies
Submitted 16 April 2014

Pristine Forage Technologies

Building whole farm profits.

Agricultural Productivity White Paper
Written Submission

Andrew W.H. Lake

Andrew is a 35 year career scientist and research leader, specialising in plant breeding, genetics and farming systems. He spent the first part of his career in the public sector, during which he led a national breeding program, gained international reputation for his variety breeding work and was for a time branch Chief Scientist for a major public sector institute in SA. To date among other things, approximately 10 trillion seed of his pasture and forage legume varieties have been produced and sold around the world. He now heads Pristine Forage Technologies, a privately owned company which continues to build on this work. In particular, Pristine has established itself as the breeder and developer of new annual pasture and forage legumes that are setting new standards for super-fast growth and highly efficient water use. These are being used for cutting edge technologies to improve farming system productivity and sustainability, reduce greenhouse gas emissions and mitigate environmental impacts of global agriculture.

Major issues to which this submission has relevance

Food security/sustainability of production
Improving farm productivity and profitability
Improving competitiveness
Enhancing exports

Summary

- Productivity of Australia's major crops is falling in real terms, primarily due to overcropping and dangerous soil degradation.
- If unaddressed, this will increasingly render crop production and farm businesses unviable, will eventually cost billions in lost production and exports annually, and may even trigger a financial crisis through high rates of unrecoverable rural debt.
- If rectified however, we will add billions to value of production, broad acre farm businesses will be far more profitable and internationally competitive, and our exports will expand to feed many millions more humans.

Problem

From the late 1980s, broad acre farming systems and rotations changed away from having legume pasture leys within the rotation to more intensive or continuous cropping. Among many other negative or problem aspects of these systems vis-à-vis the ley systems they replaced (as have been emerging ever since), they are usually almost entirely reliant on chemical nitrogen fertiliser for maintenance of soil fertility and consequent crop productivity. However as now very extensive experience indicates, these are conflicting aims; with fertiliser N in our environment, it has not been possible to maintain productivity and soil N levels at the same time.

As the principal functional component of all proteins and enzymes, N is both vital for all life processes and the primary driver of growth. Aside from directly affecting plant productivity, its decline also negatively affects soil microbial life and health, leading to increasingly degraded soils and an inability for them to support adequate crop yields.

However while inexorable, these problems are slow in their development. Without good objective records or R&D data to compare, they can easily pass unnoticed, as they largely have been here.

Consequences; biological productivity

Since the middle 1990s, crop yields have declined dramatically compared to both the previous trend and to global yields, and ultimately in real terms (Lake 2012a) (See Figure 1). This can be traced directly to the change in rotation system and in particular to the loss of biological N from soils and the consequent soil degradation (Lake 2012b). *

Because of that degradation and N loss, yields today are no better than they were 20 years ago, despite the fact that,

- we use far higher yielding varieties,
- machinery and production technologies are far better,
- chemical and fertiliser inputs (particularly N) are far greater and more timely,
- money spent growing the crop is far greater, and
- almost all farmers are now using (and having to use) professional advice.

* It should be noted here that other problems associated with removal of pasture legume leys and heavy or continuous cropping are not inconsequential either, but are generally soluble, albeit at considerable and increasing cost to the producer. These increasing costs also have impacts on viability and international competitiveness.

