

I absolutely and explicitly object to the Culcairn Solar Farm SSD 10288.

Firstly we would like to know, if something goes wrong and our family suffers from any of the following impacts, Who is responsible?

Is it the company, the landowner, the NSW Government or the Independent Planning Panel?

Introduction

Since hearing about the proposed development from Primary Landowner (Landowner 2) in April 2018 our family suffered trauma and intimidation. We held a lease on a large portion of the proposed project land due to expire 31 Jan 2020. Landowner 2 initially advised a development size of 400 hectares and they would lease land to a solar company.

From the outset our family was extremely concerned about the loss of prime agricultural land, the opinions of surrounding neighbours, towns and community and the ramifying impact on us all in the hands of a large multinational company with a financial agenda.

The company showed interest and pursued some of our land. We felt it important to understand the development, were taken by the proponent to a Solar Farm in Griffith, did research, consulted with legal representatives, community people and neighbours. **ALL** discussions pointed to significant concerns with a strong majority believing that land in this area was too agriculturally valuable for solar development.

Our measured decision, regardless of massive financial benefit, was that this development had far too many impacts, would create significant conflict in our community and above all, with drought and water issues happening in our country that the loss of prime agricultural land with strong capacity to provide hay and grain when others are failing was not justified. Our family stands by our principles and could not accept the simple benefit of huge financial return from a development so damaging to those around us.

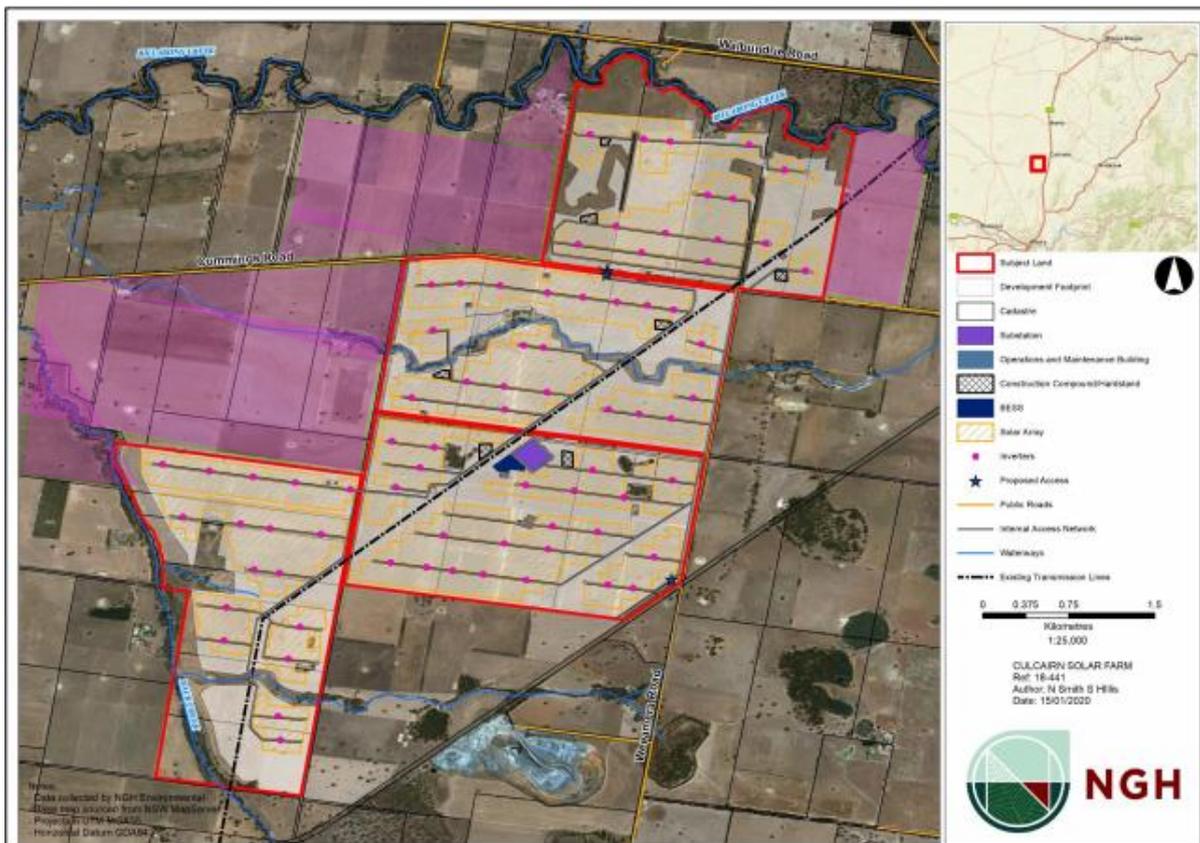
The company pressed on pursuing 2 other landowners whom we feel would have objected to the development if not offered significant returns.

As lessees of the project land it was threatened that our lease could be cancelled if we did not adhere to the needs of the landowner in pursuing this development. Since then we have incurred legal costs, lost time in our lives and relationships have been destroyed.

Size/Location

Since the initial advice the development the size has grown to a monstrous 1317 hectares. The size is seriously ridiculous in this area considering the number of family homes, agriculture and location of nearby townships. This size development should be placed on arid land in isolated locations. The size cannot be justified, there was no need to increase from one landowner as the primary landowner had a large parcel on their own except, all around would have otherwise objected. The developer tries to justify the size to be viable for the substation installation but I question why other developments requiring a substation are much smaller.

Our property will have approximately **7 kilometers** of frontage on multiple sides east and west being L shaped by the solar development in two places as shown below.



Our farm neighbouring this development is extremely productive, on the Billabong Creek and has successfully supported 5 generations of our family since 1909.

- Our family home with children will immediately neighbour the development R24 with views in multiple directions and insignificant screening
- Our parents family home R29 is immediately next to the development on the Billabong Creek with broken views through tree line
- We have purchased a third home currently rented R32 intended for our son (or otherwise if we ourselves or our parents cannot cope with the development) upon completion of the tenants home in another location – Tenants were previous owners who sold due to the solar issue
- There are many neighbouring homes with families and children including new homes who have worked hard to achieve their goals and will incur loss if the project proceeds
- 1,100,000 solar panels will have huge impact to rural aesthetics over a massive area and is not acceptable by neighbours
- Too close to towns – only 3.3kms to Culcairn (North East) and 4.7 kms to Walla Walla (south west)
- Immediately adjacent the longest creek in the world – The Billabong Creek (and contributory waterways)
- Close to ecologically valuable Gum Swamp
- Prime cropping land
- Close to hazards of gas pipeline, Culcairn tip and on bushfire prone mapped land

The success of this area has allowed our family business to grow and expand with many costly infrastructure projects undertaken over the past 20 years including through funding of the NSW Government Farm Innovation Fund.

Contradictions

The many following contradictions with planning policy must be taken into consideration:

- NSW Solar Guidelines
 - 4.2 Key Site Constraints
 - **Agriculture** – important agricultural lands, including Biophysical Strategic Agricultural Land (BSAL), irrigated cropping land, and land and soil capability classes 1, 2 and 3.
Greater Hume Councils report confirms that this land IS high quality agricultural land and will be mapped as Important Agricultural Land under the Riverina Murray Important Agricultural Land Mapping project and therefore **is an area of constraint**.
 - **Visibility** - there **IS** an elevated home
 - **Biodiversity** – site contains environmental Billabong Creek & Back Creek and waterway all with riparian areas. Threatened and vulnerable species on site.
 - **Residences** – numerous homes in the area, many new homes, many families
 - **Natural Hazards** – Billabong Creek Floods, Land mapped as bushfire prone
- Very strongly contradicts the [NSW Renewable Energy Action Plan](#) aim 2 to Build community support for renewable energy – this development has caused significant fracture in the community and serious conflict.

Solar 'fractures' communities in Greater Hume Shire before approval process even begins

Ellen Ebsary Local News



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"It's a very emotive topic and has fractured the local community," Culcairn

COMMERCIAL

- Contradicts [Rural SEPP](#) with direction to protect agricultural production value of rural land.
- Contradicts [ministerial direction](#) to protect rural land
 - Item 1.2 Rural Zones objective is to protect the agricultural production value of rural land.
 - Item 1.5 Rural Lands objectives is:
 - (a) protect the agricultural production value of rural land,
 - (b) facilitate the orderly and economic use and development of rural lands for rural and related purposes
- Contradicts [Greater Hume LEP](#) item 1.2 – 2 – b particular aim to (b) to protect and retain productive agricultural land and;
Greater Hume LEP RU1 Zone objective **to maintain the rural landscape character of the land**.
- Contradicts [NSW Right to Farm Policy](#) principles that the NSW Government recognises the value of agriculture for growing food and fibre for domestic and international markets and is concerned about the potential loss or impaired use of agricultural land.
- Contradicts multiple areas of the [Riverina Murray Regional Plan](#) acknowledging the regions agricultural wealth and need for protection.
- The Development is not being conducted in the designated AEMO Renewable Energy Zone
- EP&A Act. *to encourage*:

- The proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.
- The promotion and coordination of the orderly and economic use and development of land.
- The protection, provision and coordination of communication and utility services.
- The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.
- Ecologically sustainable development.

Agriculture

I am exceptionally concerned that the scale and intensity of the development will impact the agricultural capacity of our land and the immediate area. Our property will have approximately 7 kilometres directly interfacing extremely productive areas of our property. 800 Hectares previously leased on the proposed development area has been now lost to our production.

Our farmland along the Billabong Creek has been successful under cropping and grazing rotations for 5 generations. The area is known to have consistent and reliable climatic conditions for cereal cropping.

Our lease of the project land has achieved excellent results in the past 3 years. The impact of drought and reduced production in our state has intensified demand for hay, grain and straw provided by this area. Significant tonnages have been sent to drought and fire affected towns. The project land saw record results for our business in 2015 producing 10 tonne to the hectare oaten hay crops.

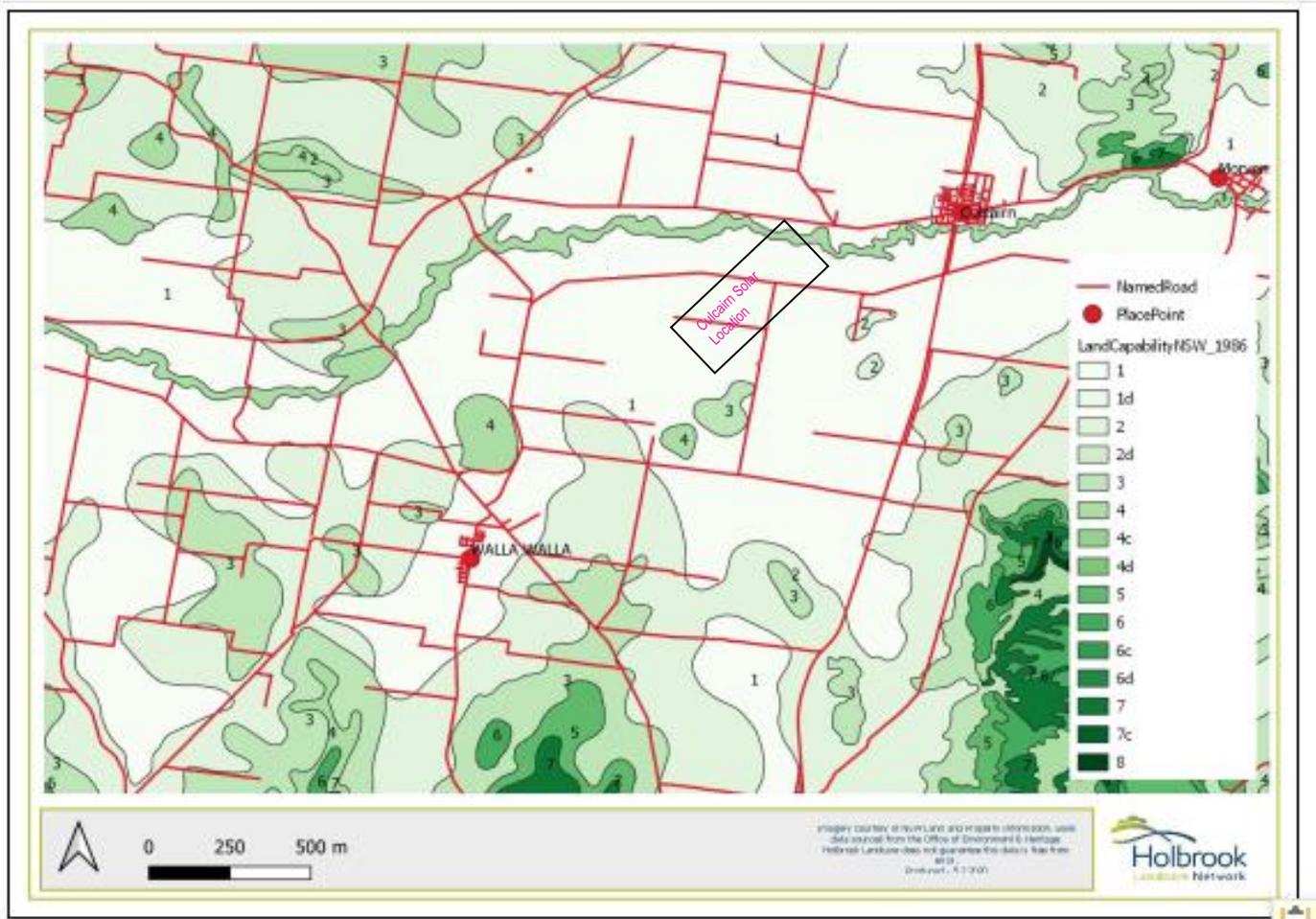
The current climate of drought reflects an increased importance to protect strong agricultural land.

Only 6% of Australia and 11% of NSW is suitable for cropping production. Cumulative impacts of drought, fires and water availability affect food and fodder security. Reliance on imported food brings significant issues such as market volatility and biosecurity concerns. Last year Australia imported wheat for the first time in 10 years. Livestock operators struggle sourcing fodder and pricing is high due to demand.

Solar can be located elsewhere. Farming can not.

We sourced independent advice from an agricultural consultant regarding the land capability of the project area. Land capability assessment is complex and depends on the particular dataset/s used. The EIS suggests land capability is Class 4 under the Land and Soil Capability Assessment Scheme drawing incorrect conclusions. **It is considered that this measure of land capability assessment is inaccurate** and does not acknowledge other measures of agricultural land capability. We refute the class 4 soil classification defined by [OEHLand and Soil Capability Assessment Scheme](#), this land would be class 2 – 3 confirmed by our agronomist. There is no slope, it is continually cultivated, there is no salinity issue, no erosion and the land has minimal limitations. NSW DPI are aware of inaccuracies of soil mapping in the Greater Hume area as this contributed to problems with the initial draft of the Important Agricultural Land Mapping Project. It is concerning that solar companies are using this inaccurate information to their benefit. A full independent agronomic assessment of land in this area should be sought by the NSW DPI through a company not receiving a financial benefit from a solar company.

More appropriately, this land is mapped as Class 1 under the Rural Land Capability mapping classification that is the highest quality land. This method of classification comprises a more thorough assessment of the land based on assessment of the biophysical characteristics categorising the land in terms of its general limitations with regard to the types of land uses appropriate to that particular area.



Greater Hume council reports confirmed the land is mapped as high quality agricultural land and will be mapped as Important Agricultural Land. Having regard to the capability mapping information available on the land, and our experience, it is contended that the land is high quality agricultural land and is an area of constraint under the NSW Large Scale Solar Guidelines.

Current farming techniques effectively manage the health of the land. We strongly disbelieve resting the land will be beneficial. The EIS states that there will be benefits including returning soil organisms, soil carbon, soil moisture and soil structure to the areas previously cropped and grazed and allowing the regeneration of groundcovers and other grasses to return. The likelihood of this to occur is strongly questioned, particularly in that there is no information or assessment made to consider the impact of solar facilities on the site and how growing conditions may alter on the land given that the intention is to undertake strategic grazing.

