NSW GOVERNMENT | Department of Primary Industries

Agriculture Industry Snapshot for Planning

North West Plains Sub Region

August 2020

The value of agricultural production in the North West Plains Sub Region was over $1.66b from a range of livestock for meat and wool, cotton, broadacre crops and nuts (ABS 2015/16). While the North West Plains is just 5.9% of NSWs agricultural production area, it produced 40% value of NSW cotton ($415m), over 60% of NSW chickpeas ($247m) and nearly 80% of NSW sorghum ($117m). Agriculture and agricultural product manufacturing employ the largest percentage of people (ABS 2015/16). However, continual pressure from development of competing land uses ranging from lifestyle blocks, hobby farms, dispersed rural living opportunities, satellite large holdings developments, biodiversity offsets, mining and solar farms are fragmenting the rural landscape, increasing speculation on land values out pricing returns based on agricultural pursuits and directly or indirectly sterilizing through heightened risks associated with land use conflict. The North West Plains has a distinct advantage of large unfragmented areas needed to achieve economies of scale that support agriculture. This coupled with high quality soil and good water access lays the foundations for a strong profitable agricultural sector that underpins the region's economy.

Purpose of this profile

To develop effective land use planning policy for agricultural industries it is important to understand their location, the reasons why they exist in that location, the opportunities they take advantage of and the challenges they face. This profile details the key agricultural industries in the North West Plains and their interactions with suppliers, processing facilities and markets.

Establishing the significance of agriculture allows its recognition and management in land use planning by Councils. By providing the evidence base for strategic planning, agricultural land and local agriculturally-based economies can be protected and supported in planning instruments.

The North West Plains agricultural industries operate in an environment of increasingly global competition and opportunities, external challenges and changing land use. This profile will inform local council strategic planning for these key agricultural industries by considering their linkages to infrastructure and secondary industries throughout the New England North West. Land use planning is guided by the New England and North West Regional Plan 2036 (2017). The regional plan has clear directions for the need to identify, protect and appropriately capitalise on the region's agricultural industries, infrastructure and rural land.

Agriculture in the North West Plains Sub Region

Agriculture is a key industry for the North West Plains economically. The area is particularly important for cotton, broadacre cropping, beef, sheep and wool, poultry, fruits and nuts.

The North West Plains is 40,990 km^2 in area and incorporates Moree Plains, Narrabri, Gunnedah and Liverpool Plains councils. This is home to 46,145 people (ABS 2015/16). The following table shows the Gross Value of Production (GVP) and percentage share of agricultural output for the Sub Region and NSW for each of the top industries.

Industry	Gross Value of Production ($)	% share of NWP total	Number of businesses	% share of NSW
Broadacre cropping	$988.9m	60%	644	24%
Cotton	$414.8m	25%	140	47%
Beef	$178.9m	10.8%	482	7%
Poultry	$14.6m	0.88%	9	1.7%
Sheep and lamb	$11m	0.66%	197	1.5%
Wool	$15.4m	0.93%		1.3%
Hay	17.9m	1%	163	5.5%
Fruit and Nuts	$5m	0.3%	6	1%
TOTAL	**$1.65b**	**100%**		**12.7%**

Source: ABS 2015/16 (note: some businesses cover multiple industries).

In 2015/16, broadacre cropping was the dominant industry in terms of GVP, contributing $989m (ABS 2015/16), being 60% of the North West Plains regional GVP and 24% of NSW GVP. Also $414m from cotton, 47% of NSW's production and 4.7% of NSW output across beef, sheep and poultry.

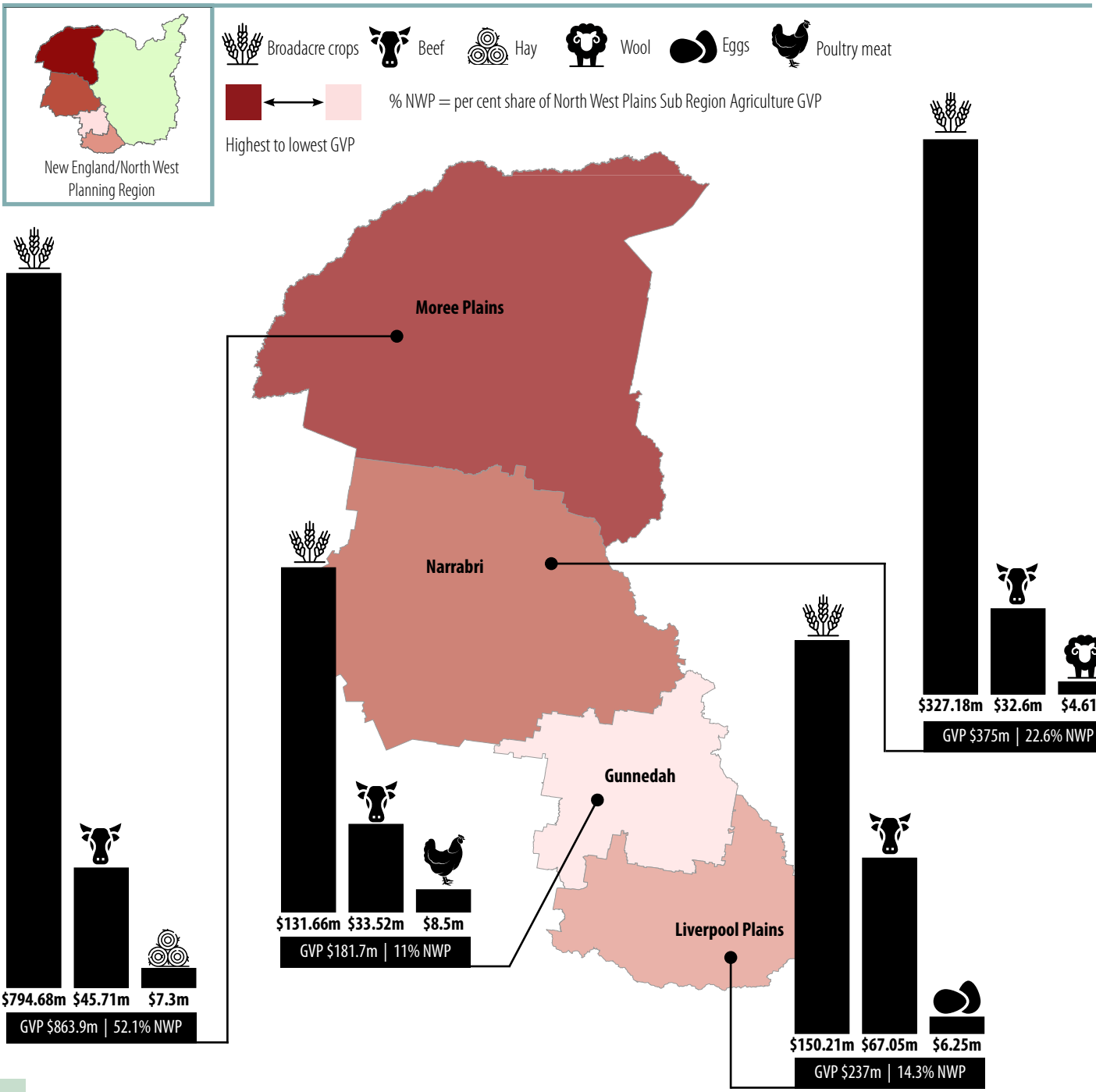
Employment

Agriculture employs over 3,425 people across the North West Plains (ABS 2015/16). This is 21% of the workforce with the biggest employer being sheep, beef and grain farming (68.7%) followed by fruit and nut farms (1.4%) and poultry (1%). The LGAs with the highest agriculture employment are Moree Plains (34.5%) and Narrabri (27.4%) These are people employed in the primary production of agriculture and do not include the vast workforce within the key secondary industries. It does not include employees that are hired on a seasonal basis that were not working in the North West Plains at the time of the ABS census.