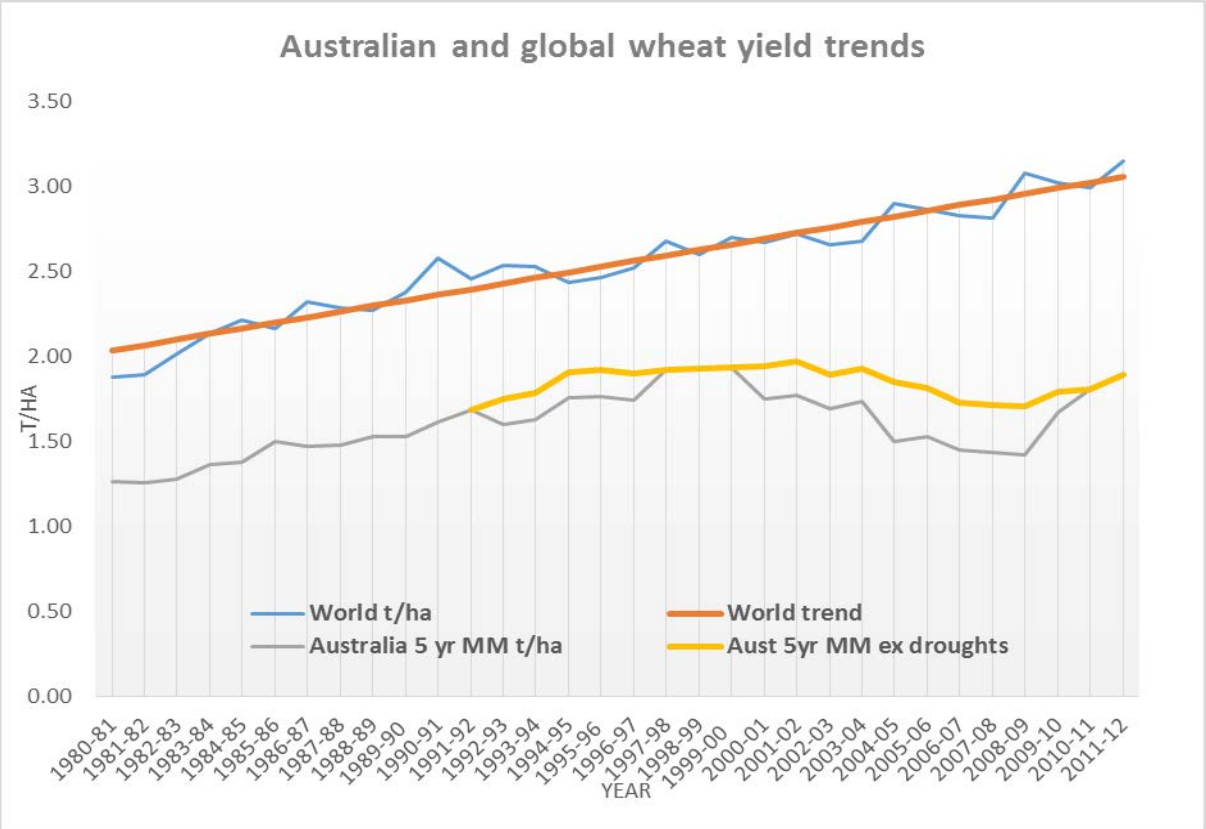

Figure 1. Wheat yield trends (t/ha) since 1980. World wheat yields (blue line) with its average trend (orange line) plus Australian wheat yields, expressed as 5 year moving means (grey line) and with drought effects removed to iron out seasonal/climate variations (gold line).

Consequences; economic impacts

This fall in real productivity coupled with the rise in costs of production has squeezed average real farmer crop margins down from > 30% to < 10% of gross income, even though everyone else in the wider crop industries other than the farmer is still making money. As a result,

- farm business viability and production competitiveness are being severely compromised; international competitors can produce and supply the same products far more cheaply,

- production cost cutting is accelerating degradation; N fertiliser is very expensive (it is now usually the greatest single crop input cost) and is usually the first input that is cut, thereby increasing the drain on remaining soil N reserves,
- many farm businesses are now only capable of making a profit in years when both crop prices and yields are high, but the land is still being exploitatively cropped every year in the hope of covering immediate cash and farm debt obligations,
- off-farm industries that sell the tools for cropping but are not subject to the associated risks and costs of crop failure and soil degradation (eg cropping advice, chemicals, fertilisers, machinery, finance) also continue to pressure farmers to grow more crops,
- this downward spiral eventually ends with soils almost bereft of N and not able to grow a crop, land degraded beyond economically viable repair and farmers walking off,
- financiers are then left holding written off debt and worthless land, and remaining farmers pay higher interest rates, further reducing their business competitiveness and viability.

Note that the alternative broad acre production option of sheep grazing is profitable, sustainable, provides sensible enterprise diversification and resilience in the face of climate change, but many farmers are too far committed to cropping to be able to change to that in the short term without assistance. They have their current financial obligations to meet, and in order to change, need to sow pastures, upgrade fences and infrastructure, purchase sheep, etc. Those up-front cash costs are usually beyond their capacity to meet in the short term.

Nevertheless:

If this decline is not halted and reversed, then Australia is in danger of losing most of its broad acre cropping land to irreversible soil degradation and loss. That will mean the accompanying loss of tens of thousands of farm and associated businesses and industries, many billions in value of production and export income, and even Australia's capacity to supply its own food staples.