Grazing will be difficult given constraints of having sheep contained within the development area and around panels. There are likely to be difficulties around resowing, topdressing and general improvements to soil and pasture conditions while it is used as a solar development.

Our family does not believe grazing could near equate to 80% capacity and estimations based on the Dubbo site results reveal agricultural gross production would be near 10% of that currently returned from cropping with grazing between rotations. Numurkah and Dubbo have different agricultural potential to this location and we note that footage shows minimal ground cover with feeding of hay which would have to be purchased as could not be made on the solar property. We view the sheep grazing as marketing to reflect a retention of agriculture to NSW Department of Planning. The trials are based on short timeframes raising questions.



The World Health Organisation lists ELF-EMF as a possible carcinogen, will sheep get cancer? Has this been researched?

Land value is a good indicator of the production value of farming property.

[Australian Farmland Values Report](#) confirms Greater Hume has the highest farmland value in the southern NSW region. The [Border Mail article](#) 1 Feb confirms local rural land values have increased significantly with some areas of the Greater Hume Shire seeing increases of more than 90 per cent. David Smith of Greater Hume Shire confirms "our farm land was still producing reasonably well when other areas were really, really bad," He confirms that Greater Hume farmland in this area is highly sought after as is relatively reliable rainfall area, close to major markets, has two major highways, a rail line and close to major saleyards

Agent Reg Coulston said "Some top Billabong Creek country is making \$5000 an acre, when five to ten years ago it would have been worth two." We contend these prices and associated increases reflect this land to be prime agricultural land and the issue of drought has increased recent demand in this location.

Economics

Through our business our family has a strong understanding of the multiplying economic benefit of agriculture to our community.

We question the economic impact assessment and know that the agricultural production figures are significantly underestimated. Most recent season gross production figures are estimated at around \$1650 per hectare and therefore the data in the economic analysis is undervalued reflecting only around two thirds of this value. We have been advised that the economic multiplier should be 2.178 which is different to the figure used.

It is considered that the assessment ignores some of the flow on effects from agricultural production.

We understand that there will be economic stimulus during the short term construction period of 18 months that will benefit local communities however we must ensure this does not outweigh the loss to the agricultural industry over the extremely long term of 30 years plus a potential further 30 years which we strongly believe is being significantly underestimated. This will contribute to a Boom and Bust scenario.

Greater Hume Employment figures advise that agriculture employs 1121 people within the shire. From our basic calculation, given that the development land is estimated at 1.0536% of the area of agricultural land in the Shire, we could estimate employment at 11.8 people being employed through production on this land. We contend that the economic analysis does not adequately consider the full flow on effect right through the food production chain between the farm and supermarket nor the associated expenses of the annual agricultural cycle.

It is difficult to estimate the true cost to agriculture as this is dependant on so many factors but from our knowledge we do feel there is a strong underestimation. Commodities and fertiliser require freight, freight needs employees, trucks need tyres, fuel, mechanics. This is just one example, yet there are so many including grain delivery, livestock services, financial services, agricultural plant and machinery requirements, farm infrastructure and so much more. Food production relies on so many other industries to create their product and significant employment occurs between the farm gate and the supermarket. The products of hay and grain provide so much more than the farmers direct income. Our towns are full of agricultural suppliers and our region has significant services to agriculture who will be affected.

We question whether the economic analysis adequately identifies agricultural loss from this development.

In any case it is not appropriate to displace employees in one industry for the cause of another. Agricultural workers will not necessarily want to change employment to work in a solar development.

We attribute the low unemployment rate in Greater Hume of 3.1% to the strong agricultural workload in this area. The low unemployment of regional areas should not be considered as a means to displace agricultural workers here. Local contractors in this area are already busy. We feel solar jobs may be predominantly regional or wider afield being large contracting companies with teams of specialised contractors from other solar developments. Local contractors should consider the potential long term risks to their business if focus is on short term gain.

[It is extremely interesting to note that the large company Downer is exiting solar construction due to significant issues.](#)

Production Impacts

This project has resulted in a loss of lease diminishing our production jeopardising employees.

The loss of land on the northern side of Cummings Road along the Billabong Creek has potential to impact our business through loss of hay work in our contracting business.

Lost production results in a flow on effect of hay shortfalls to meet the needs of our hay clients. Drought, fire and water shortages greatly impact fodder demand and hay shortages as evidenced last year will again arise in the coming months and years placing increased pressure on those already suffering.

Large quantities of hay from this property have been sent to support drought affected areas of Northern NSW due to their lack of rainfall and production.

The following impacts are of great concern and will be a course of action if we are affected.

Stock Movement

We have land both east and west of the project. Construction will cause difficulties moving sheep along Cummings Road between properties and through Cummings road vehicle crossing.

Heat Impact

There is variable [research](#) on the heat affect of solar developments with the EIS stating some is contradictory. All confirm there are changes.

Fthenakis and Yu research confirms there is still a heat impact 700 metres away from the development.

Research referred to by the developer is based on extremely small facilities. This development will be 400 times the size of one of the researched areas. This research says consideration of the spatial scale and geographic position is required and that further study is warranted.

The clean energy presentation suggests that temperatures are slightly warmer adjacent a solar farm.

We operate cropping land immediately adjacent to the land proposed to hold 1,100,000 solar panels with **7 kilometers** of frontage. The development will **surround our property in an L shape**. There is potential of **heat impacts on multiple sides**. We question if heat in this scenario will be exacerbated.

A drier than usual September/October and warm windy temperatures can heat stress crops affecting yield. **ANY additional heat impact** on already heat stressed crops could be catastrophic to our production.

We would like to be clear, we do not appreciate our business being used as a guinea pig.

Setback should be 700m if further mitigation is not provided.

Why are there only limited empirical studies on the heat effect in utility scale solar plants. Is this because solar developers do not want the truth known? Full studies should be completed by now with many solar developments in our country.

The Clean Energy Council and other reports talk of dense vegetation buffers to mitigate heat. The proponent has advised that vegetation buffers will not be applied as a heat mitigation measure. In any case trees would need to be substantial in nature, mature, dense, and many rows. The Clean Energy Council presentation shows pictures on the potential mitigation page however tubestock trees could not be considered appropriate as take many years to grow and could not meet such mitigation. **The Landscape plan proposed has minimal trees**. The company is saying ground vegetation will be eaten by sheep so would also not mitigate heat.



sPower 340MW Solar Farm approved for Virginia, North America

In an email to the proponent **to which we never received a response** we asked whether they would consider contracting an independent research company to undertake temperature monitoring on our property and if heat impacts were evident that compensation would be made to us for the loss of the value of our crops.

Our view is that the only possible mitigation to overcome heat issues would be to fully surround the development with a bank of earth to the height of the infrastructure and cover this bank of earth (similar to a dam bank or around an oval) with trees and vegetation. This would ensure heat would only travel in an upwards direction even with windy conditions and would insulate the surrounding area. Obviously suitable drainage would be required at the foot of the bank. We have suggested this to the company, but again they provide no response.

Given the lack of proven research on the temperature impacts on solar farms and surrounding land, and with the massive scale of this development it is considered that the heat impact is a significant land use conflict.

We ask that the Precautionary Principle be applied to many aspects of this development. This principle is described in Principle 15 of the Rio Declaration on Environment And Development (to which Australia is a signatory) and states as follows:

“Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

Dust Impact

There is researched evidence that dust on plants can affect plant health and photosynthesis and therefore the health of crops growing adjacent to the development may be affected should suitable dust mitigation measures not be taken.

Over a period of 18 months the proponent suggested the amount that 62ml of water would be required which equates to only 4 trucks per day.

We would question whether this would be adequate for dust minimisation considering that the EIS says prior to excavating the cable trench the topsoil would be stripped. In addition the significantly increased vehicle movements and construction activities will disturb the soil and create significant dust over and above that in normal circumstances.

As members of the Rural Fire Service my family is strongly aware of the slow filling capacity of the nearby standpipe and question whether this will adequately cope with the amount of water required. We note that Hurricane Hill Quarry response regarding the provision is only that they could possibly assist in some capacity however is dependent on rainfall.

We also question that should suitable rainfall to allow for runoff continue to be an issue whether water restriction may also impede dust mitigation and should the amount of water required exceed the 4 trucks per day will Greater Hume still be able to promise such an allowance.

A further consequence should dust not be suitably managed is that dust impedes herbicide efficacy and therefore crop production could be significantly affected by increased weed growth. This may allow further encroachment of resistant weeds.

Livestock

Many of the paddocks adjacent to the development including those L shaped will contain livestock on either grazing crops or sown pasture. [Research](#) indicates that metabolic impacts from construction noise can have an affect on productivity.

Cattle fertility may be affected by stress levels from construction noise and activity and disturbance may cause animals to injure themselves on fencing if startled or scared.

Research indicates that hearing discomfort occurs in livestock at 90-100 decibels which we understand is under the noise specifications of some piling equipment. We note that the noise modelling advises that the piling rig is 87 decibels however would query whether this is correct as have been told that this equipment is extremely loud requiring double ear protection by workers on the site. Some piling rig specifications and documents refer to piling equipment with a noise level of 107 – 117 decibels. We therefore ask that this be checked by a noise expert to confirm if correct.

We also note that the noise calculations in the EIS only refer to the use of 1 piling rig. Unfortunately, our cow, calves, sheep and lambs cannot wear suitable ear protection. Physical ear damage can be applicable to livestock with sound levels over 110 decibels.

We will have lambing and calving activities in the paddocks adjacent to the development and these animals need a calm environment to ensure mismothering does not occur due to being frightened or disturbed. Should disturbance occur and stock leave their offspring we may see losses of calves and lambs.

Why should our business be put at risk due to the loss of a calm environment as the livestock require.

We are also aware of the high pitched noise of inverters which the company downplays, when we visited [Colleambally](#) this noise was a high pitched whistling sound. Research advises that high pitched sounds may impact livestock.



The proponent advised that glare is not a concern but recent photos from the Bomen Solar development clearly shows significant glare and reflection, we believe this is further attempt by the solar industry to mislead the public and department.

We are exceptionally concerned that any glare will have impact on our agricultural activities such as spraying, spreading, sowing, harvesting and all paddock activities in view that on most occasions we are driving back and forth and possibly in the direction of panels. Glare could be dangerous causing accidents and also eyesight damage is a concern. We believe a 12 month visual assessment considering these issues should be undertaken by an independent party.



Weeds

We understand that the neighbouring property has previously had a silver leaf nightshade problem that has been difficult to control. We are concerned that construction activities and the many hundreds of vehicles travelling from the site may spread this noxious weed and others throughout the community.

It has been suggested that due to soil changes under the panels woody weeds will encroach on poor soil and create an increased weed burden that will require regular management.

It is our concern that management of weeds will be difficult in view of the solar panel infrastructure on such a large site. This could result in increased weed burden in the area and a severe issue for neighbouring landowners.

The weed [panicum effusum](#) commonly known as hairy panic is a significant issue in our area and will pose difficulty with potential for build up around solar infrastructure and fencing. We would like to know how the company intends to manage this issue? High security fencing will be installed causing hairy panic to accumulate on the outside of fencing. Will this be cleared by the company? Current agricultural fencing allows for dispersal of hairy panic however chain mesh security fencing will cause build up. Build up of hairy panic is considered a possible further fire risk especially if around electrical infrastructure.

Consultation

In the initial stage we believe that secondary landowners were sought as otherwise every single landowner surrounding the primary property would have objected – if secondary landowners did not receive huge financial offers for their land we believe they would have opposed.

Our consultation with neighbours and community provided a strong understanding that a large majority, particularly agricultural members of the community, were very strongly opposed on the basis that there is an understanding of the agricultural wealth and reliability in this area.

We dispute the proponent adheres to their values and principals. The proponent has steamrolled into this community, told us what they are doing, and do not care about impacts to neighbouring landowners and businesses.

We have met with the company who in all instances have neglected to provide solutions, genuine answers or mitigation strategies. The company has not been conducive to the needs of neighbouring landowners. They have created volatility. They use ambiguous marketing text. Their actions have angered neighbours affected by the development.

NSW Farmers became involved after we made contact to voice our concerns and held a formal [meeting on 2 October 2019](#) at which time the following formal motions were put forward due to the great concern of our members:

1. *That the NSW Farmers lobby the NSW Government and relevant authorities for clarification in relation to categorization of agricultural land use in NSW.*
2. *That the NSW Farmers lobby all levels of Government for state significant solar infrastructure development to be placed on land with limited agricultural potential.*
3. *That the Association lobby for research of the triple bottom line impact of Large Scale Solar infrastructure.*

Approximately 150 concerned members of the community attended this meeting.

The proponent only engaged with NSW Farmers after this meeting and then a forum was held in response.

Information in the EIS about the Community information day is misleading.

The people they call anti solar protesters were concerned neighbours seeking answers. They are not anti solar and some have homes off the grid. We attended the day to obtain answers. No person was pushed and such comments are inflammatory.

Misleading statements were made by the proponent and when corrected by neighbours the landowners interjected causing argument.

The organisers had the room closed into a very small area causing conflict.

Minimal answers were provided at the community information day. Response to many questions was "we can talk about that in a neighbour agreement". No further mention of neighbour agreements has ever occurred.

Contact with our parents at R29 was requested due to lack of consultation but has NEVER occurred. They completed a feedback form. Garth was provided phone details. The proponent talks of undertaking 130 interviews with residents of Walla Walla and Culcairn but HAVE NOT ONCE driven down the R29 property driveway, written a letter, or phoned these life long residents of the area, it is disgusting.

ALL feedback should be heard by the proponent including opposing comment. Their strategy to avoid conflict has avoided opposing community. It is easy to imply that a majority support the development **when you avoid those that object** such as the neighbouring landowners. The change of strategy is a calculated marketing tactic. Further community information sessions should have been held.

Due to minimal response we sent an email in July 2019 with a list of questions. **To date we have received no response** after multiple requests.

Community engagement has been selective. Some community members were invited to visit Numurkah. This email was not sent to objecting neighbours. Consultation has been targeted to gain support not alleviate concerns.

Our meeting on 14 October 2019 with the proponents representatives was worthless. No resolutions achieved. The proponent neglected to supply promised information :

- The meeting was supposed to be about Photo Montages – the company representative advised he did not bring them and would email the next day – didn't happen
- asked for maps of the proposed layout – not supplied
- as we were offered \$15,000 construction disruption payment we requested a full list of the proposed disruptions in writing – was never provided
- again said they would answer my previous list of questions dated July – no response

We question the following EIS and marketing information:

- disruption payment \$200 - \$300000 - Few neighbours offered \$15000 worded to sound like large payments – why?
- Sheep production – comparison to cropping land in this area is not appropriate
- All quotes in marketing material are from people that appear to have received a financial benefit, of course they are going to be in favour
- Solar farms have low visual profile - we reject this
- Wildlife connectivity is not “very limited” in this area
- Use unusual wording like “ a minimum number of tree lines” what is the number???
- Information is copied and pasted from one development to another and websites not kept up to date

These issues make neighbouring landowners, that actually care about the area, extremely angry and absolutely defy the [NSW Renewable Energy Action Plan](#) aim 2 to Build community support for renewable energy.

Conflict in our Community

This development has caused serious conflict in our community with a high level of concern in the area surrounding the development.

It feels like a bomb has gone off in our community and we are in the centre at no choice of our own.

Community Benefit funds should not be used to leverage acceptance of a development. A representative from the company advised us at our kitchen table that some members of the community described the community benefit fund as a bribe. Neighbours to the development feel that their loss is being hedged against benefits to the community. Community funds should only be promoted after approval to avoid buying acceptance.

Neighbours of the development see the Community Benefit Funds as inappropriate and these funds should be spent on mitigation or to alleviate losses to those affected, not buy the community.

The conflict has extended into schools with our son told not to talk about solar even though he will be greatly affected. Some workplaces have stopped talk about the development.