Local government distribution

The following map shows the local government areas and agricultural GVP of the three leading industries for each.

The biggest individual contribution is Moree Plains with $864m followed by Narrabri Council which contributed $375m, Liverpool Plains Council contributed $237m and Gunnedah Council contributed over $181m. This also reflects the area of the councils too.



Agricultural highlights of the North West Plains Sub Region

The North West Plains contains some of the most highly productive and sought-after agricultural land in NSW. The alluvial landscape north and west of the Nandewar Range supports a diverse range of agricultural industries that place a high value on the region's water supply and topography. The high success of broadacre cropping in the area flows on to successful livestock production, primarily beef. Beef production complements cropping through maximising use of crop residues, utilising areas which cannot be cropped and value adding grain produced as a feed source in feedlots.

The highest-value areas are the Liverpool Plains and Gunnedah LGAs with highly fertile black earths and access to both ground and surface water, resulting in the highest yields per hectare in the state. Poultry meat production is increasing as it capitalises on proximity to processing, grain supply and relatively unfragmented rural land required to meet separation distances when establishing poultry farms.

This section continues to highlights the prominent industries for the North West Plains.

Broadacre crops

The North West Plains are highly suited to broadacre cropping, supporting a wide variety of both winter and summer crops such as bread wheat, malt barley, sorghum, maize grain legumes and cotton. Moree and Narrabri are home to what is commonly known in agriculture as the 'Golden Triangle'. The Golden Triangle is an area that produces consistently high yields of prime hard (high protein) wheat. The Golden Triangle is an area of approximately 350,000 ha (east of the Newell Highway from Bellata to North Star and Yallaroi) that reliably produces 3-4 tonnes of grain per hectare. This area makes up a considerable percentage of national production of prime hard wheat. Prime hard and durum wheat are essential ingredients for bread and noodles. The Golden Triangle is also the key area for producing durum Wheat in NSW, and Australian durum wheat is an essential ingredient for making pasta. NSW accounts for around 56% and South Australia 41% of current production (John Kneipp, 2008).

The southern area (Liverpool Plains and Gunnedah LGAs) has the highest productivity (t/ha) in NSW with an exclusive combination of deep volcanic soils, rainfall reliability, climate (sunshine hours, moderate temperature and protection from hot westerly weather) and availability of surface and groundwater. The soil and climatic conditions are so unique that with good management two crops (both a summer and a winter crop) per year can be produced. This combination is not replicated anywhere else in NSW and the only place likened to it in Australia is the Darling Downs in QLD. The Darling Downs and Liverpool Plains are said, by agricultural practitioners to be the most productive in Australia.

Industry requirements

Cropping systems have developed based the unique physical combination of highly productive soils, climate and reliable rainfall. It is also facilitated by the large holdings in a non-fragmented landscape which accommodate the changes in technology and economies of scale necessary to drive profitable broadacre cropping enterprises. A wide range of secondary industries are required to support the inputs and outputs of broadacre crop production, such as machinery and irrigation equipment suppliers, mechanics, freight and logistics, trades, and rural suppliers, agronomic services, grain storage and marketing, milling, contract planting and harvesting. Graincorp has grain storage infrastructure. Grain processors are located at Tamworth, Gunnedah and Inverell.

Cotton

The northern section of the North West Plains is suited to growing cotton, having been established in the 1970s. Moree and Narrabri combined produce 47% of NSWs cotton, which is a significant irrigated industry, and the single biggest agricultural commodity grown in the North West Plains. Australia's cotton growers produce yields two and a half times the global average and have produced the world's highest cotton yields for 20 years running (Cotton Australia). Today the North West Plains consistently has the highest average cotton yields in Australia and has developed a comprehensive supporting industry framework of cotton-ginning, logistics, containerisation-for-export, cottonseed crushing and state-of-the-art research and development facilities (RMCG 2015).

The average family-owned cotton farm grows 467ha of cotton as well as other crops and livestock (The Australian Cotton Industry Cotton Education Kit). Public and private investment in major dams forming irrigation fields, on-farm water storages and processing drives agricultural industries to deliver the highest value commodity per megalitre of water per hectare which is currently and historically, cotton. Extensive industry investment in value-adding, secondary agricultural industries and infrastructure ancillary to agriculture highlights the importance and significance of this farming system to the region.

Industry requirements

Cotton is a summer crop, requiring a reliable summer water supply. This supply may come from summer dominant rainfall and/or adequate soil available moisture or irrigation water. The North West Plains has almost as much area planted to dryland cotton (38,365ha) as irrigated (55,625ha) (ABS 2015/16). While cotton can be grown in both dryland and irrigated situations the yield from irrigated cotton exceeds that of dryland cotton by at least 2.5 times.

Temperature influences cotton production through the rate of plant growth, development of fibre quality and length of growing season. The North West Plains enjoys a longer growing season compared to that of the Macquarie and Hillston areas.

Cotton is known to achieve the highest yields in black self-mulching soil however it may grow in a wide range of soil types. The floodplain environment of the North West Plains has proven highly suited conditions for this high value crop.

The success of the cotton industry has created synergistic opportunities for ancillary industries and other agricultural enterprises such as machinery and irrigation equipment suppliers, mechanics, freight and logistics, and rural suppliers, agronomic services, cotton ginning, contract planting and harvesting businesses. Large tracts of unfragmented agricultural land free from conflicting land uses are required for cotton production.

Livestock - beef / sheep

The rearing and fattening of livestock for meat, primarily beef, complements cropping systems in the North West Plains. Beef feedlots are also used to add value to grain cropping enterprises. The North West Plains has many large beef feedlots due to the competitive advantage of proximity to grain as a feed source and livestock from breeding enterprises across the plains and on the neighbouring Slopes and Tablelands area.

Sheep meat and wool production has remained consistent from 2010/11 to 2015/16 providing around $12m for sheep meat and $15m for wool to the region (ABS 2010/2011, ABS 2015/16).

The supply of finished beef cattle from farms or feedlots, sheep meat and poultry underpin a critical mass of primary product to support the value adding supply chain for surrounding meat processors and transport companies. Supporting livestock production through planning is essential as livestock production systems are complementary to broadacre cropping and combined make up a significant proportion of the total farm area.

Industry requirements

Livestock grazing production requires large areas of unconstrained land with opportunity for producers to increase scale without risk of land use conflict. Holding sizes need to reflect the ability for beef enterprises to return a gross margin that can cover associated costs and deliver a sustainable income. Pasture-based cattle, sheep and wool production needs access to suitable water supply, and relies on a range of infrastructure for livestock handling, husbandry, fodder production, storage and transport access. Typically, livestock are managed in a system of rotational grazing, with paddocks recuperating after grazing.

