Economics of Machinery Manufacturing

A Western Australian Wheat belt Perspective



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Executive Summary

Capital required for the purchase of grain production machinery is now a significant part of any producer's budget. The vast majority of equipment used in Western Australia (WA) today is imported from North America and the European Union; very little is manufactured locally. Understanding why capital equipment is so hard for producers to afford, is critical for manufacturing companies to be able to develop products and meet their sale targets. Understanding the associated costs and techniques of machinery manufacturing around the world, will lead to local products and their development opportunities being a successful enterprise. Small, low volume manufacturing into a niche market can provide agricultural machinery at a competitive cost.

Enhancement of our local manufacturing base allows producers the choice of product to buy. At the moment, choice and competition is significantly lacking within the WA market place. Governments at local, state and federal levels have an important role to play in providing the necessary infrastructure for regional development, complimented by a competitive tax environment.

Primary producers have three options for machinery acquisition; to buy from and support local entrepreneurs through established or emerging companies. To direct import into Australia equipment from overseas', or to custom build their own equipment on farm. The vast variety of machine's required in today's agriculture sector, means primary producers will always be using a combination of machinery acquisition methods.

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Foreword

The eastern wheat belt, low rainfall zone of Western Australia (WA) presents many challenges to modern day primary production. The challenges include less than 325mm of rainfall, with shallow, very old and weathered soil types ranging from highly abrasive white sands through to red clays. Without the now standard practice of No-Till and the associated soil moisture conservation techniques developed to farm the land, severely low rainfall over the past decade would have seen many more producers leave the land due to the financial pressures applied by banks. The capital requirement to "start out farming" in today's climate, sees the amalgamation of landholdings, not new primary producers coming into the district which was once the norm. This has flow-on effects to the local communities, volunteer groups, sporting associations and the like. But the biggest impact is on the expanding enterprise. More land means either longer work days (labour requirements) or most likely larger machinery.

Having access to the latest technology does not always increase profit. Having access to equipment which significantly increases efficiencies, cuts operating costs, decreases reliance on outside labour and most importantly, increases the quality of life for the producer are determining factors for capital purchases and profitability of the business.

For my family's enterprise, this has meant building equipment that has been unavailable "off the shelf", to suit our requirements. In particular bulk grain handling products. Having experienced the benefits of this real, increased production with less labour units required firsthand, finding the means for our producer colleagues to achieve this as well will allow them to survive on the land in the longer term. This is critical to my business as we trade on the world market bulk commodities of wheat, barley and canola. It is about economies of scale in production, marketing and continual supply. I need other local producers growing the same products profitably so we can all compete in the global marketplace.

So much of our broad acre equipment comes from North America. I focused study time driving up through Kansas, the Great-Plains of United States of America (USA) and through 7

the state of Saskatchewan, Canada, looking at the equipment manufacturers of the products we use to find their best manufacturing techniques. I also looked at the various arrays of business models used and company structures, getting an understanding as to why and how their success can be replicated here in the eastern wheat belt of Western Australia.

Time spent in South East Asia was investigating the use for flour, ground from the wheat grown in WA. I was escorted through four different styles of factories. The contrasting differences of the factories due to the final market for the product were most apparent, yet the floor layouts and production logistics were similar to what I experienced throughout North American agricultural manufacturing.

Italy gave an insight into the issues of an economy struggling to evolve from the 2008 economic downturn. High government taxes from the austerities measures are driving manufacturing companies towards Asian production. Economic factors from Government policies are significantly affecting the sector in this part of the world.

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Brother Colin - for taking care of business while I was away.

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Abbreviations

AUD	Australian dollar
Со-ор	Co-operative
CPI	Consumer Price Index
EU	European Union
JD	John Deere Ltd
OH & S	Occupational health and safety
R&D	Research and Development
SME	Small to medium enterprise
USA	United States of America
USD	United States dollar
WA	Western Australia

Objectives

My main objectives were:

- Understand why so much equipment comes from North America and the pricing mechanisms employed by these companies.
- Determining the differences in manufacturing costs between Australia and our major suppliers of agricultural equipment.
- Analyzing the strengths Australia has for manufacturing, and how this can relate to a business model to supply cost effective equipment to the Australian grain producer.
- Creating a factory-floor setup template for a new enterprise in agricultural equipment production.