We are unable to visit our local stock and station agent where we spend significant funds due to conflict and comments.

Community fracture will increase if the project proceeds due to community funding at the expense of neighbours impact.

The company highlights high levels of concern from neighbours as opposed to other business and community stakeholders however is not focussing on a resolution in this direction.

Neighbours feel that the town community groups are being played against the neighbours.

Visual Impact

Our family loves our home, we have an amazing waterway in front of our house and we enjoy the peaceful rural outlook and views. It is our gift for the hard work we endure.

We strongly believe this development will destroy that peace and turn our amazing rural outlook into a massive industrial monstrosity. Solar does not have a low visual profile and is extremely visually confronting as we saw when visiting Griffith and Colleambally Solar.

The panoramic photos distort the view and do not provide a clear visual aspect, roads look distorted and it is difficult to see the location of tree lines. We were told optic effects were used.

There is no photo montage towards the north east of our residence is R24 where we will drive past every day.

Addressing the unnamed Council Road as a woodland is inappropriate, there are some trees with broken sections to our east however views through these areas will be seen.

We will see the development from our kitchen bench and from the back of our house and there is a long strip towards the south west behind our house that has no tree line at all.

Only minimal screening of one row of tubestock trees has been allocated. Tubestock trees will take 10-15 years to grow to if they survive. Mitigation will not meet its strategy. There is nothing to shield us from the view. This is not satisfactory.

Tubestock trees at the Griffith site had minimal growth and looked nearly dead surrounded by weeds. Contrary to the EIS they have NOT spoken to us about vegetation types and the vegetation is inadequate and insufficient.

They have said an agricultural fence and an unsealed track will break up the view of the development site, the fence is wire and the track is flat dirt on the ground, this is a stupid statement.

Our view is that the only suitable mitigation would again be an earth bank surrounding the development to the full height of the panels and infrastructure covered in trees. Drainage would be required.

Our family members will have to work in the vicinity of the panels which will be visually confronting.

There is minimal natural screening along Cummings Road which will not sufficiently shield the development from traffic or when exiting our property at R29. We are concerned that people will look at the development when driving past and we will be at greater risk from collision on our road every day. Full tree lines of mature trees to obscure the development should be placed along Cummings road to avoid an accident occurring.

Greater Hume Shire is supposed to be the place that we "Live a Greater Life" however how can this be looking at an industrial eyesore.

The visual impact will cause severe mental health issues.

This company should have to redesign the full layout and design.

Fire

The EIS states the nearest Rural Fire Service is 12kms from the development however the Culcairn South West Brigade is immediately adjacent the development. They have not consulted with the local brigade

Meetings have been held by the local brigade confirming that workplace health and safety issues will prevent RFS Brigade members from entering the solar development sites due to WHS issues of entrapment, electrocution and toxic exposure. RFS members are not HAZMAT trained or equipped and therefore will not enter. Other brigades in the area have also confirmed the same stance and this has been discussed with the District Manager of the Albury Local Fire Command.

HAZMAT responders are NSW Fire and Rescue in Culcairn, Henty and Holbrook with others in the distant regional centres of Albury and Wagga Wagga. Distance will affect response times should an incident occur.

The location and size of the development being 7 kilometers in length increases the risk. The location of the development along the creek will cause access issues.

This development is proposed on **Bushfire Prone Land**. It borders numerous treed riparian areas, the heavily treed local lands travelling stock reserve, it has a gas pipeline running through the property with the gas pumping station on the opposite side of the creek. It is near the Culcairn tip and is extremely close to the townships of Culcairn and Walla Walla. Surrounding areas will be significantly covered in stubble in the bushfire danger periods adding fuel to the fire.

The company has said that farm dams will be kept for fire control however they are currently predominantly dry.

Neighbours will be at increased risk if RFS members can only combat fires when they are outside of the development footprint. Aerial response takes time.

As previously mentioned hairy panic build up will cause a fire risk.

We request that assessment of fire impact form part of approval process not just be a condition of consent requiring fire management or emergency rescue plan afterwards. If fire management cannot be implemented effectively or cause increased risk to lives then the development should be refused.

Our community was tragically affected by the recent fires at Jingellic and therefore consideration of risks to volunteers is an extremely high level of concern. We do not need to put our RFS members at additional risk. Our area also saw significant loss in the Walla Gerogery fires and if a fire of a similar nature entered this massive solar development the ramifications could be catastrophic.

The Gum Swamp would be considered an extreme risk only 3kms from the solar development.

Environment/Biodiversity

The area is a haven for wildlife particularly in the riparian areas of waterways, Billabong Creek, Back Creek and the unnamed water way that extends from the development site to our property in front of our home at R24.

I am extremely passionate about our area, with [significant frog](#) and bird life in our waterway and we enjoy the most amazing sound of frogs at the right times of year.

The unnamed waterway leading from the development flows to a lagoon that brings migratory birds such as brogas, cormorants, herons, spoonbills, pelicans, black swans etc. The proponent tries to suggest that wildlife is limited however we understand that there is significant wildlife in the area, flora and fauna.

We are concerned about the habitat of such wildlife including vulnerable and threatened species and it is concerning that vegetation that supports such species is earmarked for removal. It is not clear how offsets being sought would benefit local populations and the relocation of hollow logs to another area does not support the immediate environment. The removal of 99 paddock trees is exceptionally concerning.

In our very first meeting with the proponent, we advised that we were strongly against any development in the area near the waterway however we have again not been heard and the development footprint has been pushed immediately along and around this area that will result in great disturbance from construction noise and activities.

We note that this waterway has critically endangered woodland and feel that this should be further explored and protected.

Our family has undertaken numerous riparian projects with Landcare to protect this area and the Billabong Creek. We strongly believe that this development will have a detrimental impact on the ecology and habitat of the area and query whether soil runoff into the waterways may have dire ramifications and potential chemical leaching into the future.

In addition to the many birds and frogs we have on our property enjoyed visits from flame robins, believe we have seen a bush stone curlew, often see wedgetail eagles, many different types of owls, have had goannas, lizards, snakes, possums, squirrel gliders, hares, echidnas, wombats, bats, black wallabies, kangaroos and probably more.

We would query whether the short amount of time spent in assessing this ecologically valuable area is adequate and neighbours that spoke to people undertaking the assessments were perplexed at some questions they asked about wildlife leading to wonder of their expertise.

Although we do not have strong environmental knowledge we would question whether all appropriate studies were conducted at the appropriate times of the year. It is of concern that being an extremely dry year, with little water catchment, it would be difficult to properly assess many of the species that may be evident when dams and waterways are full. We believe this may have an impact on the accuracy of the studies.



Waterways/Drainage/Flooding

We note that within the EIS document there are contradictions in relation to flood impacts noting that flooding will be minor however then that major floods have been recorded. The document notes that the worst flood occurred in 1931 but our records confirm 2010 exceeded this flood level.

It is said that the development is outside critical flow areas but we are aware that the infrastructure on the development site is susceptible and close to flood areas as the creek changes course during flooding, only local landowners would be aware of flood course and nobody has asked.

Our family is extremely concerned about flood impacts in view of numerous previous flood events and any changes to flood patterns that may occur due to the development.

Significant flooding does occur on the project site even out into the paddocks as shown in the picture below in 2010. In flood the course of the water can be significantly changed dependant on the conditions at the time.

We have noted that consultation must be undertaken with SES under the requirements of the Infrastructure SEPP for development of land on areas susceptible to flooding, has this occurred? The Culcairn SES Facebook site confirms significant flooding information in our area and levels.

Our property at Roseview can be significantly flood impacted and immediately neighbours the development site with grain and hay sheds very near solar panels and infrastructure. Changes to flood impact could cause damage to our products in storage..

The changes to the water course during flooding cuts sheds at Roseview away from the house bringing significant debris and completely wipes out fencing with debris build up. We do not want solar or associated debris scattered through our property.

Flooding in 2010 caused \$162,200 worth of damage with massive loss of 215 sheep and only centimetres away from flooding the home at Roseview. The EIS advised that a decrease in peak discharge would be accompanied by increased flood depth in the order of 5 cm. A maximum increase in flood height of 13 cm could occur in the southern section of the development site during the probable maximum flood (PMF). Does this mean that we could potentially have an increased risk from a higher level of floodwater?

I strongly believe that the flood issues are being understated by the company and concerned that changes may cause increased flood effects to our property

We are unsure whether this development will have any impact on the Billabong Creek Water Sharing plan being implemented and associated flows.

The EIS mentions erosion and sediment laden runoff. This could impact surface water quality in local waterways during rainfall events - Will this affect runoff into our dams and lagoon, will stock drinking water be affected, will frogs/birds in the waterways be affected

Is contamination from chemicals in panels, bess, and infrastructure possible with waterways in such close proximity, we are extremely concerned about those risks.



Roads/Traffic

Our family is exceptionally concerned about increased noise, dust and road pressures from 300 passenger vehicle movements and 100 heavy vehicle movements during peak construction and compounding pressure if both Walla Walla and Culcairn Solar farm were to proceed.

Our family will be significantly disrupted for the 16 to 18 month construction period and expect that we will not be delayed on our road. As we all do, it would be expected that all vehicles crossing between the South and North of Cummings road would give way to ANY vehicles travelling on Cummings Road.

Cummings road is already in significant need of repair and could not cope with increased traffic. I would like to know how the developer intends to stop light vehicle traffic from utilising Cummings road as a primary source of entry to the development. If this does not occur then additional financial and safety risks to our road will be evident.

We have in excess of 6 school bus trips travelling on our road every day and there will be increased risk from additional traffic along with kids waiting for buses and crossing the road with a large number of vehicle movements.

As mentioned earlier we are concerned that our regular movement of stock through the Cummings road crossing will cause difficulties.

The slip lane on the Olympic highway turning from the south into Cummings road is exceptionally sharp and increased traffic volume will create increased risk at this location.

We move extremely large machinery (headers, balers, tractors, seeders, field bins, mowers, many oversized taking up whole road) and increased vehicle movements of the number suggested will cause safety issues eg cars that are not familiar with farm machinery don't slow down.

If trucks come from north down Hume Highway will they use of the single lane Culcairn Holbrook Road increasing danger to a black spot road. How could this be stopped?

The massive number extra vehicles on roads will increase the road repair financial impact to Council – will ratepayers fund this, will other projects not occur due to road damage caused by this development

Cumulative impact on Weeamera Road is massive with the Walla Development, I do not know how this developer can justify travel past the home of residents at R14 who will be so significantly affected I don't know how they will continue to live in that location. They will not be able to breathe from the dust, the noise will be intolerable and I feel sorry for them with their young children. It is disgusting.

There will be increased collision risk at the intersection on the Olympic/Benamبرا Road.

How are they going to stop the 300 extra cars from using the Cummings Road to turn into Weeamera Road intersection.

Will exiting the Roseview property be dangerous with solar panels and no screening directly in front of the vehicle, will glare cause difficulties driving south down the Roseview track and create a visual hazard?

Our family will be at significantly increased risk on our roads that will endure massive numbers of vehicle movements and fear for my families life.

Noise

How can the developer only use noise measurements for 1 inverter when there will be 75 or 1 pile driver when no doubt there will be many, the calculations should reflect the cumulative noise impact especially considering the impact in inclement weather or windy conditions. These calculations need to be adjusted to reflect the true value.

We are concerned the noise of pile driving equipment has been underestimated with some specifications at 107-112 decibels. We have been told that solar construction workers need double ear protection.

Will our farm workers be adversely affected by noise when they are working in the paddocks nearby and will neighbouring landowners be advised of noise activity when in proximity, how will we be advised of risk.

I am sensitive to high pitched noises. [The noise of inverters are high pitched](#) and annoying, how is this considered with inclement weather (eg railway line is louder when inclement). There will be so many of these around my house with a whole line of them behind our house to the south.

The local community enjoys a quiet peaceful lifestyle and should not have to endure night time noise of electrical infrastructure or battery equipment that should be placed in isolated locations.

Hazards

It is greatly concerning that this area with many neighbours including families with children is being subjected to a hazardous situation containing [Battery Energy Storage Systems](#) that should be located in an isolated and less inhabited area. The PHA advises that emergency plans will be conducted in consultation with the RFS but they are not HAZMAT qualified so this is not appropriate.

We note that in the non agency consultation appendix C2 that a requirement to locate the development near the gas pipeline requires a Safety Management Study including electrical hazard and interference studies and I question why this has not been included as part of the EIS. Other requirements are also indicated by APA. The preliminary hazard assessment does not refer to the property being bushfire prone land or being in the vicinity of a gas pipeline and pumping station. This should be assessed by experts and form part of the approval process not just be another condition of approval. If it is not safe it should not be approved in this location.

I am exceptionally concerned that should a fire occur from the BESS that the toxic fumes can be lethal. Mishaps occur and should we have a significant fire incident we do not want to be at increased risk. Will there be a disaster evacuation plan for our community.

I am greatly concerned that in event of flood, natural disaster, fire or a severely wet year leaching of chemicals could enter waterways.

Social Impacts

The serious lack of genuine answers from the proponent causes severe anxiety of the unknown to nearby neighbours consisting of families and children. We have seen the Erin Brokovich movie. There may be potential health impacts of such a huge large scale electrical facility, so many batteries, so many panels, ELF EMF EHF, chemical leaching.

The stress and mental anguish in relation to the significantly changed landscape will result in a health affect to our community. Some may not want to go outdoors or undertake a healthy lifestyle eg walking or working around the farm as they currently do, this will most likely impact health. People may chose to stay indoors as they do not want to see the industrial eyesore or deal with the construction noise.

Construction impacts will cause a loss of tranquillity and peaceful environmental aspects (bird & frog sounds) that will cause mental health impacts.

There will be increased anxiety of flood and bushfire impacts which is significantly concerning due to the recent impact of nearby fires on our local community that has endured loss of a brigade member.

The destruction of friendships has already occurred. Further fracture will be evident if this development proceeds. Local people may chose not to associate in their usual circles especially if community groups or business accept financial benefit at the loss of neighbours. This fracture has massive mental health implications.

The fracture of business relationships could affect livelihoods causing a financial impact.

There may be a loss of agricultural opportunities for young people with a bright future.

The stress of this development is affecting children due to the stress of parents. This will have a massive impact on students in an important year of study such as year 12.

This development could split families. I think it would kill me to stay and watch the destruction but know my husband could not leave this fifth generation property. How would this affect our children.

Post traumatic stress could be the result of the conflict and stress.

I find it exceptionally hard to consider that my beautiful friends from the city that come and stay with us annually for the country life may no longer wish to visit.

Electricity

I find it seriously annoying that the EIS states on page 11 that the project is not required to meet supply demand. Why then would we forsake large amounts of prime agricultural land for this development?

These developments need to be directed to the renewable energy zones as determined by the AEMO and as long as we approve development in places outside these areas it does not push Government to create infrastructure to where it needs to be.

The proposed NSW Government Transmission Infrastructure Strategy to construct transmission lines from Wagga Wagga to South Australia will open up to appropriate areas that avoid massive large scale developments on prime agricultural land. Haste is not the answer, sensible measured decisions are required .

We have been told that Cockatoos prolific in our area have caused damage to solar infrastructure and potentially create electrical shortages. Will we have increased fire risk from this?

The proliferation of solar developments in other areas of Australia will contribute to a larger cumulative effect of loss of agricultural production caused by drought, water issues and fires.

It is concerning that [grid instability media](#) advised that some solar developments in our area are having their output halved and that connections are being delayed up to 7 years due to the grid. This area is only being targeted due to the transmission lines, if there are problems why are we putting the community through this torture. We are continually being told that not all developments will be able to connect so why therefore is it appropriate to put families through such stress, there should be a better system for development, don't accept a development application unless there is a definite connection available.

It is disgusting that our country is considering renewable energy projects in our desert to provide electricity to Asia however for ourselves we consider it acceptable to forsake prime agricultural land. Surely this kills the transmission loss argument.