Intensive animal industries require reliable water supply, transport access for stock and feed and areas of unfragmented rural land with large separation distances to sensitive receptors for odour and noise management. Lot feeding enterprises need adequate land resources to manage drainage water and manure disposal.

Livestock industries are supported by ancillary industries and other agricultural enterprises such as meat processors, machinery and irrigation suppliers, mechanics, transport, rural suppliers, agronomic and veterinary services, livestock marketing agents and wool brokers. The North West Plains is serviced by saleyards at Moree, Narrabri and Gunnedah which have weekly sales. There are also several abattoirs located outside the region at Tamworth, Inverell and Scone where meat product manufacturing employs a significant number of people.

Poultry

Southern Councils of Gunnedah and Liverpool Plains are part of a growing poultry meat production centre based around the poultry processing plant located in Tamworth. Poultry meat production is limited by proximity to processing facilities, reliable water and electricity supply.

Industry requirements

Intensive poultry operations require large separation distances from sensitive receptors, reliable feed and water supplies, adequate drainage and manure disposal systems, and quality road access. Large areas of unfragmented rural zoned land are required for intensive operations to incorporate buffers to manage biosecurity, amenity, odour and noise. Legitimate agricultural activities may cause external emissions such as noise, dust and lightspill anytime during 24 hours including early mornings and late evenings, depending on the enterprise. Poultry enterprises also need access to adequate reliable power supplies to run climate controlled sheds within approximately two hours travel time maximum to processors (Tamworth).

Fruit and nuts

Fruit and nuts are a growing agricultural sector in the North West Plains. There is a significant pecan nut farm east of Moree, producing 9.8% by value of NSWs nuts (ABS 2015/16) and 90% of Australia's pecans (GVIA). There is some investment in citrus, with the region supporting 2.3% of NSWs orange trees, while this is not reflected by dollar value as the region has 9% of NSW citrus trees not yet bearing fruit. With a citrus production target of 50 tonnes/ha it is expected that Moree will produce more than 15,000 tonnes of oranges, worth almost $4.3 million by 2020 (GVIA 2008). Both nut and citrus producers in the region have invested in the value chain through processing and marketing. Vegetable production is also a prospect for farmers in the region when market conditions allow vegetable production to be the highest value end use of the land and water resources.

Industry requirements

Citrus production requires an adequate water supply and soil that is well structured and free draining. The oranges produced in Moree are transported to Warwick for processing. Pecan production needs deep well drained soils, cool winters and 350-400 hours of temperature at or below 7^{0}C. The crop will tolerate moderate frost but can be adversely affected by late frosting. Pecan nuts from the North West Plains are de-husked on farm before being shipped to Toowoomba for storage and shelling as required (GVIA 2008).

North West Plains Sub Regional assets for agriculture

The North West Plains has ideal growing conditions with summer dominant rainfall combined with high quality soils, excellent land capability, access to irrigation water and rainfall enable highly productive farms to prosper, especially summer crops (dryland and irrigated), livestock (beef, sheep, poultry meat and wool) and intensive horticulture. Farming systems, services, infrastructure and practiced farm operators are well established and have geographical advantage given proximity to Newcastle and Sydney and access to Brisbane via major national road and rail routes (RMCG 2015).

Supporting industries and infrastructure

The North West Plains has a comprehensive range of support services and infrastructure, processors, transport and logistics, professional services and farm supplies in the larger centres. Before agricultural produce makes it to market, there are inputs such as fertiliser, fuel, technical support services such as agronomists, vets and mechanics, processing facilities, transport and infrastructure. There is also substantial movement of produce supplying grain to intensive animal producers and moving livestock to processing plants. The interactions of these agricultural industries with their secondary industries is a critical consideration in planning for agricultural land uses.

Good road transport networks, with the Newell, Kamilaroi, Gwydir and Oxley highways providing the main access to the Hunter Valley and Sydney and north to Brisbane.

The existing rail network extending through Moree, Narrabri, Gunnedah and through Werris Creek and onto Newcastle is used to export grain to international markets. The Inland Rail (Melbourne-Brisbane) Project may improve freight efficiency to both Melbourne and Brisbane ports. The proposed Moree Special Activation Precinct (SAP) could also provide freight options for exports destined to either Port Botany or Port of Brisbane.

Climate

The North West Plains is generally known as having a summer dominant rainfall pattern. The average annual rainfall has traditionally ranged from around 600-800mm in the east to around 500-600mm in the west (OEH, 2014). Rainfall and temperature variability are highest in the north west. The climate is conducive to both summer and winter cropping and livestock production.

The high number of sunshine hours are ideal for irrigated plant growth. The northern section has a high number of warm days ideally suited to maximise cotton production while the southern section has a more moderate temperature and protection from hot westerly weather.

In summer, average temperatures are warm (26-28^{0}C) and winters mild (12-14^{0}C). Average maximum temperatures in summer are hot up to 36^{0}C in the west and in winter average minimum 4-6^{0}C (OEH, 2014). Frosts occur across the plains in winter while in summer, hot days (over 35^{0}C) can number more than 50, west of Moree.