Chapter 1: Introduction

Around 4,200 registered grain growers in Western Australia (WA) account for a recognizable percentage of Australia's GDP. 15.8 million tonnes of cereal grains, oilseeds and legumes were delivered into the state's receival system in the 2013/14 year, of which more than 95% will be destined for export markets (CBH Group, 2014).

The cost price squeeze in agriculture, international trade issues and adverse weather events are all part of modern agriculture today. Grain producers combat these with prudent financial planning, farm production planning, integrated weed management actions and the biggest factor, no-till seeding techniques. No-till/minimum tillage in Australia has given producers the ability to work vast areas of land with limited labour, producing food for export to satisfy the world's appetite for quality grains. Large machinery, with new technology and techniques, has replaced many farm labour jobs. This comes as a significant capital outlay to the producer, but one justified by the benefits achieved through production efficiencies gained, which is required in today's economic environment.

In budgets of grain producers from Western Australia today, a very significant and growing part is for machinery replacement. Historically figures used for year in year out budgets have been 10% of current machinery capital cost. This is still true for today's budget's, only the much higher capital cost of current machinery requires significantly more cash to purchase new equipment. This cost to purchase new equipment, for production gains and efficiencies, is at an all-time high for producer businesses in the WA wheat belt; agricultural consultants Farmanco have highlighted these trends, "Since 2002, the average investment in machinery has increased from \$674,375 to \$1,341,291, an increase of 99%" (Nankivell, E. 2012).

In the WA marketplace, this machinery is dominated by John Deere Ltd (JD), CNH Industrial N.V. and to a lesser extent, AGCO Corporation (European origin). Local manufactures are few – but do have a place in the market competing alongside the multinationals. Most equipment in WA is sold through dealerships or equipment resellers; only a handful of local manufactures have direct sales to the primary producer. Local agricultural manufacturing 12

creates products specific for the target market in the area. This was a reoccurring observation throughout the world on the author's travels. Prior to a particular piece of equipment becoming a success in the export market, it needs to have been successful locally and to have saturated this market. For the WA manufacturer, innovation in both design and manufacturing techniques are key components used to compete for the producer's dollar against their international competitors. Recognizing and respecting we are in a global marketplace is paramount to the success or failure of an enterprise, wherever they are located throughout the world.

Business classes are now teaching a move from cost plus pricing – to what markets can bear. "This results in a move towards minimal inventory holdings and made-to-order products only" (Green, R. 2013). Short work contracts are used to cover the busy part of the year, leading to the effect of a workforce not having pride in their workmanship and lacking in the necessary skills for the task at hand. Onsite training occurs, but quality issues with the products can arise from this itinerant natured workforce. In agriculture's regular boom and bust cycle, demand drives pricing up on limited stock when producer's fortunes are good. Equipment manufacturing volumes are scaled back in the poorer seasons, but the price remains set by the good times. Accelerated inflation of a products price is the result seen by the primary producer.

The buying power of the Australian dollar is reflected in the Consumer Price Index (CPI). The average weekly earnings of working Australians today have by and large kept pace with the CPI over the past 40 years. However, the buying power of wheat is only 16% of what it was in 1973 (Green, P. 2014). In this example, when a producer's income is set by the tonnes of wheat he can grow, coupled with the accelerated agricultural rate of cost inflation – it becomes quite clear why new equipment purchases seem out of balance with the average producer's income. The question of "Why does machinery cost so much today?" is merely a reflection of the percentage of physical production required to generate the necessary cash flow for capital purchases.

Chapter 2: Where does our equipment come from?

2.1 The mechanization of Australian agriculture

As a Commonwealth nation our heritage devolved from Great Britain, who settled this land. In the early years, all our trade was for the benefit of the British Empire, trade was primarily with the English-speaking nations. Having an understanding of the cultural issues and language itself, led importers to deal with what and who they knew. Hence, the equipment and agricultural machinery in the early days was European designed.

As agriculture expanded it became apparent that the European equipment was not suitable for our environment. Early in the 1900's mechanization of Australian agriculture took hold. This heralded a new age of machines and concepts for harvesting, seeding and general grain handling. These were developed and built here in Australia; most notably H.V. McKay-Sunshine Harvesters. The industry had a ready market in all the new country being opened up across our land. These companies – such as Sunshine, Chamberlain, were all profitable enterprises, but with a limited Australian market. Corporate investors from North America eventually bought them out, taking the technology home and building on the designs for their own country and for their growing export markets.