I am significantly concerned that improvements to technology will see these massive solar projects become defunct in the future causing major issues. How far away is hydrogen and nuclear?

Sustainability/Waste

There is great concern that the concept of renewable energy is defeated by the end result of a huge solar [toxic waste issue](#). When all these developments come to the end of their life in 2-3 decades will there be a wasteland of solar panels as [research](#) suggests. Will these products really all be recycled, we heard that solar panel seals will deteriorate and toxic leaching of dangerous chemicals could have devastating results.

The infrastructure required for this development contains products that require mining and production and therefore we question that these developments are truly renewable.

We want assurance that no waste will blow onto our property and wonder if consideration has been given to waste requirements at the local tip.

If there is a catastrophic event or natural disaster that causes severe damage to infrastructure I would like to know what plans are in place to ensure immediate restoration occurs to avoid chemical leaching or the travel of debris. Again our family does not want to end up bearing the burden of this development, suffering from health issues or dealing with toxic waste causing environment degradation particularly around our waterways and the Billabong Creek.

Lithium battery recycling needs to be exported – we ask how is this achieved without hazardous impacts??

Climate Change

The company uses the argument that solar contributes to carbon reduction and hence alleviates climate issues. It should be strongly considered however that Agriculture is the industry most significantly affected by climate and therefore to ensure food production into the future serious protection of strong agricultural areas is imperative.

Production deficits result in a need to import food bringing bio security risks and market volatility issues.

The livestock industry relies on feed from cropping in times of drought and therefore increased protection is required for land with cropping capacity.

The do nothing argument in the EIS is not valid, nobody is saying do nothing, just locate development appropriately on arid less productive land

Difficulties of drought in poor farming areas should be seen as an opportunity for solar development providing a benefit whereas in contrast the removal of farming land in strong agricultural areas creates a loss. There are so many areas in Australia that cannot farm.

Other

We have not been able to establish whether any of our services will be affected by this development. We have concerns that the electrical nature of the development may cause interference to NBN, UHF, Mobile Phone and Television. Some of these services are required for safety purposes within our business and there must be no interruption.

Our family was advised that in order to purchase the property for solar development that a change of use of the land to industrial is required purchase under Financial Investment Review Board requirements. If the proponent is continually advising that agriculture will be retained through the grazing of sheep how can this occur?

Land Values - Will our land value reduce due to less desirability/saleability. We do not believe the information provided by the company and have concern that loss of land value will impact borrowing capacity and altered risk ratios may push up interest rate pricing. This may have a financial impact on our business and subsequently affect stress and mental health.

This company is a multi national company and we should be supporting the Australian economy rather than foreign based companies.

Remediation

There is no financial guarantee given towards remediation of the land. I understand that NSW Planning has an enforcement department however if the company becomes insolvent and the landowner themselves cannot fund remediation we are the ones left with a massive waste land around us. This is not acceptable and financial assurance should be provided by either the company undertaking the development or the landowner.

The company is advising that remediation will only occur down to 500mm deep. How can they leave waste in the ground for future users. Remediation should return the land exactly the way it was before the development. Tree removal will not allow full remediation so this should not occur. Land could be acidic and salty due to removal of paddock trees. Solar panels will deteriorate the soil under panels therefore soil restoration should occur.

Vermin

Kangaroos will accumulate on our side of the security fenced areas especially as we are on the side of the Gum Swamp and there is a corridor through that area. High fences will inhibit movement and corner these animals. This could create an increased loss of crop production .

Fox and rabbit vermin will have a harbour, especially along the creek, they will burrow under fencing and be difficult to control.

Locust and mice plagues will be more difficult to control.

Insurance

This development is worth over \$600m. Our public liability insurance is only \$20m. We will not be able to insure to cover an event caused by ourselves therefore this development poses as a risk to the financial security of our business. Negligence is difficult to define. If a fire accidentally travels from our property to the solar development from a machinery fire or through lack of a fire break then we will be at risk. We should not be at increased risk at all and should be fully indemnified for loss at their choice to place a development of significant value in a rural area with fire risk.

Cumulative impacts

There are four large scale solar developments in the pipeline in Greater Hume Shire. The Walla Walla Development will be in very close proximity to the Culcairn Solar Development. The cumulative impact of ALL of the above issues needs to be considered particularly the massive loss of agricultural land and associated agricultural business such as our hay contracting business. Road impact will be substantial on the Olympic Highway and Benambra Road.



27 February 2020

Rob Beckett
Department of Planning, Industry and Environment
GPO Box 39
SYDNEY NSW 2001

Dear Rob,

Re: Submission to SSD-10288 – Culcairn Solar

In response to the exhibition of the EIS for the Culcairn Solar Farm, this submission is made on behalf of Feuerherdt Pastoral Co, being the landowner and operators of a significant portion of adjoining land. Feuerherdt Pastoral raise a number of issues in relation to the project and wish to object to the development for the following reasons:

- the land for the proposed development is High Quality Agricultural Land;
- the land for the proposed development is identified as important agricultural land by the Riverina Murray Draft Important Agricultural Land Mapping project;
- the scale of the development may lead to impacts upon primary production activities of the adjacent properties;
- concerns that the scale of development will lead to alterations in airflow and temperature in the immediate area which may adversely impact agricultural production;
- that the changes to the land for development for solar production will lead to long term deterioration of the condition of the land, including soil structure/condition;
- that the loss of agricultural land from production may lead to reduced management regimes;
- the removal of a significant portion of high quality agricultural land from production will have adverse flow on effects to the local economy;
- landscape screening is insufficient to mitigate the visual impacts from a large scale facility on the surrounding environment; and
- the extent of vegetation removal is significant and will have a long term impact on habitat and biodiversity.

The issues are discussed in further detail below.

Feuerherdt Pastoral Co undertake large scale agricultural production including production of wheat, canola, oats and hay as well as associated grazing. The land primarily used for such production is described as Lots 12 & 13 in DP753735, Lots 32 in DP753764, Lot 33 in DP1081518, Lot 115 in DP753735, Lots 62, 63, 76 in DP753764, Lots 591-593 in DP702677 and Lot 75 in DP665573. Land comprising the development has also been farmed in association with the Feuerherdt Pastoral holdings until recently.

A dwelling is located in the northern portion of the total land holding, with two additional dwellings contained on lots towards the south west. The land holdings also interface with the majority of the western side of the development, for a distance of approximately 6.5 kilometres and a further 1.5 kilometre portion of the eastern boundary.

A site context plan showing the land owned and operated by Feuerherdt Pastoral Co. is provided below.

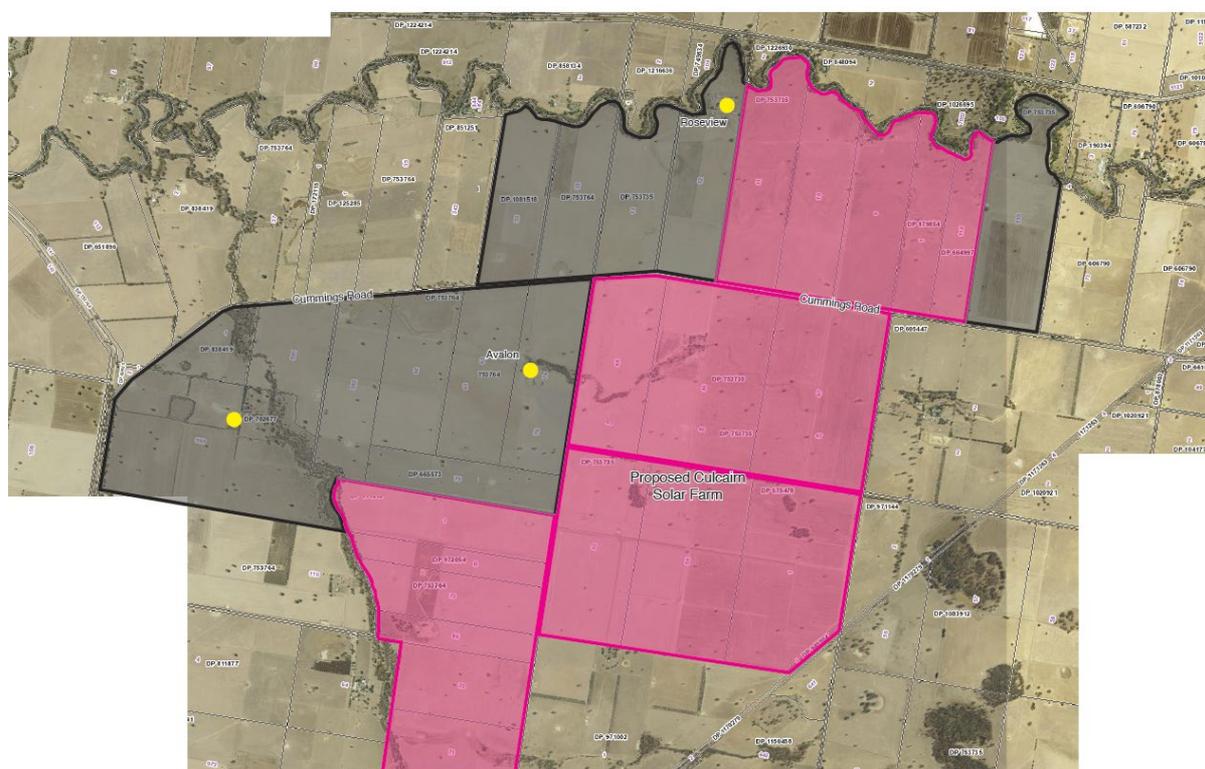


Figure 1 Location of Feuerherdt Pastoral Land Holdings (black shading) in context to the proposed development (pink shading). See enlargement at Appendix 1.

1. Agricultural impacts & Land Capability

Feuerherdt Pastoral are concerned with the scale and intensity of the development and the associated impacts of the development on the agricultural and productive capacity of their land and the broader area. The land which is farmed by Feuerherdt Pastoral directly adjoins the proposed development for a distance of approximately 6.5 kilometres on the western side and a further 1.5 kilometres on the eastern side. Portions of the proposed development area also proposed to occupy land previously leased for the purposes of agricultural production.

The land owned and leased by Feuerherdt Pastoral totals more than 1,000 hectares and has been successfully farmed for a number of years under different cropping rotations. Despite comments to the contrary, the productive value of the land for development is also well known, with Feuerherdt Pastoral having been able to accommodate a viable farming venture on the land for some time.

Agricultural land quality is a key component of the constraints assessment and site selection process for any large scale solar developments. The DPIE document "Large-Scale Solar Energy Guideline" specifically states that *"important agricultural lands, including Biophysical Strategic Agricultural Land (BSAL), irrigated cropping land, and land and soil capability classes 1, 2 and 3 . Consideration should also be given to any significant fragmentation or displacement of existing agricultural industries and any cumulative impacts of multiple developments."*

It is noted that the EIS indicates that the land is classified as Class 4 under the *Land and Soil Capability Assessment Scheme*, which represents a "moderate capability land with moderate to high limitations for high impact land uses". Feuerherdt Pastoral have sought independent advice regarding the land capability of the area from an agricultural consultant, which has indicated that this classification is inaccurate and does not acknowledge other factors of agricultural land capability. The *Rural Land Capability Mapping classification*, which the *Land and Soil Capability Assessment Scheme* is based upon, identifies the land as "Class 1" which it describes as *"Land suitable for a wide variety of uses. Where soils are fertile, this is the land with the highest potential for agriculture and may be cultivated for vegetation and fruit production, cereal and other grain crops, energy crops, fodder and forage crops and sugar cane in specific areas. Includes prime agricultural land"*. The original classification system is described as being based on climate, soils, geology, geomorphology, soil erosion, site and soil drainage characteristics, and current land use data to determine overall land capability. An extract of the dataset of land capability using the *Rural Land Capability Mapping classification* is shown below. The plan demonstrates that the subject land and the majority of the surrounding area is in fact considered to be Class 1 land and therefore representing high quality agricultural land. It is also now understood that the land will be mapped as important agricultural land by the Riverina Murray Draft Important Agricultural Land Mapping project.

Having regard to the data available for assessment and the observations and experience of the landowners in undertaking crop production and grazing for many years, it is contended that the land represents high quality agricultural land and is constrained for proposed solar development.

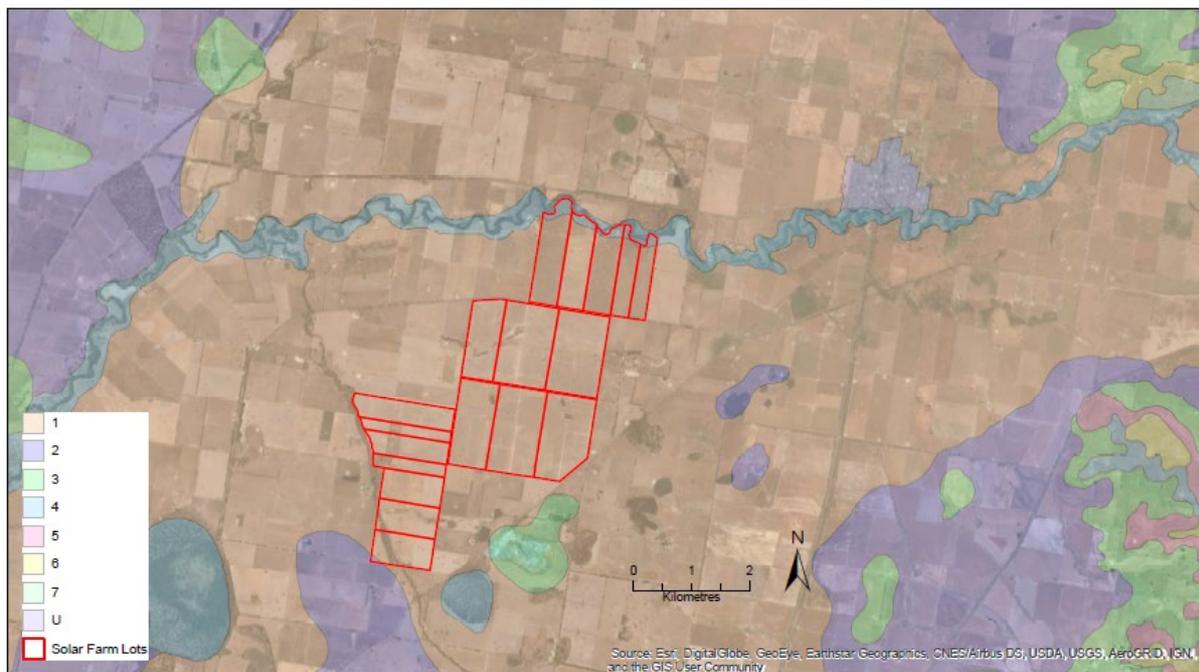


Figure 2 Map of Land Capability utilising *Rural Land Capability Mapping* classification system, with the development lots highlighted in red. See enlargement at Appendix 2.

2. Agricultural Production

Having regard to the development of high quality agricultural land and the scale of the proposed development, it is considered that there is potential for the development to adversely impact on primary production purposes, both for the land to be developed and the surrounding areas. As discussed, Feuerherdt Pastoral have historically farmed parts of the development site and are well aware of the high quality agricultural conditions and the potential loss of productive land that will occur.

It is noted that the primary agricultural function of the development site has been for crop production rather than grazing. The proposal for further grazing of the development site in conjunction with the solar facility is not consistent with the nature of how the land has historically been farmed. This proposed activity is unlikely to generate any productive value and will be difficult to manage and operate given constraints of having stock contained within the development area and around solar arrays. The changes to the site and the agricultural land uses also potentially introduces further changes to soil conditions, soil structures and may lead to additional invasive species spreading within the site and the adjoining productive properties. The proposed grazing proposal put forward is considered to better represent a potential maintenance regime than being a genuine productive activity.