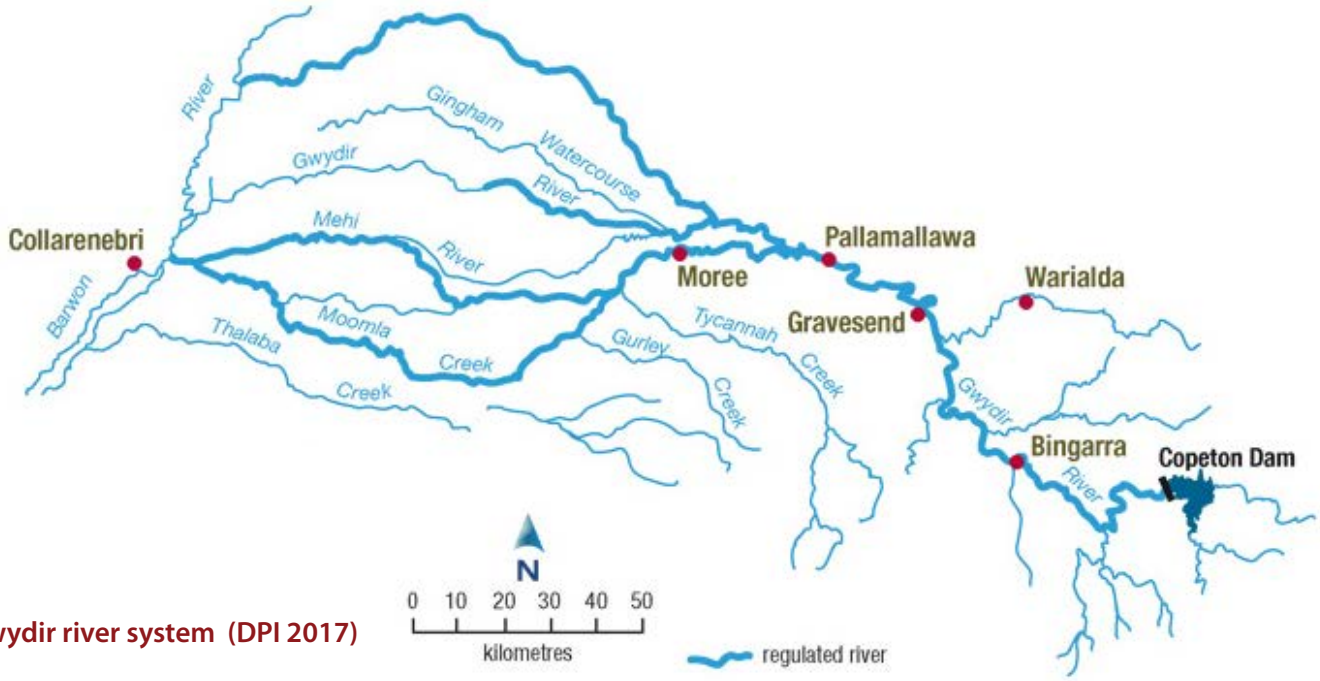
Biophysical characteristics

The highly fertile floodplains of the Namoi, Gwydir, and Macintyre–Barwon rivers are commonly described as grey vertisols, known for their high content of expansive clay minerals that form deep cracks when dry. These properties when correctly managed provide excellent plant growing media for broadacre irrigated cropping.

East the floodplains the slopes are derived from the rich volcanic soils of the Nandewar Range. These soils have a high inherent soil fertility which are relatively rare in the cropping regions of Australia These soils are highly reactive to moisture — they shrink when dry leaving large cracks and swell when wet. This capacity to shrink and swell facilitates the ability to store rainfall for crop and plant growth during dry periods and recover from compaction without the need for cultivation.

Locational advantage

Rising interest in Australian agriculture is linked to awareness of food production systems, reducing 'food miles' and buying locally, as well as demand for fresh and high nutritional quality of food consumed It is also recognised that agricultural land provides ecosystem services, food security and other benefits for urban communities that warrant its support and preservation through planning instruments, despite inherent difficulties with coexistence with urban sprawl in some places (Brinkley, C, 2012). The North West Plains has reciprocal advantages for local producers providing these services with markets, access to supply chain and value adding.



Gwydir river system (DPI 2017)

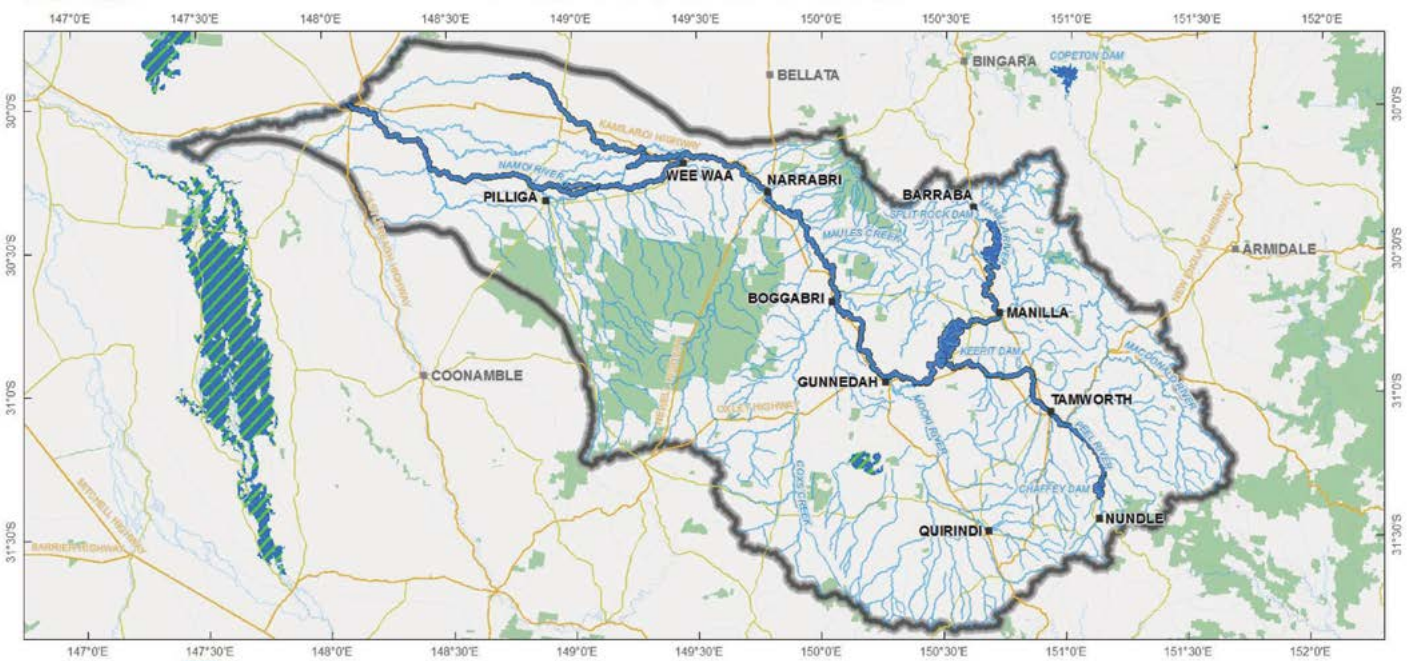
Water access and irrigation

The environment of the North West Plain supports high levels of agriculture production due to highly fertile floodplains coupled with significant investment in water infrastructure for irrigation such as Copeton Dam to supply the Gwydir Valley, and Pindari Dam (operates with Queensland's Glenlyon Dam) to supply irrigation water to the Macintyre/Border Rivers Valley. Source: https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/gwydir.

Keepit Dam and Splitrock Dam supply the Namoi Valley, as shown in the diagram below. Source: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/145397/Namoi.pdf.

The investment in the network of dams coupled with level topography, favourable climate and soils provides a successful combination for growing cotton. Additionally the area is underpinned by the groundwater resources of the Great Artesian Basin which supplies water for livestock stock production and the Namoi alluvial groundwater source which is high yielding and can meet irrigation needs.

Gwydir water resource plan area (DPI 2017)



Challenges for agriculture in the North West Plains Sub Region and planning levers

Agricultural land is a finite resource, even in the North West Plains where land fragmentation has created undersized rural holdings which are used for lifestyle purposes. This gradual process has affected broadacre cropping and livestock grazing in more contested areas.

This section highlights some of those challenges faced and planning solutions.

Historic land use planning

Historic planning policy has not strategically valued and protected rural land in many areas, instead regarding it as 'urban land in waiting' (Houston 1993). The absence of dedicated planning policy for agriculture has resulted in Local Environmental Plans (LEPs) that do not support agriculture in practice. Agriculture has spatial, biophysical and production criteria that can be similar to industrial development, especially intensive industries. However, in LEPs industrial zones are in dedicated areas with development controls managing incompatible development. In contrast, rural planning provisions often allow incompatible development and subdivision that affect farm amalgamations, expansion or intensification plans and ultimately restrict a farmer's ability to make a living.