Source: Green, P. (January 2014) Chamberlain C670. WA Built.

During the 1980's, a dramatic downturn in the fortunes of producers saw the majority of these Australian equipment manufacturers close their local production lines, never to reopen. The market for the products had dissipated due to a number of factors affecting producers' confidence worldwide in buying new equipment. With shareholders requirement for a reasonable capital return on their investment, managements decommissioned the unsuitable factories and concentrated on centralized hubs to manufacture their range of products. Smaller, niche market orientated manufactures were the result in Australia when the multinationals closed up.

During this time the North American equipment manufacturers could see how the Australian designed equipment produced concepts suitable for their own country. This led to the agricultural practices of North America becoming very similar to Australia in the way land is worked. Size and scale of equipment was the future to increased production efficiencies. This new demand created money for research and development (R&D) work to again be done, with manufacturing of products close to the ready market as the result. Today, Australia's majority of farm equipment comes from North America. Trade agreements of the past between our nations; have created a simple method for Australians to import this equipment.

The rise of Asia and South America has opened up many opportunities for companies to have their products manufactured in a much lower cost environment. Major factors influencing these expenses include low labour costs, land rents, energy pricing, government red/green tape and most of all the currency exchange rate as compared to first world countries. Workmanship and quality of products are rising, allowing more confidence from importers in trading with these non-traditional business associates bringing in parts and products for Australia's local market.



Source: Green, P. (September 2013).

Above photos were taken in Jakarta, Indonesia. On the left a bread roll making factory, for the local market, showing very poor sanitary and work hygiene – making product to a cost. On the right is a factory that has gained government export approval for waffle biscuits – the Western influence around expectations of workers' rights and factory hygiene, demonstrates the efforts business' are striving for to gain quality and confidence of products for their export markets. Buyer's need confidence that the product produced, meets their requirements.

2.2 Negotiating the dealerships

JD is the most common brand of major grain handling equipment supplied to the agricultural zone in WA and as such the author needed to understand the profit drivers of the company and its sales franchises. Study time was taken up in and around JD dealerships throughout both USA and Canada, then compared to local WA dealerships. The privately owned and run businesses of North America dwarf the majority of WA dealerships in size and turnover of equipment. The high population of a region allows for a diverse workforce, as well as a greater number of potential customers for equipment. WA significantly lacks this population to sustain repetitive, high volume sales of equipment. Sloan, J. (Aug 2013), described the loyalty of his customers and his ability to move on second hand equipment within six months. He expects to be able to sell and re-sell the same piece of equipment three or four times over the useful working life of the particular machine.

Having the ability to make money as the machine is traded a number of times, allows for a

lower margin to be applied, but giving more opportunity at each trade by the dealer to make their commission. In contrast the WA marketplace is small, with a finite number of agricultural businesses. Dealerships have a need to make their money on the first sale. The second hand market is not as reliable as in the Americas; a local salesman described it as *"non-existent and primary producers see this in prices offered for second hand equipment trades"*. Recent years have seen partnerships formed between dealerships from the West and East of Australia, to gain access to the Eastern States market. This acts to become their outlet for the traded, used equipment. Dealerships allow approximately \$20,000 (when pricing used equipment) to decontaminate and transport a large machine from WA to the Eastern States. This is another cost to the market WA producers have to bear.

2.3 Global pricing via technology

The JD website has a link to allow producers to build their own equipment from a list of available specifications. Throughout the world any person can price a machine for purchase from their local dealership in the comfort of their home. Discrepancies between countries are accounted for by the freight and currency differentials, (calculated by the program on any given day), allowing uniformly global price for product.

Producers need to be aware that these prices are list pricing, or recommended retail prices. Agricultural equipment manufacturers often run promotional incentives, like early order programs in a particular country or region. This is to attract trade via discounting from the list prices, as well as reward dealerships for sales targets. Sales plans from JD head office dictate where and when the discounting takes place. For a producer in Australia who views a pricing opportunity overseas on the internet, it is just that, an opportunity to buy, or to use and apply pressure to their "local dealer" for some discounting as well. The success of this approach is dependent upon the individuals themselves.