The EIS states that there will be long term benefits including returning soil organisms, soil carbon, soil moisture and soil structure to the areas previously cropped and grazed and allowing the regeneration of groundcovers and other grasses to return. It is considered that the removal of land from production, particular crop production, will have a greater impact on the productive potential of the site given that farming practices will cease and more limited site management will be undertaken. There is also limited discussion within the EIS on issues of long term agricultural production and changes to growing conditions given the physical changes that will occur to the site. It is expected that any potential rehabilitation of the land will become more difficult over the longer term and there will be limitations on potential treatments such as resowing, topdressing and general improvements to soil and pasture conditions while it is used as a solar development.

The potential for adverse impacts of solar development being located directly adjacent to the productive areas of land is also raised as a concern. The scale and intensity of this development, at 1,126 hectares and more than 80% of the total site area covered by solar arrays, raises potential for localised changes to airflow and temperatures which may lead to impacts on the primary production activities being undertaken on adjacent properties.

3. Economic impacts

Feuerherdt Pastoral raise concerns with regard to the economic impact assessment provided in support of the development, particularly with regard to the true economic impacts of development. It is considered that the economic assessment focusses heavily on the impacts on revenues of production and ignores some of the flow on effects from agricultural production.

Agriculture is a critical industry for the Culcairn community and the broader Greater Hume region and the assessment contained in the EIS and supporting documents focusses primarily on the direct economic impact of the loss of production over a period and also quantifies this on percentage of total agricultural land in the Shire. It is considered that the assessment does not adequately consider the broader impacts on businesses associated with the agricultural industries and the potential for impact resulting from a removal of a significant area of land from production. The assessment of economic impacts needs to be balanced against the loss of jobs and potential loss of income for those in the community that rely on agriculture.

The suggestion that large scale solar developments create economic benefits and jobs to the immediate Culcairn and Greater Hume region is also questioned, particularly in comparison to an area that relies heavily on its agricultural sector for employment. The economic assessment also considers the wider region of Albury-Wodonga and Wagga and based on the detail within the economic assessment, it appears a significant portion of assumed benefits will be in these regional centres.

The projected revenue from the site in the Economic Impact Analysis of \$1.42M equates to just under \$1,100 per hectare. Based on the experience of Feuerherdt Pastoral, it is considered that the revenue from productive capacities in this area are in the order of \$1,500 - \$2,000 per hectare, which is greater than the estimates provided within the EIA. This accounts for majority of production being for crop production and smaller scale grazing.

4. Amenity impacts

Feuerherdt Pastoral raise concern in relation to potential amenity impacts and the appropriateness of the mitigation responses to these issues given the scale of the development. Feuerherdt Pastoral undertake rural production across a large portion of land which has an interface with the proposed for a total of more than 7 kilometres.

The scale of the development will impact the visual qualities and reduced amenity of surrounding properties, including long views from surrounding land. While it is noted that the landscape screening has been detailed across the development in different formats, the screening is provided in selected perimeter locations only. It is considered that additional landscape screening areas should be considered for other perimeter locations of the development, including for the full extent of roadside locations.

Given the interface of the development with the productive areas of the adjacent properties, Feuerherdt Pastoral are concerned with the increased potential for land use conflicts, including changes in localised air and temperature conditions and potential weed infestation from inappropriately managed land. This has been detailed again in relation to agricultural concerns above, however the use of properly considered screening and landscaping would assist with mitigating the potential impacts of land use conflicts.

With regard to vegetation screening there appears to be no detail regarding the maturity of the vegetation to be planted for screening areas. It is assumed that smaller vegetation and tubestock will likely form the majority of screening, and that this will take many years to develop to an extent that will have the mitigation response envisaged by the landscape plan. Greater detail and information is required regarding the landscape treatments and interfaces proposed for the development, and the interfaces must include the use advanced landscaping plantings needs to be put forward to appropriately address visual impact and mitigate potential land use conflicts.

The potential for dust is raised as an issue, particularly during construction phase of the project. The development will occur over a large scale and within proximity to a number of receptors and the potential for dust to be generated in the immediate location is considered to be very high. In addition, there will be higher numbers of vehicles (including heavy vehicles) on adjoining roads that may also contribute to additional dust impacts.

5. Biodiversity

It is noted that the development will involve the 0.61 hectares of Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion and 99 paddock trees including 71 hollow bearing trees. The EIS states that the design has been modified to retain areas of significant vegetation, however it does not appear to make attempts to modify the placement of panels to retain any of the scattered vegetation which is significant in providing habitat opportunities.

Feuerherdt Pastoral is also concerned with the placement of new solar development with close proximity to the Billabong Creek and Back Creek, and their associated drainage lines and wetland areas. These watercourses and waterbodies include areas of native vegetation that can provide habitat opportunities.

6. Bushfire Hazards

Given the scale of the development, there is a need to properly consider the risk of bushfire generated by a large scale solar facility. Notwithstanding the identification of bushfire prone land, the scale of the development is considered to increase the risk of bushfire and subsequent impacts to adjoining properties.

While there is risk of fire from the operations of the facility, there is also concern that the development will lead to increased risk of bushfire. At a minimum, it is considered that best practice would be to identify a suite of appropriate bushfire protection measures needs to be properly considered and how these could be effectively established on the site. Management requirements are also critical to the prevention of bushfire risk from the site. The EIS refers to the regeneration of the site for natural conditions, however this may also increase risk of fuel loads and ignition points within the development area.

Yours faithfully,

Feuerherdt Pastoral Co

Attachment 1

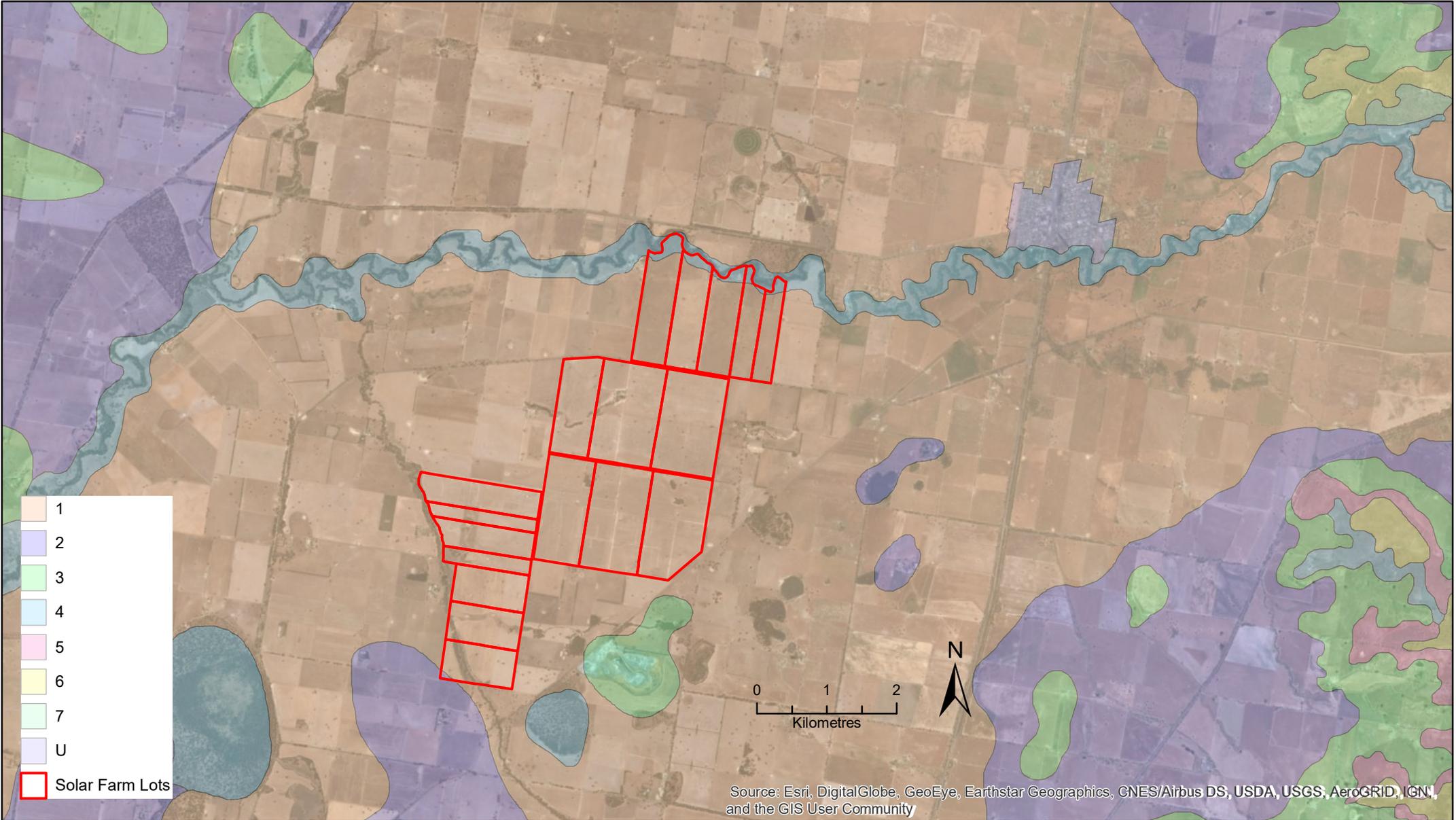
Site Context Map

Attachment 2

Land Capability Map

CULCAIRN SOLAR FARM RURAL LAND CAPABILITY

Note: Riverina Agriconsultants and its employees do not guarantee that this publication is without flaw of any kind or is wholly appropriate for your particular purposes, and therefore disclaims all liability for relying on any information in this publication.
Date: 03/02/2020
Project: Culcairn Solar Farm
Created By: GIS Administrator - J Kajewski



Feuerherdt Pastoral Co

From: Michael Ryan - Riverina Agriconsultants <M.Ryan@rivagri.com.au>
Sent: Monday, 3 February 2020 11:57 AM
To: David Hunter; Sharon Feuerherdt
Subject: Culcairn Solar Farm
Attachments: MURPHY.pdf; rural-land-capability-mapping.pdf; ACS2019_WheatTables_v1.0.0.xlsx; ACS2019_OilseedsTables_v1.0.0.xlsx; 2006-2011-ABS-Ag-Data.xlsm

Hi Sharon,

A summary of our discussion.

The land is mapped as Class 1 under the Rural Land Capability mapping classification, which is the highest quality land.

According to the attached paper Land and Soil Capability mapping was introduced to replace this dataset. In any event I think the description of the land in the EIS as Class 4 land with moderate to severe limitations is inaccurate and the land is prime agricultural land and likely to be mapped as Important Agricultural Land when this mapping is completed.

I think the impact should assess lost gross revenue and need not have regard for costs of returns. The projected revenue from the site in the Economic Impact Analysis of \$1.42M is just under \$1,100/ha. Based on your experience you could state what you know it is capable of. The attached ABARES tables show long term average (national) prices for wheat and canola. Livestock revenue from grain could be calculated as a fair agistment rate or use the grain and graze estimate of \$200-\$400/ha.

Post farm gate multiplier I use 2.1788 as used by ABS in the agricultural census.

You are well placed to comment on the comments in the Economic Impact Analysis on employment impacts.

Regards,
Michael Ryan

 **Michael Ryan | Principal Consultant**
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A REVISED LAND AND SOIL CAPABILITY CLASSIFICATION FOR NEW SOUTH WALES

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Abstract

In recent years, New South Wales has seen the development of a number of natural resource management initiatives and reforms. These have created a renewed need for a land classification system to assist the implementation of sustainable land management practices as well as the targeting of public funds. Rural land capability classification (RLC) (Emery 1986) is one system that has been used in the past to achieve these outcomes. However, the rural land capability classification was designed principally to assess the physical characteristics of a site to define limitations on agricultural practices and was intended to meet the needs of farming operations of the time. Such a system therefore has limitations for contemporary use since it does not account adequately for more recent farming practices nor does it account for soil limitations in a sufficiently transparent way. A revised Land and Soil Capability (LSC) classification has therefore been developed to provide a capability assessment based not only on physical land characteristics but also on soil limitations and the management of these to mitigate land degradation and associated off-site environmental impacts. The concepts and development of the revised LSC classification are described and the application of the system to contemporary natural resource management challenges are illustrated.

Introduction

In recent years, NSW has seen the development of a number of natural resource management initiatives and reforms. These have created a renewed need for a consistent land classification framework to assist the implementation of sustainable land management practices as well as the targeting of public funds. The concept of land capability is useful in this respect because it is a composite assessment of land and soil, which incorporates the key physical characteristics that limit sustainable land management. Such an approach is simple and logical in approach, is widely known and accepted in the rural community and has been applied widely (e.g. Klingebiel and Montgomery, 1961; USDA, 2000, CLI, 1965; Bibby *et al.*, 1991).

The existing Rural Land Capability Classification system in NSW (Emery 1986) was originally developed to identify and map the environmental factors that may limit agricultural activity in a rural environment and was designed to meet the needs of farming operations of that time. While soil limitations were considered in this original classification, there was no transparent system for including or recording these. The system also has limitations in that it does not fully account for contemporary farming practices nor for all the available information and current knowledge of soil constraints, related off-site environmental impacts and the appropriate management of these.

Here we propose a revised land and soil capability classification system for NSW. The proposed '*Land and Soil Capability Classification*' (LSC) retains the eight class structure of the earlier Rural Land Capability Classification system (designated Class I to Class VIII) because of their logical and transparent nature and their general acceptance in the land resource assessment and the rural community. However, the revised scheme places additional emphasis on soil limitations and their management and explicitly incorporates these into the classification. As we move to progressively higher capability class numbers, an increasing degree of both soil and land limitations then progressively restrict the range of land use practices within these.

The Revised Land and Soil Capability Classification

The aim of the Classification is not to take the place of existing detailed classification systems relating to specific land uses (eg Urban Land Capability Classification, Hannam and Hicks, 1980), but to provide a broad overview for the assessment of the capability of any particular parcel of land. The LSC provides a guide for the assessment of land capability, soil constraints and land management recommendations for use at a range of scales including State,

catchment and the property planning level. The existing NSW DIPNR Land Capability Mapping used in conjunction with other soils information such as soil landscape mapping can be used to provide a broad guide to the soil and land capability class and soil limitations present at the coarse scales. However, when applying the LSC at the more detailed property scale, a site investigation and assessment by local experts in land resource planning is required.

Operation of the Revised LSC

Although LSC is intended primarily to address land resource issues associated with agricultural activities, it can also be used to provide a general indication of the capability of the land for other land use practices. This is achieved by grouping land use practices on the basis of their potential *impact* on soils and other natural resources, including on-site and off-site environmental effects. Some examples of land uses grouped by their impact on the soil are listed in Table 1.

Table 1. Examples of land uses and land management grouped by their potential impact on the soil.

| Impact of Land Uses and Land Management on the soil | Examples of land uses and land management |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Very low impact | National parks and wilderness areas, |
| Low Impact | Very light opportunistic grazing and low intensity logging. |
| Moderate impact | Occasional tillage of the soil, long term medium intensity grazing, urban and infrastructure development where erosion control and sedimentation practices are adequately implemented. |
| High impact | Removal of ground cover by tillage, grazing or clearing, frequent tillage of the soil using discs and tines, long term intensive grazing; clear felling, irrigation; water use and disposal in urban environments, land uses that can have a high impact on the soil chemical balance (eg soil acidification, exposure of acid sulfate soils); |

The identification and appropriate management of soil constraints is an important component of the revised LSC. Table 2 summarises a range of soil limitations used in the classification. This list is intended to be flexible and can be augmented by the addition of other limitations as knowledge of soil degradation and its mitigation improves. The severity of soil limitations present, along with any landscape constraints, determine the capability class of the land being assessed. For example, LSC classes I and II have minor soil limitations which are easy to overcome whilst LSC classes VI to VIII have high to extreme limitations that are difficult to impossible to overcome.