A short note on social factors and impacts

One of the major problems facing the entire industry is the constraints to change imposed by the fact that the average age of farmers is now approaching 60. Some of the specific negative influences on change achievement that this has are;

- older farmers are more set in their ways and more inclined to stick with what they know
- their perceived time horizons are in years, not decades, so that longer term solutions to problems are not attractive and short term "patches" are more likely to be employed
- older farmers are far less capable of the physical aspects of animal management that may accompany rotation change; it is easier to drive a tractor than to crutch a sheep

The focus on a potential retirement and the means to be able to achieve that retirement is also likely to be foremost in the minds of many farmers. In the absence of an intra-family handover, that either means a sale of the property, or that the incumbent will walk off or literally be left to "crop until he drops". Given that the land is degraded and increasingly unlikely to attract a buyer at a price the farmer needs to meet debt and retire, without change, the latter two options are likely to become an increasingly common and unfortunate means of farmer exit.

Solutions; general industry changes needed

The only currently viable solution to this problem for the vast bulk of the broad acre cropping zones in Australia is to introduce improved legume ley pastures and sheep (or cattle) into farming rotations. This will directly cut crop production costs by removing the need for N fertiliser and providing new, more effective tools to address the manifest and growing problems caused by heavy/over cropping in these zones. In time, it will also restore soil organic N banks and crop productivity, increase production diversity, total system sustainability and resilience to drought and climate change. This will then restore both farm business profitability and competitiveness, plus boost total agricultural production value, exports and contribution to the economy generally.

While there may be some short term down-turn in total crop production due to the reduced area of crop, the greater production per unit of crop area, plus the additional agricultural production

afforded by the improved pasture, for example as higher value products (sheep meat and beef) for the developing Asian market, will more than offset that over time.

In any case, the alternative is an ongoing and ultimately irreversible decline in crop production as land is lost to soil degradation.

However, this whole solution will not be achieved in the short term, due as noted to the widespread loss of animal production infrastructure (fences, water-points, etc), the lack of stock to use the improved pasture and the lack of seed needed to sow improved pastures.

Presupposing change to the appropriate attitude to adoption (itself a major problem), achievement of the solution will therefore require a gradual, but ongoing and sustained build-up of seed, sown pasture area and sheep numbers, and restoration of production infrastructure over time. While it needs to be sooner to minimise land losses, it is expected that a full implementation of these restorative ley farming rotations and consequent flow on of increases in total system productivity will probably take up to two decades to achieve, even with an immediate commencement.

Solutions; argument for specific actions to address adoption barriers.

While there are multiple barriers to adoption of these more productive and sustainable soil remediating rotations, there are three primary barriers that may be addressable by government action under the auspices of the white paper.

The first relates to knowledge. There is a lack of both industry-wide acknowledgement of this yield decline, and even where acknowledged, an understanding of what is causing it and how to most effectively remediate it in any region. This can be solved by longer term investment in R, D&E to demonstrate this decline and its solutions down to a regional or local level.

However, while considerable government and RIRC funding to that end is justified, it is unrealistic to expect any major changes to an industry knowledge base sufficient for this to encourage adoption of more sustainable rotations in the short term (5-10 years) by this means alone. Given the time lags involved, both to get to that point and then to actually adopt these new rotations, far too much crop land is likely to be permanently lost before this bears fruit. Effective early action to minimise that loss requires addressing of the more immediate and fundamental adoption barriers discussed below.

The second barrier is the availability of seed of suitably adapted pasture and forage legume varieties. Current production and sales of these varieties into the cropping zones are totally inadequate to meet the needs of such system change. We estimate that to sow the requisite areas of ley pasture, more seed of these varieties will need to be produced and sold *every year* for the next two decades than has been sold into these zones *in total* over the last two decades. Further, given current very low sales and poor margins, the seed industry cannot afford to be proactive in this market. At the very least, it must wait until it is very confident of an upturn before contracting production to meet it. Such a seed production response therefore lags sales changes by at least a year and more realistically two years. Hence this lack of seed availability will be a very significant drag on at least the early stages of change adoption.

The third barrier is farmer debt burden and the consequently magnified disincentive posed by immediate cash costs of change adoption. Farmers are locked into generating immediate returns via cropping and do not have the economic freedom to want to, or to be able to invest in longer term strategies such as reversing this soil degradation by sowing pasture legumes. In this, the cash cost of the actual seed of well adapted varieties is the primary concern. As most farmers have the machinery needed for any ground preparation and sowing, the only other significant direct cash costs are for fuel. These are minor. Other costs (eg for upgrading fences and infrastructure or the breeding or purchase of sheep) are incidental, in that most of the benefits of system change (improved soil N levels and health, disease break effects etc., and consequent crop productivity and profitability increases) are derived directly from the legume. The additional profits and benefits from grazing the legume pasture are in effect the cream on the cake.