Source: Green, P. (March 2013).

The above photos were taken on an American family's operation in Brazil. The nearest JD dealer is over 500kms away, so they import parts as well as new equipment direct from John Deere Ltd USA. They assemble and maintain the equipment on-site themselves. They achieve considerable savings by purchasing equipment this way. Dealerships are machinery brand resellers, acting as the link between consumers and the parent manufacturing company. Prior to arriving at a price offered to a primary producer, the JD dealerships add their costs and profit margins to the price they pay for the product from John Deere Ltd, which in turn is expected to pay dividends from sales profits to its' shareholders.

Chapter 3: Accounting the difference

3.1 Taxation

Operating a business can be fairly generic within a particular region, but large differences between regions and countries do exist. Individual tax rates can exist and various incentive schemes are expressed by governments to achieve whole-economy outcomes. Areas of low economic activity are often subsidized by governments to stimulate activity. Australia has a flat 30% company tax rate. In USA and Canada it depends upon which state or province one is in for the applicable company tax rate. Large, multinational companies take the region's tax concerns into account when new factory investments are made, but as always these investments have a complicated formula to determine final capital investment.



Table 1: Company tax rate Percentage paid in 2012 year

Source: John Deere Ltd, 2012. Caterpillar Inc., 2012. AGCO, 2012. Australian Tax Office, 2012.

Taxation is a significant component of any equipment's price. Though the difference between our supplier's rate and that in Australia is not too dissimilar. From Table 1 above, for company shareholders of JD to achieve 20% return on capital after tax, JD needs to charge cost of production, plus 30.7% to the customer (JD Annual Company report, 2012). For an Australian producer purchasing a North American built machine, this tax is going to the North American government. When equipment costs are in the hundreds of thousands of dollars, a lot of cash leaves our economy as taxation revenue to foreign governments, paid for by the Australian producer.

3.2 Global Wages

The wage differences between our nations show Australia at a distinct disadvantage. Skilled labour is in short supply within all the economies, leading to above award remuneration. Table 2 below shows remuneration in US dollars (USD) for the 2012 year – the most recent data available for direct comparison. From the data, *Australia has a 17% higher labour cost* *for manufacturing than the USA*. Products that have a high labour component in their build price are at a significant disadvantage. Note that AGCO's headquarters are based in Germany; John Deere and Caterpillar come from the USA.





Source: Charting International Labour Comparisons, 2012.

The emerging economies of the third world have wages significantly cheaper again. As most of WA's agricultural equipment is built in North America, it is these economies that Australian agricultural manufacturers compete against and the reason the author is focusing on these.

3.3 Australian dollar and wages invoice

The mining boom within Australia has rippled through the WA labour market with expectations of labour remuneration to be well above award rates. As with the primary producers, manufactures in the State find competing for skilled labour to be a balancing act between productivity and wages paid. Competing in a climate of historically low unemployment, it is a difficult task to achieve an efficient, productive factory line.

Table 3 below is the Australian Dollar (AUD) historical price over the past ten years. Exchange

rates between countries account for the major price differential primary producers around the world pay for equipment. With an exchange rate near parity against the USD, Australian manufactures have limited currency protection for local products.



Table 3: Australian dollar history compared to USD.

Table 4 below highlights the increasing weekly wage remuneration for Australians over the past seven years. Finding techniques in manufacturing that decrease the reliance on Australian labour, through strategic partnerships with low cost economies and innovative design will be the inevitable fact of future manufacturing in Australia.





Source: Australian Bureau of Statistics, 2014.

Source: Trading Economics, 2014.

3.4 Steel Price Rising

When the sales mantra is to buy before the price rise of steel comes into effect, one needs to understand where this comes from. Being a traded commodity, steel prices rise and fall depending upon global supply and demand factors. Table 5 below shows the raw steel global billet price in USD over the last 13 years. Australia's currency exchange rate influences the price paid by Australian manufacturers at any given point in time. If we are to look at the year 2007, the AUD was 12 cents lower than the 2013 year (12 month average, table 3) and steel billet prices were only \$20/tonne more in 2013. Adjusting for Australia's exchange rate, steel billets are 9.7% cheaper in 2013 for an Australian manufacturer to purchase, than 6 years ago. The steel price of a machine is calculated from the weight; price rises need to be justified to primary producers in line with the true cost of materials used.