Table 2. Summary of soil limitation categories

| Soil Limitation | Risk Categories |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Soil acidification | ac0 = no acidification risk; ac1 = low acidification risk; ac2 = moderate acidification risk; ac3 = high acidification risk; ac4 = extreme acidification risk. |
| Wind erosion | ze0 = no wind erosion risk; ze1 = low wind erosion risk; ze2 = moderate wind erosion risk; ze3 = high wind erosion risk; ze4 = extreme wind erosion risk. |
| Water erosion | we0 = no water erosion risk; we1 = low water erosion risk; we2 = moderate water erosion risk; we3 = high water erosion risk; we4 = extreme water erosion risk. |
| Soil structure decline (sodic surface soils) | ssd0 = no soil structure decline risk; ssd1 = low soil structure decline risk; ssd2 = moderate soil structure decline risk; ssd3 = high soil structure decline risk; ssd4 = extreme soil structure decline risk. |
| Mass movement | mm0 = no mass movement risk; mm1 = low mass movement risk; mm2 = moderate mass movement risk; mm3 = high mass movement risk; mm4 = extreme mass movement risk. |
| Soil carbon loss | Relevant for greenhouse issues and especially for peat and alpine soils. |
| Soil contamination | con0 = no soil contamination risk; con1 = low soil contamination risk; con2 = moderate soil contamination risk; con3 = high soil contamination risk; con4 = extreme soil contamination risk. Often relevant in man-made lands associated with mining or in areas of industrial waste disposal. |
| Soil fertility decline | Related to acidification but also considers losses of nitrogen, phosphorus, sulfur and micronutrients |
| Acid sulfate soil | as0 = no acid sulfate risk; as1 = low acid sulfate risk; as2 = moderate acid sulfate risk; as3 = high acid sulfate risk; as4 = extreme acid sulfate risk. |
| Dryland salinity | dsal0 = no dryland salinity risk; dsal1 = low dryland salinity risk; dsal2 = moderate dryland salinity risk; dsal3 = high dryland salinity risk; dsal4 = extreme dryland salinity risk. |

Having assessed the site characteristics and soil limitations, land is then grouped within the classes detailed in Table 3. Although these class definitions are similar to those of the original Rural Land Capability Classification System (Emery 1986) they incorporate more information relating to land management intensity and soil limitations. For this reason, the revised Land and Soil Capability Classification can, in some circumstances, substantially alter the original classification under RLC. An example of such a change includes riparian zones adjacent to stream channels, which are assigned a relatively high class number in an area of otherwise low class number. Another example might be Class II or Class III land (RLC) in which a clear salinity or sodicity soil limitation exists, in which case this land would be assigned to Class VI.

Table 3. Summary of the land and soil capability classes.

| Class | Definition | Description | Land-Use |
|-------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I | Land with no major limitation for use and suitable for a wide range of land uses | Generally found on level alluvial flats of major rivers with stable fertile soils. Considered to be prime agricultural land and contain some of the best cropping soils in the State. | Suitable for both high and low impact land uses. The exception urban development as much of this land is flood prone. Includes the best cropping land in the State. Few limitations. |
| II | Land with minor constraints to land use | Generally on very gently sloping to undulating slopes and footslopes where limitations can be controlled by simple soil management. | Suitable for a wide variety of land uses with very low to high impact on the soils. The exception is urban development as much of this land is flood prone |
| III | Land with slight to moderate constraints to use | Includes gently sloping to undulating areas prone to soil erosion that can cause significant off-site impacts | Generally suitable for very low to moderate impact land uses but also some high impact land uses if suitable soil management practices implemented |
| IV | Lands with moderate limitations for land use | Not capable of regular cultivation cropping owing to limitations of slope gradient, shallowness of soil, climate or a combination of these. | Generally suitable for very low to moderate impact land uses. Includes some of the best grazing lands in the State. |
| V | Lands with moderate to high limitation to use | Land not capability for regular cultivation owing to limitations of soil erodibility, slope gradient, shallowness of soil, climate or a combination of these. | Land is generally suitable for moderate to low intensity grazing. Significant limitations for high impact land uses.. Suitable for very low to moderate (with appropriate management) impact land uses such as direct drill cropping and grazing. |
| VI | Lands with a high degree of limitation to use | Includes rolling to steep hills with slopes up to 33 % with high erosion risk and areas where climate severely limits the potential for plant growth | Not capable of supporting high or medium impact land uses due to extreme difficulty in removing or reversing degradation and associated off-site impacts. Low productivity agricultural land capable of light grazing or nature conservation. |
| VII | Land should remain under native vegetation due to high soil erosion hazard and extreme site limitations | Includes very steep lands and all eroded lands where the best method to control soil erosion is by retention or re-establishment of native vegetation. | The extreme degree of limitations present preclude the use of all land use practices except for those with very low impacts on the soil (e.g. native vegetation and maintenance for nature conservation) |
| VIII | Other lands not suitable for any type of land use apart from native timber and nature conservation due to severe limitations. | Includes: beds and banks of streams; swamps; lagoons; wetlands; lakes; tidal flats and estuaries; land with steep to precipitous slopes (> 50%); and sand dunes and beaches which are bare or prone to extreme wind erosion | Suitable for only very low impact land uses such as native vegetation conservation. Includes the beds and streambanks of streams of fifth order or greater. |

Although the land capability framework was not specifically designed with the drier western parts of the State in mind, it can be adapted to these areas. These areas are currently covered by Land Systems Mapping (NSW Soil Conservation Service) and this can provide the basis on which to apply the land capability system to these areas and this element of the land and soil capability system is currently being developed.

Although the revised land and soil capability scheme requires detailed on-ground testing, it seems to offer much potential for use in natural resource management at regional, catchment and property scales. It provides a common framework by which targets for soil management can be placed and applications of this type are currently being developed by staff in the NSW Government agencies.

Conclusion

The proposed LSC provides a convenient framework for assessing the impact of various land use and land management options on natural resources and particularly catchment health. It provides a convenient checklist of the natural resource limitations that need to be considered when natural resource planning is undertaken from the broad scale, to the catchment, sub-catchment and local property scales. It also provides a mechanism to assess these natural resource limitations, but also allows for the incorporation into the scheme of more detailed and comprehensive techniques based on the modelling of natural resource processes.

The revised LSC is intended to support land use planning. It is intended to be simple and logical, transparent to users and community, be applied at a variety of spatial scales and is designed in such a way that it can incorporate assessment of National indicators of soil quality if necessary. The scheme does need to be tested on-ground, and that is an objective for the further development of this scheme.

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Silverleaf Nightshade Management Project

CASE STUDY 1 — Changing the enterprise mix

TIPS

Jonathan believes that the important factors for managing the weed on his property are:

Spraying under the windrower, which is getting the weed earlier

High rate of Ally mixed with Roundup OR High rate of Grazon mixed with Roundup and an estercide when spraying over the summer

The seasonal routine of cropping has made it easier to be consistent in the attack on the weed, compared with running stock

Cropping has meant the weed is confined to certain paddocks and is not being spread around the farm by stock

The cropping rotation over the last dozen years or so (alternate wheat, canola) has helped to prevent it setting seed

PROPERTY SUMMARY

Jonathan Schoff farms 1100 ha on the Billabong Creek flats between Culcairn and Walla Walla. He currently continuously crops three adjoining properties, one of which is the family farm. This farm had silverleaf nightshade accidentally introduced, probably from hay, in the late 1920's, before the Schoff's owned it. They have been fighting the weed since they purchased that farm in the early 1950's.



Spraying silverleaf nightshade on the Schoff family property in February 1964

Photos supplied by Leon Schoff

Back in the 1950's, silverleaf nightshade was initially treated with arsenic in diesel, then later sprayed with 2,4,D. Advice at that time was also to cut it each year to prevent seed set, then spray it after; so this was done for three years before it was realised that this was actually spreading the weed.

When Jonathan took over the farm he was conscious of the need to repair or replace fences and other infrastructure if he were to continue running stock, and he was also aware that the stock were spreading the silverleaf nightshade. This, among other factors, influenced his decision to go into continuous cropping. The sheep went in 1999, and in 2002 he got rid of the cattle.

It was at least five years before the enterprise change affected a noticeable decrease in the amount of silverleaf nightshade.

Silverleaf Nightshade Management Project

CASE STUDY 1

DORPERS SAVED A SPRAY

In 2002, in a dry summer, with not much feed about, Jonathan agisted his neighbour's Dorper sheep for a while, and they ate the SLN right down to the ground, saving Jonathan a spray that summer.

The agistment worried Jonathan a bit, as he was concerned about the effect on the sheep, and where the sheep would spread the weed after they left his paddock, since some of the plants had set seed before the sheep went into the paddock.

Stock have been recorded as affected by toxicity due to SLN, but goats will eat it out with no ill-effects. Jonathan also observed that the sheep left the paddock a dustbowl, which was not good for the soil, but concedes that to eradicate the weed there will always be a cost.

He considered that, if he had known how effective they would be, it would be better to have put the Dorpers in before the weed set seed. However, it is difficult to do this, as the plants often flower and set seed over a wide window of time, even in the same area.



Targeted herbicide application is very attractive to Jonathan as a way of continuing to contain the weed

LOOKING FORWARD

Jonathan has made a change which means he is keeping on top of the weed for now, but he's not sure for how long. The spraying over summer is very expensive and is containing —but not eradicating — the weed.

Spot spraying in the areas where the weed is sparse can eradicate it in those areas, but timing can be an issue. The technology of the Weedseeker or similar spray setup is very attractive, as it means he could target the right rate of herbicide to each weed, thus making the herbicide budget stretch over more years, while still maintaining its effectiveness.

Jonathan is aware that he can't have an off year - if he allows it to set seed even one year, it will be back to infestation levels very quickly.

This year Jonathan has planted lupins, and will be very interested to see how this impacts on the SLN management regime he has set up with the wheat/canola rotation.



High air temperatures impact on wheat growth and development to reduce grain yield

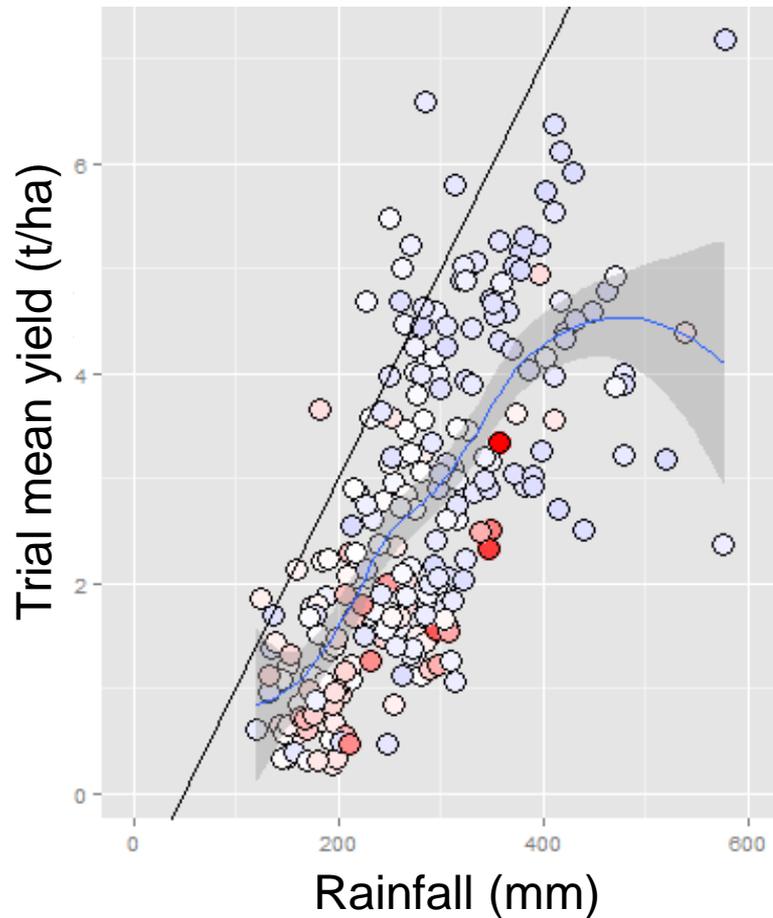
Greg Rebetzke

CSIRO AGRICULTURE
www.csiro.au

GRDC Grains Research & Development Corporation



Heat effects in yield trials



Numb. Hours > 30C
(-300/+100C around flowering)



Heat around flowering
reduced trial mean yield
in at least 30 trials

Trial yield from South Australia and
western Victoria

(Chapman et al., unpublished)

Utilising existing data sets...

| Growth Stage | Climatic variable | Unit | Effect (kg/ha) |
|--------------|-------------------|--------|----------------|
| Flowering | Rainfall | mm | 22 |
| | Avg daily min | °C | -161 |
| | Avg daily max | °C | -371 |
| | Days >30 °C | number | -379 |
| | Days >35 °C | number | -837 |
| | Avg Temp | °C | -490 |
| Grain-fill | Rainfall | mm | 23 |
| | Avg daily min | °C | -125 |
| | Avg daily max | °C | -225 |
| | Days >30 °C | number | -130 |
| | Days >35 °C | number | -179 |
| | Avg Temp | °C | -244 |



Regressions between NVT site average grain yield (600 between 2006 and 2011) and various climatic parameters (all significant at $p < 0.01$ or greater)

(Source: Scott Chapman and Bangyou Zheng)

Baseline economic losses from heat shock (hot days) (Agtrans analysis)

Annual average (over 5 years)

| | |
|-----------------|---------|
| Western Region | \$230M |
| Southern Region | \$590M |
| Northern Region | \$290M |
| Total | \$1100M |

Plus: yield losses from persistent high temperatures above the optimum of 22-25°C during flowering and grain filling.

Heat affects growth and yield

Estimated direct economic losses of \$1.1 billion annually in wheat

Heat affects grain yield and quality in one of two ways –

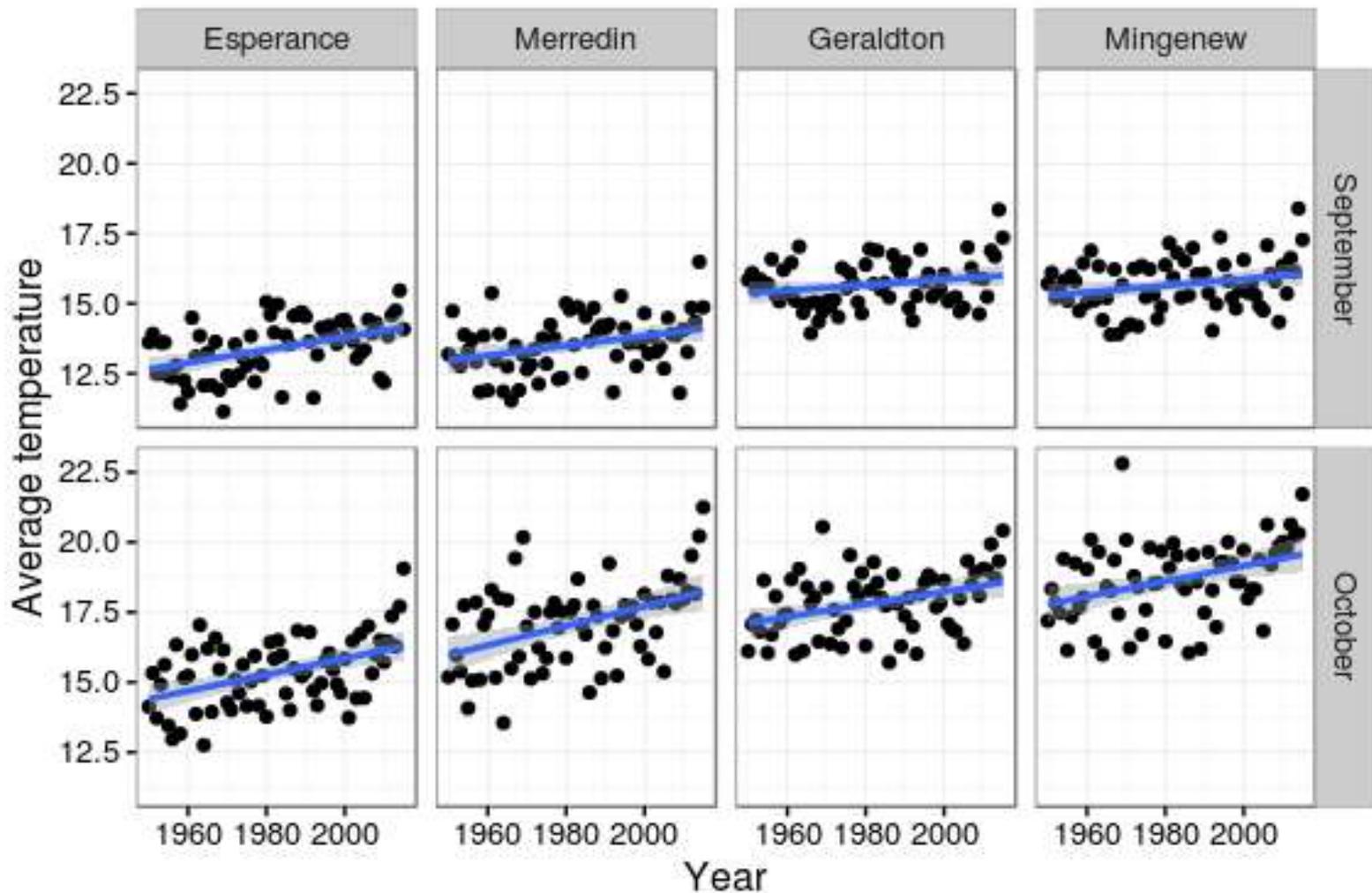
- Indirect effects

Phenology, tillering, dry-matter accumulation, frost etc.