Planning solution

Future land use planning must recognise the importance of agriculture to society and the economy and that the land and resources on which agriculture depend need to be protected and managed to enable continued use of the land for agriculture. The above challenges can lead to the following adverse impacts for agriculture if they continue to occur:

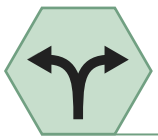
- **Inflated land prices** prevent farm expansion as residential land values are in a different market to agricultural land values.
- **Differing expectations**: Complaints are made to authorities from neighbouring residents about legal farming activities such as traffic movements, dust, noise, odour etc., resulting in adjustments being required to operations.
- **Loss of critical mass**: Urban encroachment gradually results in the loss of farmland and supporting services (a critical mass required for commercial viability), requiring farmers to move further afield.
- **Uncertainty**: land use conflict and the variable impacts on farming makes it difficult to plan for future investment in the industry. Pressures of encroaching development often result in farmers either selling land for non-rural uses or continuing to farm with the issue of land use conflict.

Statutory land use decision making

The time and cost involved in the development approval process can constrain the capacity of agricultural industries to quickly respond to market forces. Intensive agricultural land uses often require extensive site and impact assessments from specialist consultants and state agencies, while perceived environmental impacts on neighbouring properties can raise concerns in a community about the potential impacts of the land use.

Planning solution

Clear development controls which specify requirements for intensive agricultural development, and redirect non-agricultural developments away from existing agricultural land uses, are integral to minimizing community concerns and avoiding unnecessary cost and delays. Consistent requirements for information to support development applications can also streamline the application process for proponents and assist consent authorities to manage community expectations. It is important for both the agricultural industry and the community that the development approval process results in well managed agricultural land uses in the right location to enable the continued use of the land for agricultural production for the benefit of the wider community.



Land use conflict

Expansion of urban land uses and rural residential housing in rural areas creates potential for this land use conflict with agricultural land uses. This in turn places pressure on producers to adjust their normal farming practices to minimise impacts which can increase costs and threaten viability.

Planning solution

Planning policy and controls which prevent land uses in rural areas that are incompatible with agriculture can minimize the potential for land use conflict. Planning controls which require adequate buffer distances between land uses can mitigate potential impacts from agricultural land uses. With land use conflict being largely driven by the divergence in knowledge, expectations and activities of rural neighbours, particularly between new residents and traditional rural landholders, collaboration and networking becomes critically important to addressing changing social landscapes (UoN 2019).

Urban encroachment and competing land uses

The land use zones that apply to land on which agriculture occurs often permit a wide range of other land uses that are unrelated to agriculture. For example, with population growth and change, there will be pressure to use rural land on the edge of urban areas to accommodate residential development and other urban land uses. Competition for rural land on which agriculture can occur can lead to increased land prices and uncertainty for agricultural industries and investors. Increased non agricultural development on rural zoned land results in competition for the land leading to community disharmony and in some cases reduced productivity and or transfer of agriculture to other areas. This often results in dislocation, sometimes at great personal cost to producers and their industry.

Planning solution

Planning controls which limit the range of non-agricultural land uses that are permissible in zones applied to agricultural land can prevent the encroachment of non agricultural land uses on agriculture. Clear and robust strategic planning policy and land use strategies are important to guide future urban growth to locations where it will not have adverse impacts on agriculture.

Land fragmentation

Rural zoned land for agriculture (Primary Production - RU1, Rural Landscape - RU2 and Rural Small Holdings - RU4 zones) make up approximately 89% of the North West Plains.

Analysis of the rural zoned land found that:

- 15% is comprised of lots between 1 and 5 hectares in size
- 21% is between 5 and 20 hectares
- 13% is between 20 and 40 hectares
- 19% is between 40 and 100 hectares
- 32% is greater than 100 hectares in size.

Areas near regional settlements experience pressure for lifestyle subdivision, usually involving agricultural land. While there would appear to be ample land available, it is important that urban development does not compromise productive potential. As noted, adverse impacts on agriculture can occur where there is a high degree of land fragmentation. Undersized rural lot sizes result in increased land prices as competition from non-agricultural land uses arise. Small rural lot sizes limit the ability of new agricultural enterprises to achieve required buffer distances or expand their operations. Expansion of agricultural operations in a fragmented rural landscape often means significant investment to purchase additional land. When additional land is not available for expansion producers usually increase productivity via intensification of operations, a process which can increase the potential impacts on nearby non-agricultural land uses or require significant investment to mitigate potential impacts.

Planning solution

Planning policy which sets an appropriate minimum lot size for a dwelling house and prevents the further subdivision of rural land, except where there is a demonstrated agricultural need, can prevent the adverse impacts of land fragmentation. Councils can also limit the amount of fragmentation for dwelling houses in highly productive rural areas.

Critical mass

All agricultural industries have a critical level of production which ensures the economic viability of the enterprise. Where secondary industries rely on a minimum volume of agricultural product to remain viable it is imperative for the industry in that region to maintain that critical mass for the benefit of all agricultural industries. This is important for the agricultural industries as well as the related supply chain, including ancillary services, infrastructure, markets, processing facilities and related industries.

Planning solution

When land use planning decisions have the potential to affect one aspect of the agricultural supply chain it has the potential to threaten the entire industry in a region. Land use planning needs to recognise that it is not only agricultural land with excellent biophysical characteristics that needs to be retained for agricultural purposes, but also those key secondary supporting industries which may be located on lower quality agricultural land which are still potentially impacted by encroaching non-agricultural land uses.

Other challenges

Climate change

The New England and North West is expected to experience an increase in all temperature variables (average, maximum and minimum) by 2030. Summer temperatures are projected to increase by 0.7^{0}C in 2030 and 2.2^{0}C by 2070. Minimum temperatures are projected to increase by 0.7^{0}C by 2030 and 2.3^{0}C by 2070. Changes in cold nights are important in the maintenance of natural ecosystems ad agricultural/horticultural industries.

The number of hot days (over 35^{0}C) is projected to increase on the Plains by another one to five days by 2030 and five to 10 by 2070 with increases most pronounced in spring and summer. Minimum temperatures are projected to increase across the region. Prolonged periods of hot days increase the incidence of illness and death amongst vulnerable people and adversely affect ecosystems.

Rainfall is projected to decrease over summer by 2030 but is expected to increase by 2070. Across the north west winter rainfall is expected to decrease by 2030. Climate models indicate both wetter and drier scenarios for annual rainfall with the range of change -9% to +13% by 2030 and -9% to +24%.

Drought conditions directly affect dryland crops and reduce water availability for irrigation. The North West Plains will also experience an increase in the accumulation of the number of day degrees (a measure of heat accumulation throughout a growing season). Higher temperatures will extend the length of the growing season. However, warmer temperatures also accelerate the rate of crop development and could potentially shorten the time to maturity, reduce water use efficiencies resulting in reduced yields.

The impacts of climate change highlight the need to protect land for its future productive capacity particularly where there is a combination of biophysical assets such as water, topography and soils. The North West Plains supports high value agriculture now and will be important to sustain production of more specialised agricultural and horticultural enterprises into the future. A critical concern to agriculture is securing water for production in terms of quality, quantity and delivery.