Manufactures need the ability to purchase steel direct from mills, this requires large volume orders. In recent times it is becoming easier to purchase small orders, from Chinese mills in particular, circumventing the middlemen taking their percentages.





Source: Steelonthenet.com, 2013

Chapter 4: Australian Strengths

4.1 Looking through the windscreen

For Australia to be a competitive force in the manufacture of agricultural products, a business has to first recognize and respect, that we are in a global market. Consumers of today, with the use of the internet, have the ability to purchase any product, 24 hours a day, from anywhere in the world. With our historically high AUD, these products can be bought as though they are on the shelves of an Australian store down the street. Australia needs to leverage its strengths and be smart about what can and cannot be manufactured here locally. Dealerships and resellers need to change how they interact with producers; just selling equipment is unsustainable in WA. Producers are increasingly placing a higher value on service and product support, their businesses rely on this for productivity. Understanding that there is so much more to just manufacturing a product, can produce additional income streams to enhance the viability of a manufacturing enterprise.

Being an island nation, we naturally have a water barrier to cross for the importation of goods. Boats are only so big, giving a natural freight advantage for oversized products unable to fit inside a sea container or easily roll on - roll off the top deck of a vessel. WA grain growers recognize the production benefits of large equipment, almost unique to our part of the world and style of agriculture. But equipment size now is limited by this sea freight restriction. Local design and innovation will offer Australian manufacturers opportunities in this area.

4.2 With an eye on the rearview mirror

History shows Australia as being a very inventive nation. It has strong patent laws protecting inventors. A strong educational system delivers many professionals in design and engineering each year with an apprentice scheme delivering trades required by industry. It is through these people that our own innovation and design of products can be protected and used as a marketing edge for local manufactured products. This has been a legacy of previous Australian government investments. Unfortunately, the upkeep and delivery of the basic infrastructure, including transport, energy pricing, community amenities and telecommunications, has seen manufacturing in Australia being slowly suppressed from expanding. These are costs accounted for in factory operational expenses and consequently passed to the primary producer. These are costs associated with doing business in Western Australia and are the responsibility of government, for the benefit of the whole economy.

4.3 And your side window down

Partnerships are integral for any business. Whether they are financial involvements, consultation experts or trading partners for supplying goods, finding and achieving the right business synergies, makes or breaks a business. These partnerships will be both with local and global enterprises. Again recognizing we are in a global market, some products benefit from mass scale production techniques, whilst others need to have precision components made with the confidence of quality inbuilt.

In travelling the world it was noticed that as one moved further and further away from the point of a manufacturer of agricultural equipment, the products market share dissipated. A radius within approximately 150 km was the cut-off point to achieve a significant local build marketing advantage. For a town such as Hyden, this means it is a locality with the ability to reach the majority of WA's wheat belt. Cheap land for industry is available to purchase immediately and the area lends itself to the concept of assembly manufacturing with a stable workforce in a proactive community.

Locally built products give an easy and direct contact between the customer and the manufacturer. Rapid feedback on how the product performs in the paddock allows improvements to be made immediately. Service and education concerning the product is easily delivered by the manufacturer. Supplying a quality product, designed specifically for the regions environment, ensures that it works as it should and compromise is not required by the customer.

Chapter 5: Factory template for success

5.1Location

"All companies start out with a champion – someone to drive it, expand it and develop it." (Halford, J. August 2013.)

In agriculture, specialized machines required for a particular job have been built by such people in the region the machines were developed for. With the immediate market nearby, capital is put into a factory and R&D done in those local conditions. Hence, it becomes the home of that product. As these companies become mature, or when they achieve large scale production, other factors such as taxation, government incentives, material acquisition, labour costs and future markets for their products become a more significant part of the equation for expanding into a particular region.



Source: Green, P. (August 2013).

Photo of the original Conserva Pak[™] machine, invented by Jim Halford, Indian Head, Saskatchewan, Canada.