- Direct effects

Grain-set (fertility), photosynthesis through loss of leaf area

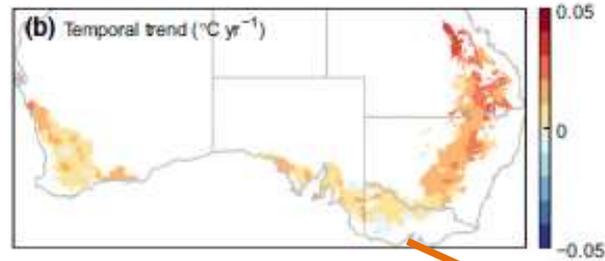
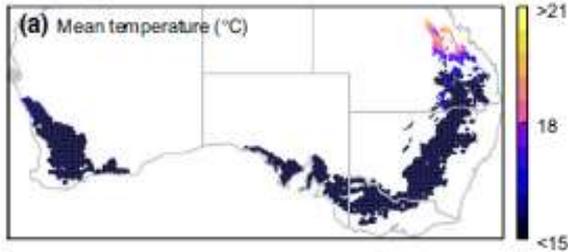
Historically, increasing average air temperature throughout WA Appendix 5



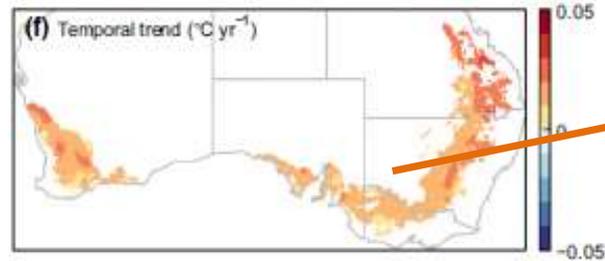
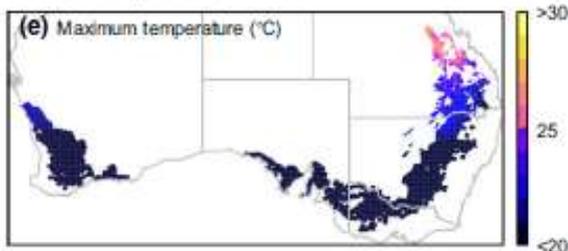
(Source: Bangyou Zheng)

Change in temperature during the wheat season over the last 50 years

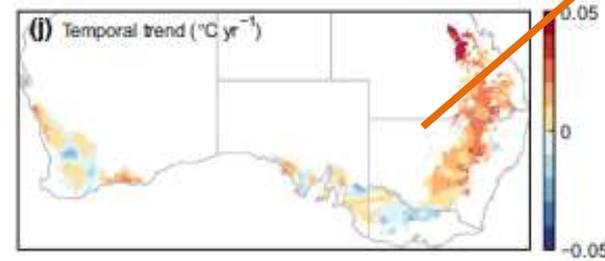
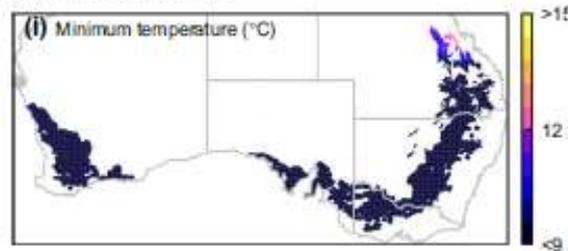
Mean temperature



Maximum temperature



Minimum temperature

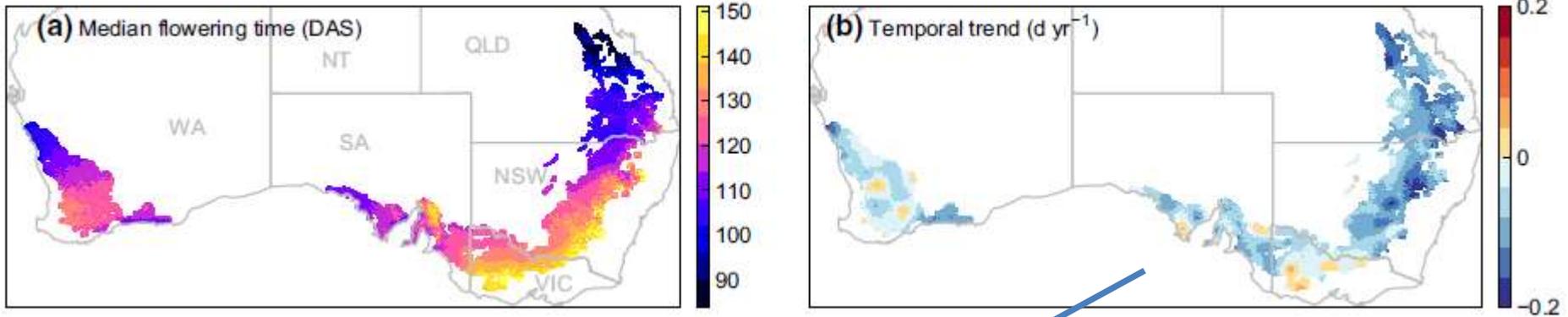


Wheat is experiencing warmer temperatures in almost all the wheatbelt

Data from 1957 to 2010

Zheng B, Chenu K and Chapman SC (2016) Velocity of temperature and flowering time in wheat – assisting breeders to keep pace with climate change. *Global Change Biology* 22:921-933.

Change in flowering date over the last 50 years Appendix 5



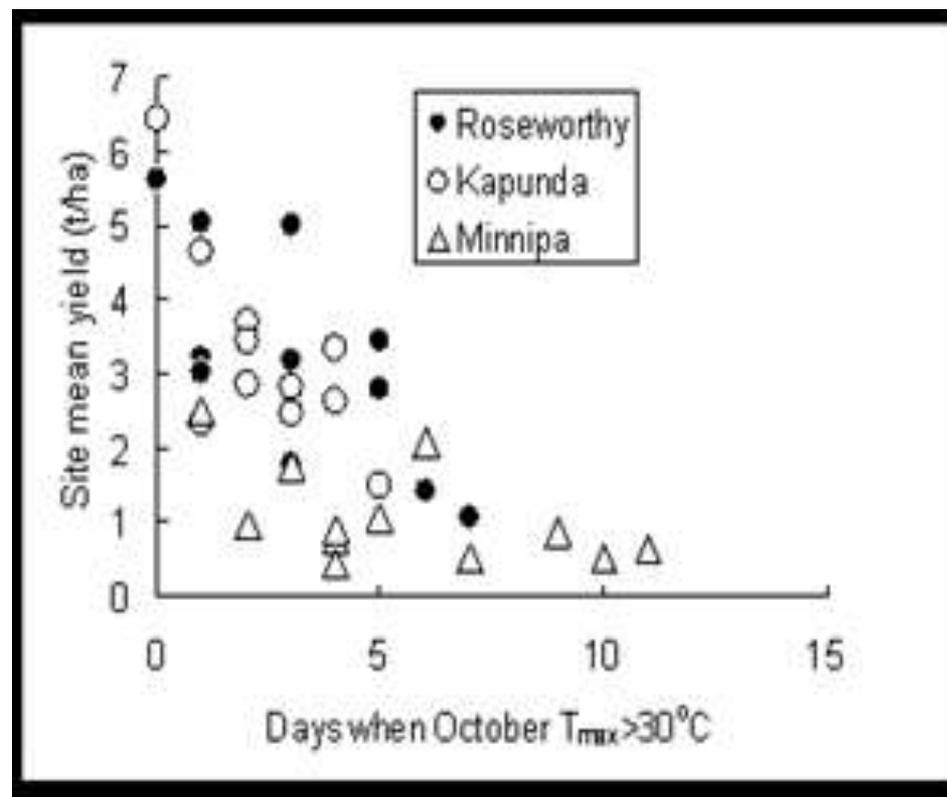
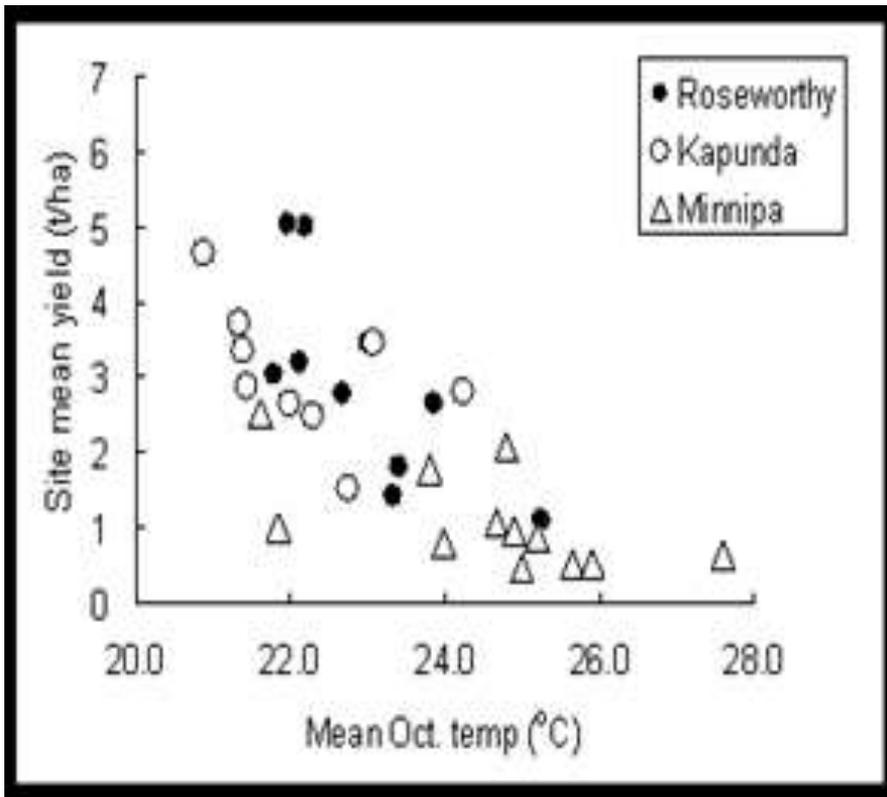
Earlier flowering (blue) in almost all the wheatbelt
(mainly due to warmer temperature)

Data for Janz sown the 1/6

Data from 1957 to 2010

Zheng B, Chenu K and Chapman SC (2016) Velocity of temperature and flowering time in wheat – assisting breeders to keep pace with climate change. *Global Change Biology* 22:921-933.

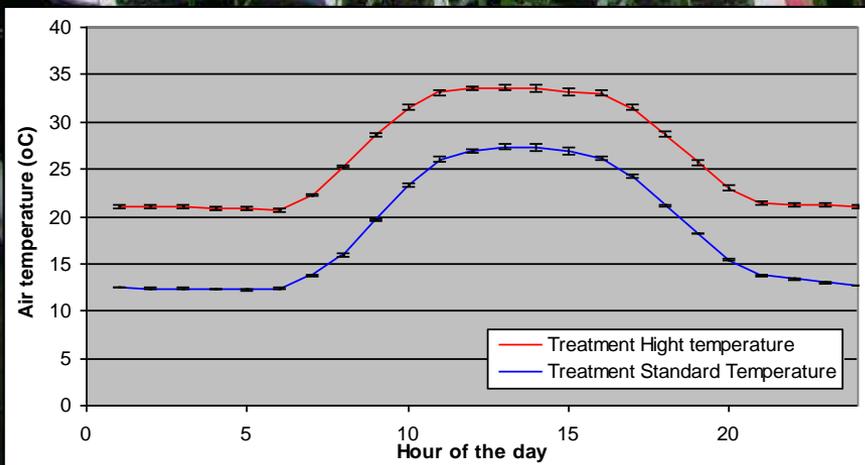
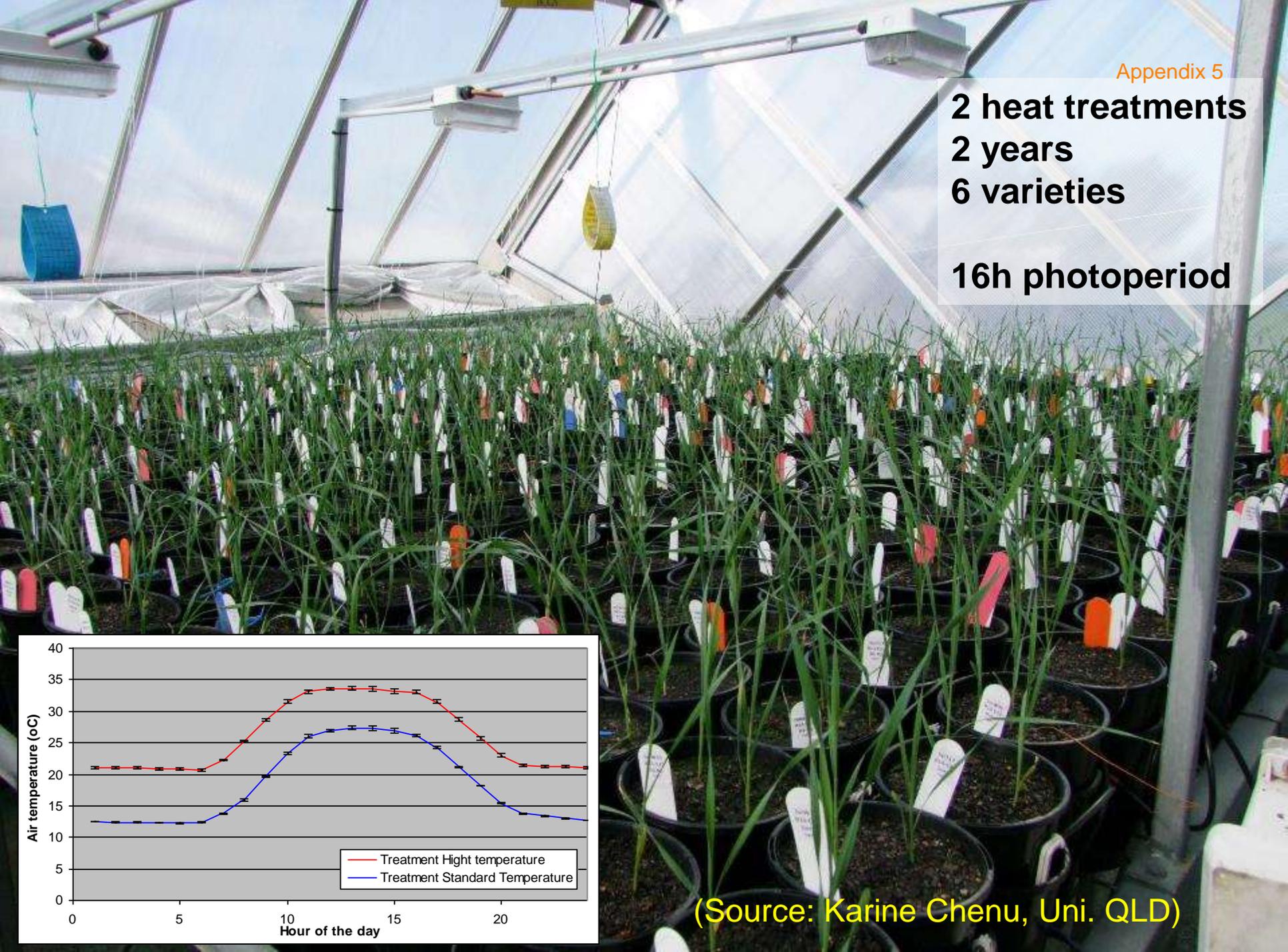
Relation between mean T and wheat yield