Biosecurity

Rural land is exposed to pests and diseases that could threaten agriculture, the environment and community safety. Biosecurity hazards are managed by the NSW Government through the North West Local Land Services. The distribution, abundance and management of insects, pathogens and weeds is also being affected by climate change. The likelihood that tropical or semi-tropical pests will spread southward in Australia, or become established after an incursion, increases with climate warming. Stressed plant systems (crops) may become more vulnerable to insect and disease outbreaks as the efficacy of current control measures are altered.

The combination of urban areas, open farmland, forested areas and water sources results in serious pests such as foxes, wild dogs, pigs, cats, rabbits and goats. Numerous pest plants are already in the landscape and have a large impact on remnant vegetation and rural land. Land fragmentation resulting in small lot sizes in some areas means it is more difficult for an agricultural producer to control the activities occurring within the necessary biosecurity buffer. Biosecurity resilience will depend on operational factors and this can result in increased costs for the producer (Agrology 2018).

Social licence

A social license to operate refers to the perceptions of local stakeholders that an industry that operates in a given area or region is socially acceptable or legitimate

It is important for agricultural industries to maintain a social licence for their operations. The agriculture industry's right to farm agricultural land and retain access to water needs to be balanced with responsible, ethical land and livestock management and adherence to best practice operations to minimise potential environmental impacts. Producers can help to protect their social licence through open communication and education and positive contributions to their communities. Connecting with local markets and demonstrating low food miles and the importance of local food security can assist in maintaining a social licence for agriculture in a region. Further detail can be found in the NSW Government Right to Farm Policy.

Changing markets and economic conditions

Agriculture is vulnerable to changes in markets and economic conditions. Long lead times for crop production and the need for extensive capital and infrastructure investment to change commodity or farming systems means agricultural land uses are not capable of quickly adapting to changing markets and economic conditions. Due to Australia's presence in global agricultural markets, farmers in are often 'price takers' which can have significant adverse impacts on smaller operations.

Opportunities for agriculture in the North West Plains Sub Region and planning levers

The North West Plains agricultural industries are recognised as the main 'engine industry' in the Lower North West Regional Economic Development Strategy 2018-2022 and Upper North West Regional Economic Development Strategy 2018-22. The competitive advantages of the North West Plains are the flat topography, fertile soils, access to irrigation water and systems in place for the efficient production of high quality crops and livestock. The diversified economy based on agriculture has benefits for regional urban and rural communities. Towns and cities benefit from agriculture through ecosystem services, scenic values, 'green space', value-adding (processing), education, research and food provenance. Agriculture supports a supply chain that generates substantial productivity and employment across local, regional and national scales.

This section identifies the practical land use planning approaches and opportunities for agriculture and some planning considerations to help implement them.

Intensification

Productivity growth is central to the performance and international competitiveness of Australia's agricultural sector. Producers can increase economies of scale through larger and more automated machinery, expanding operations onto additional land currently being underutilised and intensifying. The North West Plains has the advantage in large areas of unfragmented land needed to achieve economies of scale for broadacre agriculture including irrigation. This coupled with high quality soils and water supply, infrastructure as well as access to markets in Tamworth, Sydney, Brisbane and Newcastle make the region one of the most successful and profitable in NSW.

Commercially viable intensive agricultural operations in the region include horticulture, poultry, and livestock lot feeding. Most intensive agricultural operations need to establish infrastructure requiring significant capital investment. To secure this capital and see a return on the investment, businesses need certainty that production will be unencumbered by land use planning changes for a minimum of approximately 25 years.

Further growth of intensive animal production is feasible in the region, such as poultry, piggeries and cattle feedlots, as well as a range of horticultural crops. Recent developments in the design, management and operation of intensive agricultural enterprises has resulted in productivity improvements and achievement of food safety, animal health, animal welfare and environmental sustainability standards.

Planning levers to support intensification

a. Certainty in strategic planning policy and land use planning controls for intensive agricultural operations and neighbouring land can provide the appropriate investment environment for industry expansion.

b. Rural land use strategy development is key to understanding the needs of various agricultural industries and investigating opportunities and mechanisms to support intensive agricultural industries through LEP controls.

c. LEP zones and provisions should be applied over intensive agricultural precincts; with land use tables structured to permit intensive agriculture and related industries while prohibiting incompatible land uses such as residential accommodation, tourist and visitor accommodation, commercial, heavy industrial and recreational activities etc

d. Minimum lot sizes should be large enough to limit fragmentation of agricultural land, incorporate industry requirements, enable expansion of existing agricultural industries and provide for adequate buffers to incompatible land uses.

Food security

The need for fresh food to be available locally for the health of the community is a key opportunity for the North West Plains. There are marketing opportunities for food producers to leverage the benefits of local food production to differentiate their product in the market. Population and markets in Brisbane, Newcastle and Sydney are expected to continue growing by 2050. The expected population will increase and sustain demand for food and fibre. Global markets will continue to demand Australian produce. In combination these factors will lead to a higher value of agricultural production in the region.

Planning levers to increase food security

a. Strategic planning for rural land must ensure productive land is identified and protective mechanisms provided through the planning framework to enable provision for expansion of urban farms for intensive production, food security and education purposes.

b. Councils should zone agricultural land for primary production and only permit agriculture and a narrow range of supporting land uses in that zone.

c. Some forms of horticulture may be a suitable permissible use in a range of zones, with opportunities for associated agri-tourism and roadside stalls.

d. Minimum lot sizes should be large enough to limit fragmentation of agricultural land, incorporate industry requirements, enable expansion of existing agricultural industries and provide for adequate buffers to incompatible land uses.

Diversification and value-adding

Access to transport links to Sydney and Newcastle and favourable biophysical assets of rainfall, water, productive soils and farming infrastructure means that the North West Plains is well positioned to capitalise on growing community interest in food provenance and agri-tourism. The North West and New England Regional Plan 2036 and Upper and Lower North West Regional Economic Development Strategies all identify the need for diversification of agricultural commodities.

Agri-tourism in the form of low-key farm stays and bed and breakfast establishments can provide an alternative income stream of agricultural producers while also educating the community about the activities that occur on farm. The regional towns of Gunnedah, Moree and Narrabri provide tourist and visitor markets as well as interstate visitors for existing and future agri-tourism and value added enterprises. These ancillary land uses should not compromise the agricultural production being undertaken on the land and agricultural production should be the primary land use.

Planning levers for diversification and value adding

a. Farmers markets ('markets' as defined by the Standard Instrument LEP) should be permissible and encouraged by councils in appropriate urban and open space zones.

b. Agri-tourism (farm stays, bed and breakfast accommodation) should be associated with and complement the continued agricultural production on the land.

c. Agri-tourism should be directed away from intensive agricultural operations or precincts.

Non-planning levers for diversification and value adding

d. Intensive agricultural production precincts and businesses may be used for education of the community and tourists around how food supply chains work.

e. Roadside stalls, artisan food and drink industries and cellar door premises all offer opportunities to promote NSW's clean green image to the international tourism market.

f. Farmers markets could prioritise locally grown or made produce to support local growers.