Both of these immediate and fundamental barriers to adoption of the requisite rotation changes are interrelated and can be boiled down to pasture legume seed availability and cost. At present, industry is unable to produce, and farmers are unable to purchase the seed needed for these changes. However, once farmers start purchasing, then industry will start producing the seed to meet those markets, albeit reactively in the early stages.

Hence without in any way attempting to pre-empt, prejudice or limit any other means that may be devised to promote adoption of these rotations or to find other ways of economically reversing degradation, we suggest that government consider providing direct rebates to the farmer for the cash cost of purchasing well adapted legume varieties[**].

This will give farmers an immediate and highly cost effective incentive to adopt degradation-reversing ley rotation systems, plus send a direct message to cropping industries in general that changes are urgently needed. It will also assist in minimising the problem of seed availability. If farmers are aware that they can get a rebate on seed purchase costs, then they will be able to plan pasture legume sowing one or two years ahead of time and to place advance orders for seed to enable its timely production by industry to meet those plans.

Such a rebate scheme will probably have limited uptake and cost to government to begin with, but seeing as farmers mainly adopt new technologies from their neighbours, it will be very useful as a catalyst for broader scale and much more rapid adoption of more productive and sustainable rotations than could be achieved by relying entirely on the new R&D and trial work referred to above. Once this change is so catalysed, the rebate, while still more than justified on cost/benefit grounds to government alone, could be reduced or phased out in a manner commensurate with maintaining momentum for adoption of these better rotation systems.

On a wider scale, such a policy will also have multiple short and long term public benefits. Inter alia, it will;

- signal the community in general that sustainable farming is a public priority,
- strengthen regional Australia by returning profitability to broad acre agriculture,
- build export income earning and strengthen Australia's capacity to be Asia's foodbowl,
- demonstrate that the triple bottom line (higher production, higher profit and better environmental outcomes) is achievable in our agriculture, and
- establish Australia's reputation as the leading nation for productive and sustainable dryland farming systems.

Conclusions and recommendations

1. Australian crop yields and farm returns are falling dramatically in real terms due primarily to progressive soil degradation that traces to adoption of more intensive cropping systems that are unsustainable with our climate and soils.
2. Arresting that soil degradation and consequent yield decline is vital to restore viability to Australian crop production and to build future production to meet world food needs.
3. The only currently proven means by which this degradation can be reversed is via introduction of legume pasture leys into the rotation, but doing so will be an extensive process time-wise and is hampered by various factors such as cost and current availability of seed of suitably adapted pasture legumes.
4. Given that immediate action is needed to minimise further land loss and the limited capacity of farmers to fund such actions, direct government intervention is warranted. Specifically we suggest that government could assist in the short term by underwriting the cost of pasture legume seed purchase and in the mid-term by funding, either directly or through the RIRC system, R&D into longer term farming system sustainability.
5. In view of the gravity and extent of this productivity loss and its actual and potential impacts right across the broad acre cropping industry, a range of other remedial measures are also highly likely to be justifiable.

Andrew Lake
Managing Director
Pristine Forage Technologies
15th of April, 2014

** As a breeder of pasture and forage legumes, Pristine notes its commercial interest in this.

References;

Lake A.W.H. (2012a). Australia's declining crop yield trends I: Donald revisited. In "Capturing Opportunities and Overcoming Obstacles in Australian Agronomy". Edited by I. Yunusa. Proceedings of 16th Australian Agronomy Conference 2012, 14-18 October 2012, Armidale, NSW.

Lake, A.W.H. (2012b). Australia's declining crop yield trends II: The role of nitrogen nutrition. In "Capturing Opportunities and Overcoming Obstacles in Australian Agronomy". Edited by I. Yunusa. Proceedings of 16th Australian Agronomy Conference 2012, 14-18 October 2012, Armidale, NSW.

Visit our web site at www.pristineforage.com.au
Contact email Andrew Lake; andrew@pristineforage.com.au
8A Gurney St, Edwardstown, SA, 5041.
Ph: (08) 7225 0394 Mob: 0418 818 798