5.2 Quality assurance systems

Computers are used for data management of inventories. Various programs are available on the internet or specialist programs are written. Often these are incorporated into the factory floor workstations, giving management real-time data on production capacity. Employee capabilities can be tracked; build procedures can be fine-tuned for efficiencies. But most importantly if an issue arises with the customers' use of the product, faults can be traced back to the build stations or supplier for rectification.

5.3 Floor layout

A factory floor correctly setup is critical to getting the most performance out of employees and floor equipment. Decisions need to take into account the skill set of available labour; what parts are most efficiently made in-house should be balanced with the capital requirement for a particular workstation. It is also necessary to decide which parts must be made locally for quality control or design purposes and which parts can be outsourced. Outsourcing frees up capital, and is less reliant on the in-house labour force. Expertise and experience from outside the business can be utilized and leveraged. Greater efficiencies on the production line can be achieved with a well-managed parts supply chain. Less shed space is required for inventory and latest designs and innovation of parts supplied is managed by the experts in their fields.

Small manufacturers tend to start the floor work area as a "U" shape around the existing shed they are building in. A small workforce can be managed and product flow is easily visualized by management. As the company's needs expand for greater production, a straight line product enhancement concept is undertaken. Raw materials at one end are delivered, processing takes place at inline work stations, through to packaged equipment for sale at the other. This allows future replication to happen without disruption to existing product lines. It allows space for components to be delivered to a particular station efficiently, component supply and raw materials and finished products can be delivered and out-loaded at the same time. Equipment design changes can be achieved with only a particular work station redesigned without whole factory disruption. Creating flexibility is the desired outcome of this approach.



Source: Green, P. (August 2013).

Above on the left is the existing SeedHawk[™] factory as at August 2013. A floor work area constrained by limited shed space prior to the commissioning of the new factory. On the right is Bridgeview MFG Inc., with a straight line product enhancement model factory floor.

5.4 Product packaging

The final market determines the type of packaging required at the end of factory line. The initial design criteria of a product needs to take this into account. An agricultural machine destined for use a short distance from the factory, is assembled ready to go within the factory. If its market is overseas, it needs to be designed and packaged for sea or air freight options. This requires a dealership or distribution place for reassembly at the final destination, utilizing local labour and product support networks. These additional costs are incurred and passed to the final marketplace at local costing's.



Source: Green, P. (August 2013).

Above on left is a 24mtr SeedHawk[™] precision planter packaged to fit inside a sea container

destined for Australia. Similarly, on the right is a block of units being constructed at Indian Head, Canada. All units were prefabricated off-site and trucked as individual apartments to lift into place with a crane, completing the final structure. After the concrete base was erected, it took three days with crane to assemble all units into place - minimizing labour requirements and associated on-site building costs for the building consortium.

IKEA address these issues similarly by way of a flat pack design of their products. This achieves a freight advantage and uses the consumer to assemble it to their satisfaction. Production of products can take place anywhere in the world and each product can be freighted too and assembled onsite by the consumer. Innovative design makes the product – the skill set of the consumer determines how much of the assembly one can undertake.

5.5 Future expansion

Expansion plans of a company are driven by demand for product. Creating demand by increasing market share in a region or finding new markets, particularly through strategic partnerships, allows growth of the company. In an interview with W. Reatherford (August, 2013) GSI Group, he explains about the family owned grain storage manufacturing business' efforts to unsuccessfully expand into the European Union. An initial partnership and eventual takeover by AGCO Corporation, gave the GSI Group the ability to focus on this export market potential within the European Union. With an extensive dealer network in the European marketplace, AGCO provided GSI with this market access and capital for factory expansion to meet their resulting demand. GSI provided AGCO with a readymade and proven product range complimentary to their existing agricultural portfolio.

In an interview with Newcomer B, (21st August 2013) Rabobank, he identified the major reasons for smaller manufactures selling out to larger, global companies in the St Louis region (USA) as:

- Succession issues with no-one to carry on the business it is sold or amalgamated into larger companies with available capital.
- Costs of R & D are now too expensive for small volume production.

• Small producers benefit from the stability, distribution and market acceptance a global company can provide.

While Mr. Newcomer deals exclusively in the St Louis region of the USA, these reasons for loss or sale of small manufacturing businesses resonate throughout the first world economies, particularly the succession issues.