Farming research promotion and education

The North West Plains is uniquely positioned to provide promotion and education opportunities for the broader agricultural industry. Agricultural research by the University of New England and NSW DPI provide further opportunities for education of farmers, local governments and communities on sustainable production, innovative farming systems, climate change and the challenges facing agriculture and producers. This education is important for consumers who might not otherwise understand how their food is produced and the intricacies of the food production chain.

On a local scale agriculture will provide further opportunity for education of communities on how their food is produced and the challenges facing farmers.

Planning levers for peri-urban farming

a. Small scale information and education facilities should be a permissible land use on agricultural land to enable producers to educate the community on how food supply chains work.

Circular economies

A circular economy is one that exchanges the typical cycle of 'make, use, dispose' in favour of maximising re-use and recycling. The longer materials and resources are in use, the more value is extracted from them. The circular economy concept is best, and most often, applied in relation to resource consumption and regeneration.

For the agricultural industry a circular economy presents possibilities for significant efficiencies and input cost reductions through energy generation and smart grid distribution; innovative off-grid energy solutions; recycled water use; and opportunities for renewables and waste solutions.

Planning levers to facilitate circular economies

a. Primary production zones should permit resource recovery facilities as a means of reusing waste products while also restricting incompatible uses to prevent rural land use conflict.

b. Minimum lot sizes should account for a potential increase in the need for land area requirements as farming trends towards circular economies. Reuse of effluent and other products on farm to vertically integrate farm inputs and outputs may result in additional and diversified production areas on farm. In the region an example might be the reuse of intensive livestock (beef or poultry) manure/litter as a fertiliser substrate for cropping or horticulture use.

Planning toolkit

Best practice land use planning for agriculture includes recognition of the industry as a significant contributor economically, environmentally and culturally, providing recognition and management through all levels of the planning framework. Dedicated land use zones, provisions and minimum lot sizes are available to Councils and can effectively support primary production even in contested areas. This section highlights the parts of the planning system to facilitate this.

Strategic planning

Local strategic planning statement

A local strategic planning (LSPS) statement identifies the vision and trends for agriculture in an LGA and sets out the direction for agricultural land uses for the next 20 years. It is important that agriculture, the land it depends upon and the infrastructure and other secondary industries which interact with agricultural land uses are considered at this initial strategic planning stage. The LSPS should explain the economic contribution that agriculture makes to the local economy and reflect the community's expectations for the provision of food and fibre locally. Further information can be found in the following DPI guideline Local Strategic Planning Statements – Agricultural Planning Advice for Councils.

Local land use strategy

The New England and North West Regional Plan 2036 and LSPSs sets out the framework and expectations for preparation of local land use strategies. The agricultural component of a land use strategy should identify the agricultural industries in the LGA, land on which they are located and the essential infrastructure and secondary industries. A land use strategy is also an effective tool in communicating to the community the scale and importance of agriculture in the LGA economically, physically and socially. It is an important step in identifying where agricultural land should be protected from incompatible land uses.

A rural land use strategy will identify the linkages primary industries have with secondary industries, infrastructure and other components of the production chain to establish a holistic picture of relationships and dependencies. The strategy will also clarify the relationship of rural land with residential development and specify the circumstances in which additional fragmentation and residential development may or may not be appropriate. The strategy will also assess the policy framework including existing LEP provisions and make recommendations to retire and/or remove redundant provisions concerning rural subdivision and non-strategic residential development.

Local environmental plan (LEP)

A LEP allows councils to tailor planning controls to address the issues facing agricultural industries in their LGAs. The LEP is informed by the rural land use strategy. The following are mechanisms that can result in positive outcomes for agriculture:

Land use zones: the RU1 Primary Production or RU4 Primary Production Small Lots zones are the most appropriate zones to apply to land which is currently used for agriculture and/or is suited to future intensive agricultural land uses.

Land use zone objectives and tables: The use of specific zones for agricultural land allows the zone objectives to be specific for agricultural land uses and require other permissible land uses to be compatible with agriculture.

Limiting permissible land uses: LEPs can reduce the potential for land use conflict by restricting the range of permissible land uses where incompatible with agriculture. This is executed by careful construction of land use tables for the rural zones. Councils should review the permissible land uses in rural zones applied to agricultural land or where agricultural industries are located to prevent inappropriate land uses and limit potential for land use conflict. Land use tables for rural zones should be 'closed' to enable more control over the range of specific land uses.

Minimum lot sizes: The minimum lot size specified in an LEP for rural land needs to be of a scale to prevent fragmentation into lots which cannot support the locally typical agricultural land uses. Generally larger minimum lot sizes facilitate the establishment of larger and more appropriate buffer distance between potentially conflicting land uses. Larger lot sizes also enable expansion or diversification of the agricultural activities without the need to purchase additional land which can be an economically prohibitive option for farm expansion. While it can often be difficult to execute, the breaking of the nexus between minimum lot size and dwellings is a way to prevent new settlement on rural land, and a positive advance in promoting agriculture and preventing future rural land use conflict.

Development control plans and other approaches

Development control plans

A development control plan (DCP) for rural zones should include practical guidance for agricultural land uses. A DCP can specify buffer distances to be applied to all land uses, both agricultural and non-agricultural, to ensure that new land uses do not increase the potential for land use conflict with existing neighbouring properties. Guidance on appropriate buffer distances is provided in the Department's Buffer Zones to Reduce Land Use Conflict with Agriculture - An Interim Guideline.

Novel approaches

In some cases, Councils may need to apply both planning approaches and non-planning advocacy to achieve positive outcomes for agriculture. For example, under the current legislative framework, Councils can:

- Set up a rural industry liaison committee to establish links between council and farmers and provide a forum for discussion of the issues facing agriculture in the LGA.
- Propose a highly contested area as a special planning precinct with planning provisions to protect from incompatible land uses.

Industry can provide advocacy through active involvement in land use planning decision making and strategic planning to raise the profile of agriculture. The land use planning system is only one mechanism available to reduce the potential for land use conflict. Agricultural industries can decrease the potential for land use conflict by adopting industry best practice operations which at best eliminate or reduce the impact of their operations on neighbouring land owners.

Similarly, clear communication with neighbouring properties and an education program targeting sensitive neighbours can help increase understanding of the reasons for some agricultural practices and prevent nuisance complaints.

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Broadacre cropping

Broadacre cropping is the highest-value agricultural industry in the NWP, contributing a gross value of $988.9m. The success of broadacre cropping is the result of natural environmental features, infrastructure, large holding sizes and distribution. The natural environment of the North West Plains is a premium combination of topography, soils, water and climate that supports a diverse range of crop types depending on market conditions. The uniqueness of the environment covering large areas is recognised as Biophysical Strategic Agricultural Land by the NSW state government. Large tracts of unfragmented land free from land use conflict and completing land uses has facilitated confidence for continued investment in broadacre technology, equipment and plant breeding to ensure competitive and profitable cropping enterprises.

Distribution of broadacre crop producers by local government area

LGA	Gross Value of Production ($)	% share of NWP broadacre crops	% share of NSW
Gunnedah	$82.46m	8.3%	2.0%
Liverpool Plains	$115.32m	11.7%	2.8%
Moree Plains	$604.31m	61.1%	14.6%
Narrabri	$186.89m	18.9%	4.5%
Total	**$989.0m**	**100.0%**	**23.8%**

Trends

Long-term productivity growth in broadacre industries is said to be around 1% per year (Boult and Chancellor 2020). This is also supported by an Agricultural Expansion Analysis (RMCG 2015) which identified a plateau in wheat yields over time. To verify this there has been a decline in broadacre crop yields and an increase in pulses between ABS 2010/11 and the 2015/16 census data.

Secondary industries

- freight rail service to Newcastle and Sydney rail system allowing port access
- grain processing
- grain storage: eg Grain Corp, AMPS Storage and Handling (Premer and Caroona)
- grain trading and marketing.

Challenges

Growers face challenges from declining soil fertility, increasing herbicide resistance, and increasing soil-borne pathogens in their farming systems while under pressure from the cost price squeeze. Maximum production potential through advances in plant breeding, machinery/technology development, improved science and agronomic advice are reaching upper limits. With or without increases in production every hectare of agricultural land is valuable particularly such as in the North West Plains which have a capacity to support a diverse range of crops. If the North West Plains is going to maintain its current level of economic base, every hectare of productive agricultural land adds to achieving this goal. While physical production rates are being tested there is an opportunity to capitalize on improving quality to improve the gross value of product. Opportunities may lie in focused marketing to attract a high price premium from nutrient continent, GM free, organic, environmentally sustainable production, or other value-added premium niche.

Opportunities

The North West Plains, NSW and more broadly Australia is well placed to capitalise on premium market opportunities to increase the gross value of broadacre crops. These premium opportunities lay in niche premium product marketing of 'clean and green' environmentally-friendly production, high nutrient content, GM free, and organic produce to name a few. Australia is home to the world's largest area of certified organic land – around 51% of the global total and 49% of shoppers say personal health is the top reason they purchased organic products (Australian Organic Market Report 2019). Opportunities to maintain capital investment, global market access and most importantly improve farm productivity may also lie in the use of natural capital as a framework to direct investment into planning and industry. The concept of natural capital ensures that soil, air, water, flora and fauna health are adequately valued to ensure long term food, fibre, water, health, energy and climate security. The value of soil microbiology in crop production is an area that is yet to be quantified however, should be investigated.

Cotton

In the ABS 2015/16 Census the North West Plains had as much area planted to dryland cotton (38,365ha) as irrigated (55,625ha). The yield from irrigated cotton exceeds 2.5 times that of dryland cotton. This is due to reliable water supply, reliable summer dominant rainfall and/or adequate soil available moisture.

Distribution of cotton producers by local government area

LGA	Gross Value of Production ($)	% share of NWP cotton	% share of NSW
Gunnedah	$49.2m	11.9%	5.6%
Liverpool Plains	$34.9m	8.4%	4.0%
Moree Plains	$190.4m	45.9%	21.8%
Narrabri	$140.3m	33.8%	16.1%
Total	**$414.8m**	**100.0%**	**47.4%**

Trends

Long-term productivity growth in broadacre industries is said to be around 1% per year (Boult and Chancellor 2020). This is also supported by an Agricultural Expansion Analysis (RMCG 2015) which identified a plateau in wheat yields over time. To verify this there has been a decline in broadacre crop yields and an increase in pulses between ABS 2010/2011 and the 2015/2016 census data for the region.

Secondary industries

- Namoi cotton Ginning
- Auscott Ginning

Challenges

- Increasing costs and constraints on inputs (land, water, labour, energy, fertilisers and chemicals), biosecurity threats and climate change and extremes are challenges for the industry. These trends largely represent a set of constraints experienced by the cotton industry as part of a classic 'cost-price squeeze' (Barnett 2014).
- The increasing scarcity of agricultural inputs (e.g. phosphorous and potassium) and reported declining condition of the natural resource base (e.g. groundwater and soils) was indicated as a significant and ongoing challenge for agriculture generally. Other factors are competition for natural resources such as land and water and the food vs fibre debate (Barnett 2014).

Opportunities

- The area of the summer cereal dryland cropping zone that coincides with sufficient cotton degree days and summer rainfall during the cotton growing period should be regarded as an immediate opportunity for the expansion of the cotton industry. It is a large area with considerable regional variation (EcoLogical 2014). There is particular emphasis on expanding dryland cotton, varieties of cotton, and management systems to support them.
- An increase in the availability and relevance of new technologies, in particular informatics, automation, mechanisation, robotics and nanotechnologies, were raised as important trends that agriculture can make greater use of in the future (Barnett 2014).

Livestock

The North West Plains livestock industry is primarily centered on beef cattle production ($178.9m) the poultry industry ($14m) followed by wool ($15M) and sheep and lambs ($11m). The rearing and fattening of livestock for meat, complements cropping farming systems in the North West Plains. Livestock are primarily run as a production system utilising agricultural land that is unsuitable for cropping. Beef feedlots are also used to add value to grain from cropping enterprises.

Distribution of livestock producers by local government area

LGA	Gross Value of Production ($)	% share of NWP beef	% share of NSW
Gunnedah	$33.52m	18.7%	1.3%
Liverpool Plains	$67.05m	37.5%	2.6%
Moree Plains	$45.71m	25.6%	1.8%
Narrabri	$32.60m	18.2%	1.3%
Total	**$178.9m**	**100.0%**	**7.0%**

Trends

Beef productivity growth averaged 1.% per year between from 1977 (Boult and Chancellor 2020). Productivity improvements in this industry are attributed to improved pastures, animal breeding and veterinary management.

Around the Gunnedah and Liverpool Plains LGAs there is a growing poultry meat production centred around the poultry processing plant located in Tamworth. Poultry meat production is limited by proximity to processing facilities, reliable water and electricity supply.

Secondary industries

- Livestock selling selling centres in Moree Narrabri and Gunnedah have regular weekly sales
- Teys/Cargill in Tamworth, Bindaree Beef in inverell and JBS in scone operate beef cattle abattoirs.
- Biaida operate Poultry abattoir in Tamworth
- Peel Valley Exporters (Thomas Foods) operate a Lamb abattoir in Tamworth.

Locational requirements

Livestock production requires unconstrained land with opportunity for producers to increase scale without risk of land use conflict. Pasture-based cattle and sheep production needs access to suitable land and water supply, and a range of infrastructure for livestock handling, husbandry, fodder production, fodder storage and access. Typically, livestock are managed in a system of rotational grazing, with paddocks recuperating after grazing.

Large feedlots are located in the Liverpool Plains and Moree LGAs. Intensive beef, lamb and poultry operations increase transport movements carrying stock and feed. Intensive animal industries need large areas of unfragmented rural zoned land with large separation distances to sensitive receptors for odour and noise management. Intensive lot feeding industries need adequate land resources to manage drainage water and manure disposal.

All intensive animal enterprises need access to an adequate reliable water supply. Additionally poultry enterprises need access to adequate reliable power supplies to run climate controlled sheds while remaining within a close proximity to poultry processors (Model Code of Practice - Land Transport Code for Poultry), which is approximately a 2hr travel time maximum by road.

Opportunities

- Growing markets HGP Free, antibiotic free and grass fed beef.
- Capturing a greater share of poultry meat production centred around the poultry processing plant located in Tamworth.





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