Successful products by definition sell themselves. Having the right business structure, with a clear vision for the future, allows profits to be realized by the company as well as supplying cost effective products to the marketplace. A succession plan, for both the human resource and developed product, is vital for a manufacturing enterprise to achieve longevity in the business world.

For Australia's farm machinery manufacturing sector to expand, it will need to embrace technology and efficiency gains of the mass scale, cheaper operating factories from overseas. These can be combined with our strengths in producing products suitable for our local requirements. Key products need to be identified that can be produced locally, outsourcing the other components to become an assembly point capable of matching the buyer's individual requirements.



Source: Green, P. (August 2013).

Above photo showcase's the Claas factory in Omaha, USA, (August 2013). The almost complete combine harvesters are built and packaged in Germany, transported to the USA in sea containers, to be assembled with a little local content for sale into the USA marketplace.

Australia's international competitiveness for labour intensive work has been lost, parallel to

this is the opening up of access to the low cost economies of Asia, South America and the eastern block of Europe. Accepting this fact and adapting to the global world trade in the manufacturing industry makes economic sense.

Chapter 6: Producers producing their own

The skill set of the Australian primary producer is varied, as is the associated workshop of the enterprise. Most have the ability to fix and alter existing machinery to keep the operation running. This means most have a workshop with the basic equipment required to manufacture an agricultural product. An analysis of the cost of materials, parts, skilled labour and personal time required to manufacture one's own product, can lead to some substantial savings. Having the knowledge of how a particular machine is assembled, how best to optimize the available workshop equipment and how to best utilize the enterprise's labour is key to building customized equipment. With low volume production, outsourcing the technical requirements, importing the mass produced components and marrying these together means a low capital requirement and skill set to complete the assembly. Designing product around readily available parts, allows future maintenance to be at minimal cost, with a low labour component at build stage.



Source: Green, P. (August 2013).

Above is Dickstar, F. (August 2013) utilizing the waste from his dairy and pig stalls, solids

went into compost and the liquids into a bio-digester producing methane to drive the above Perkins engine, (note the methane delivery hose to where he is pointing). This drove his water pump for the attached centre pivot. He designed and built it all to overcome his animal effluent waste issue.

An analysis will dictate whether or not it is feasible to build one's own equipment. The savings can be balanced against established manufacturers R&D, warranty and support. Timeliness for supply of the required equipment, coupled with the producer's own available time are factors to consider, but ones that can have a dollar attached to them and be accounted for. Focusing efforts on higher cost equipment, ones with few competitors in the market place and less complex technology behind them, will be where an individual can make the greatest savings with the least amount of effort for their business. The author views air seeders, air carts and bulk grain handling equipment as product examples which fit these criteria. These are products that can be easily scaled up in size during the manufacturing process for greater gains in operational efficiencies by the primary producer. The small parts such as bearings, shafts, hydraulics, etc., - are sourced from the low cost economies and then fabrication of the oversized components takes place on site with little labour. By not having the requirement to achieve shareholder gains, not needing to account for costly office staff, but utilizing one's own experience and the availability of a workshop already onsite is where the savings come from. This is how all agricultural companies, viewed by the author, originally started out. To what extent an operation develops is up to the individual and the life choices they make.

Chapter 7: Producer Recommendations

For the producers in Australia that believe they are paying too much for machinery, or for financial reasons cannot justify the cash outlay for new equipment designed to increase their own productivity, there are other options for obtaining this equipment. Local Australian tax laws around equipment leasing and Chattel Mortgage agreements, tax deductions, etc., come into play after the purchase price of the equipment has been agreed to by the producer. They are very individual for businesses and are outside the scope of this report.

7.1 Importing

In these times of a high Australian dollar, purchases from overseas represent good buying opportunities for Australian farmers. There are many importing companies, specializing in sourcing equipment from various parts of the world. The prices of products supplied onto the local market are generally based on what markets can bear. For farmers to realize world values for equipment, producers need to source the required equipment themselves. They then utilize an importing company for a fee, providing the expertise required to freight and clear the product through customs into Australia. The producer is able to assess whether the purchase is of good value, or if a local supplier of product can provide after sales service to a greater value of the direct purchase.

Direct importing can only save the primary producer a small percentage of the purchase price. Sea freight, quarantine and customs fees are the same for a dealership, or an individual. If the purchase price can be found significantly cheaper, or the local reseller's profit margins are excessive, then Australian producers will find it beneficial to direct purchase.

7.2 Supporting Local Entrepreneurs

Encouraging the next generation of equipment manufacturer is part of this report. While certain aspects of manufacturing are expensive within Australia, there is scope for agricultural products to be developed and manufactured competitively in the region where they are required. Significant market share can be achieved by being based in close proximity to producers. Providing product support and developing parallel income streams will supplement the entities profit margin. With a factory floor setup for assembly, addressing the issues outlined in chapter 5, and focusing on developing products as described in chapter 6, presents many opportunities for individuals to become a commercial success in manufacturing and giving primary producers the choice with marketplace competition.

7.3 Custom builds

Cost analysis of a custom build project will allow a comparison to be made and give an exact dollar value for any savings to be realized against an established manufacturer. If this is great enough, Australian producers will find it beneficial to custom build. Primary producers are very time poor; long working hours are systemic throughout the industry. Finding time during the year to manufacture equipment is the most common reason found by the author that Australian producers do not build their own equipment. Foreign owned suppliers of equipment to WA have very similar costs of production to Australia; savings for the producer in custom-builds come directly from the profit margins attached to this equipment by manufacturers.

For time poor Australian producers, the author sees merit in a farmers' Co–operative (Co-op) type structure, to custom build machines for shareholders on their individual farms. It would be envisaged to work like this:

- A limited number of skilled, permanent employees of the Co-op, travel to shareholders property in a timeshare arrangement between shareholders. The Co-op provides the material acquisition and base design of equipment. This provides some economies of scale for the producers enhancing their buying power for consumables and parts.
- The producer supplements the required workforce themselves, providing design changes and specification requirements of the machine to be built, as well as trade assistance when required.
- Producers utilize their own workshop and capital equipment for the build.
- Producer pays for the skilled labour, materials and background expertise provided by the Co-op at cost.
- Producers are already paying workers compensation insurance and abiding by Occupational Health and Safety laws as part of a farming enterprise. Safety responsibilities are the concern of the primary producer.

With little capital and assets, this type of co-op structure has the ability to be active or dormant, depending upon the shareholders requirements. Balancing the permanent employee's workload to achieve continuous employment will be up to the shareholders, and the greatest challenge.

An arrangement, such as described above between like-minded producers, can achieve significant savings on required equipment. Sharing the skilled labour, bulk buying of raw materials together and targeting the manufacture of large, and high cost machinery with few competitors, can create a positive financial outcome for the Australian primary producer.

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Plain English Compendium Summary

Project Title:	Economics of Machinery Manufacturing
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Objectives	 Understand why so much equipment comes from North America and the pricing mechanisms employed by these companies. Determine the differences in manufacturing costs between Australia and
	Determine the unreferes in manufacturing costs between Australia and our major suppliers of agricultural equipment
	• Analyze the strengths Australia has for manufacturing how this can relate
	to a business model to supply cost effective equipment to the Australian grain producer.
	Create a factory floor setup template for a new enterprise in agricultural equipment production
Background	Capital required for the purchase of grain production machinery is now a significant part of any producers' budget. The vast majority of equipment used today in WA is imported from North America and the EU, very little is manufactured locally. Enhancement of the local manufacturing base allows producers the choice of product to buy. At the moment, choice and competition is significantly lacking within the WA market place.
Research	This research concentrated on North America, as this is where the majority of our grain handling equipment comes from. Over 30 individual companies were studied, from both management and physical factory operation perspectives, to gain an understanding of how and why they are operating.
Outcomes	The key for agricultural manufacturing to remain competitive is accepting we are in a global marketplace and utilizing the low cost economies for mass production, focusing our efforts on the quality requirements locally and assembling the oversized equipment onshore. For companies, the cost of production in North America is only marginally lower than Australia – meaning Australians can be competitive in the marketplace. Primary producers, as individuals, have the ability to realize value from the use of already existing workshop equipment and configuring products suitable to their skill level and ability.
Implications	Western Australia is a limited market, but our requirements for grain handling equipment are unique. Local opportunities exist for manufacturing to satisfy this market and allow producers choice and comparition
Publications	Various procentations in the state of Western Australia through the Nuffield network
FUDICATIONS	and local papers.