(Source: Glenn McDonald, Uni. Adelaide)

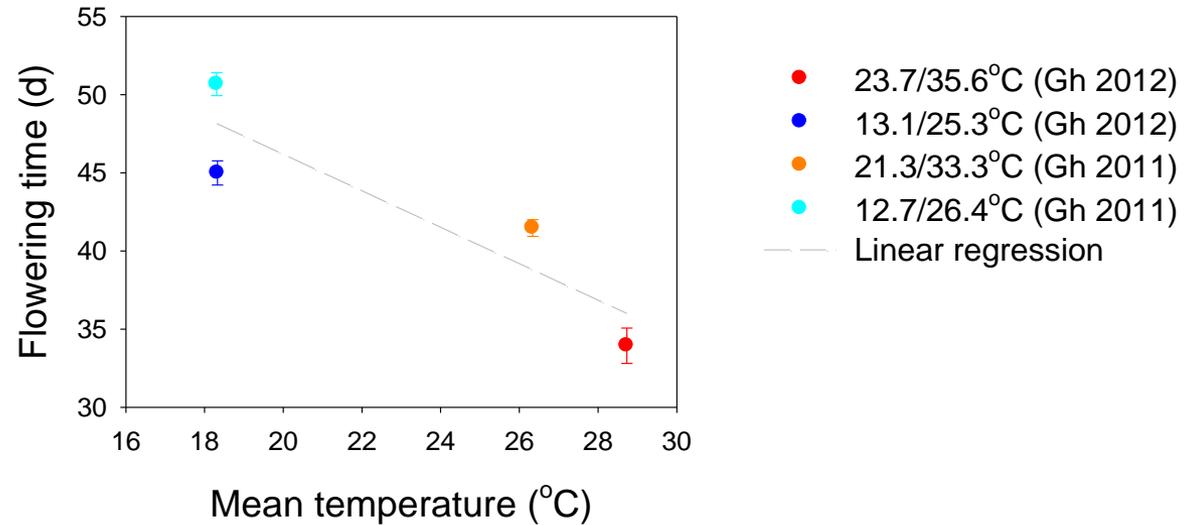
2 heat treatments
2 years
6 varieties

16h photoperiod



(Source: Karine Chenu, Uni. QLD)

Time to flowering is hastened with warm temperatures Appendix 5

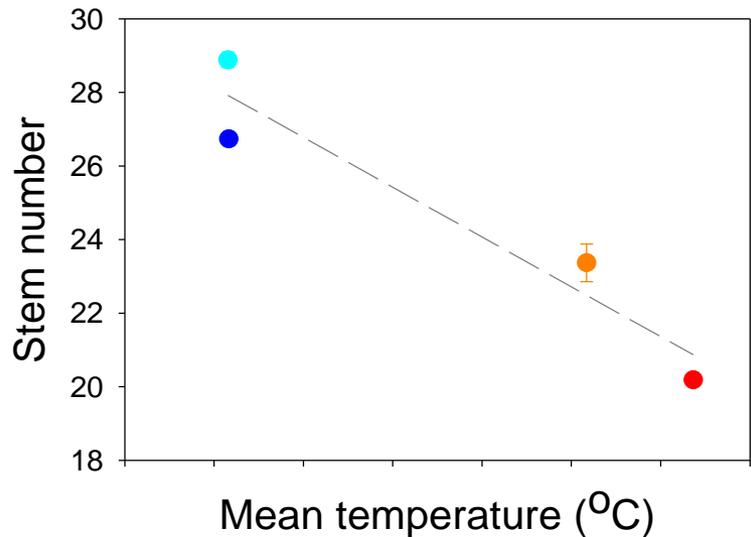


Day Temp. 35°C 35°C 27°C
Night Temp. 23°C 13°C 13°C

Higher temperature accelerates wheat phenology

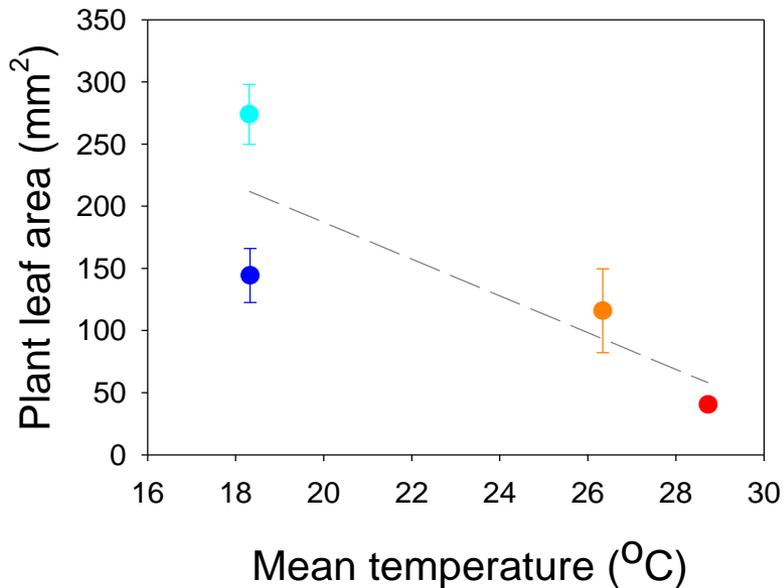
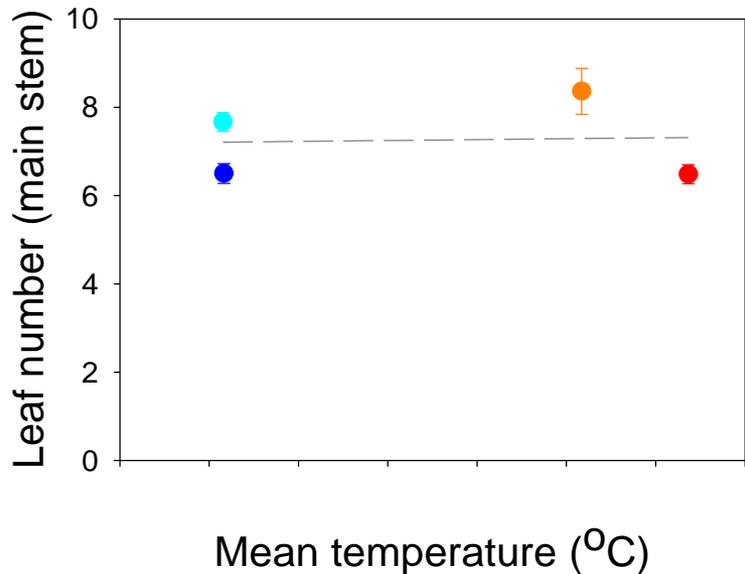
(Source: Karine Chenu, Uni. QLD)

Early impact of heat - Vegetative development



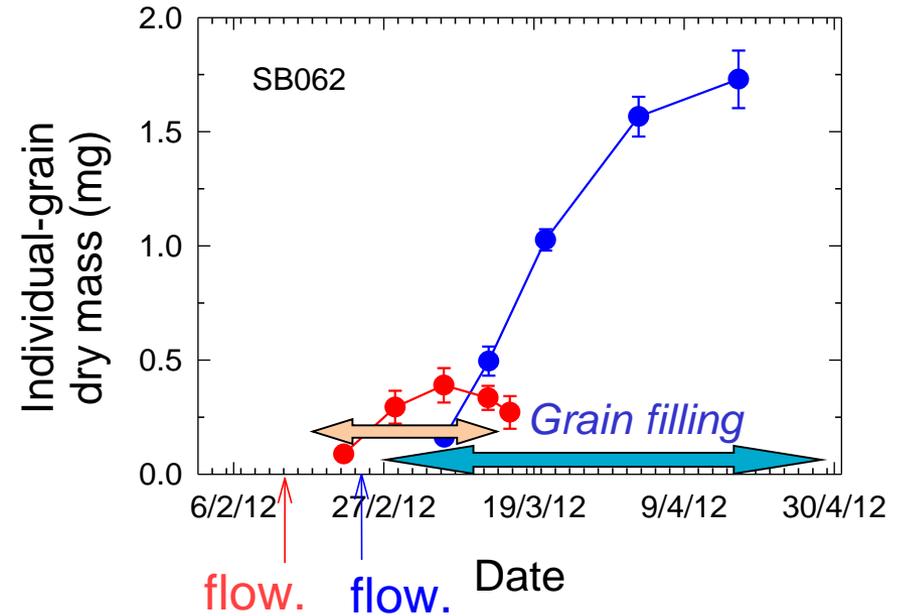
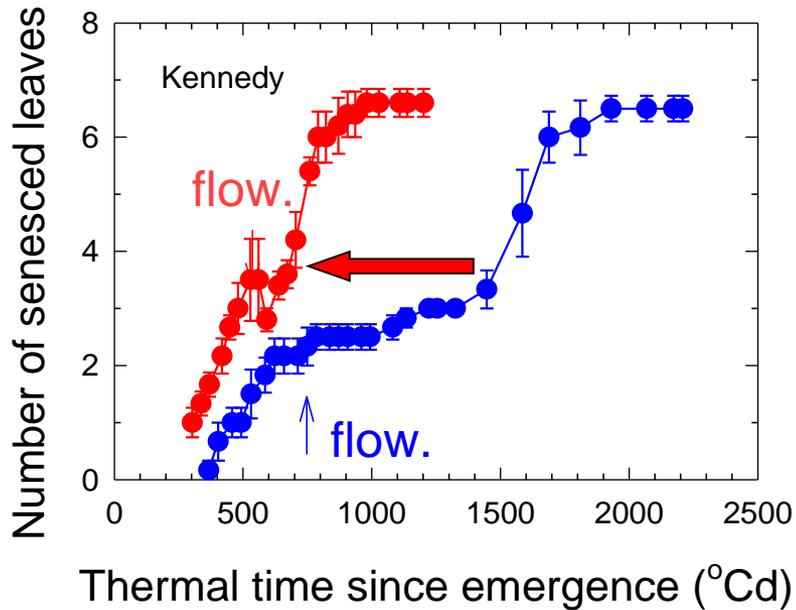
- 23.7/35.6°C (Gh 2012)
- 13.1/25.3°C (Gh 2012)
- 21.3/33.3°C (Gh 2011)
- 12.7/26.4°C (Gh 2011)
- Linear regression

Reduction in plant leaf area due to less tillers & smaller leaves



(Source: Karine Chenu, Uni. QLD)

Post-flowering



- 13.1/25.3 $^{\circ}\text{C}$ (Gh 2012)
- 23.7/35.6 $^{\circ}\text{C}$ (Gh 2012)

Accelerated senescence – Reduced grain growth rate and duration
(even in thermal time)

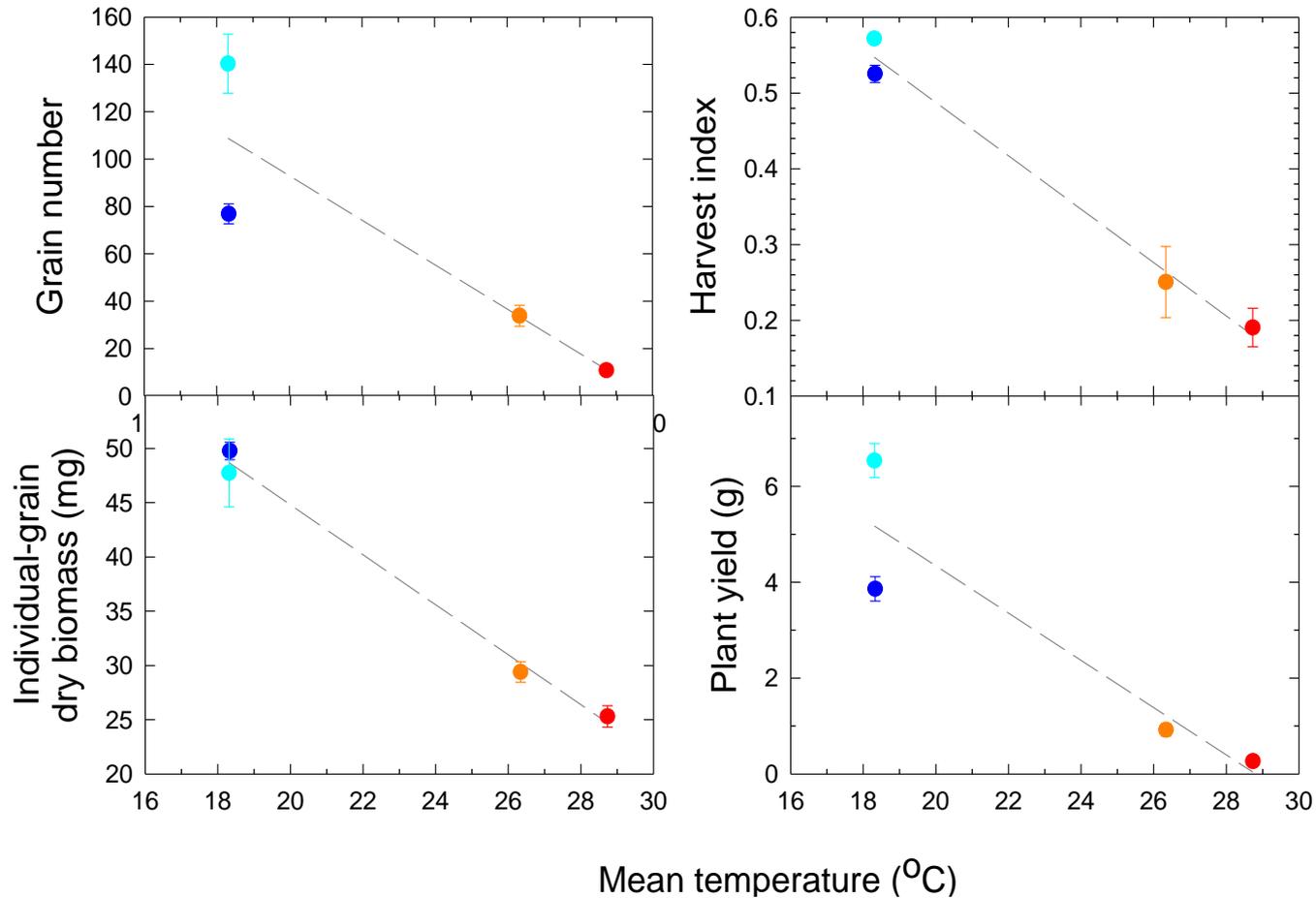
(Source: Karine Chenu, Uni. QLD)

'Plant yield' component

- 23.7/35.6°C (Gh 2012)
- 13.1/25.3°C (Gh 2012)
- 21.3/33.3°C (Gh 2011)
- 12.7/26.4°C (Gh 2011)
- Linear regression

Drastic reduction
of grain number
and size when the
stress is imposed
over the whole
cycle

Reduced harvest
index

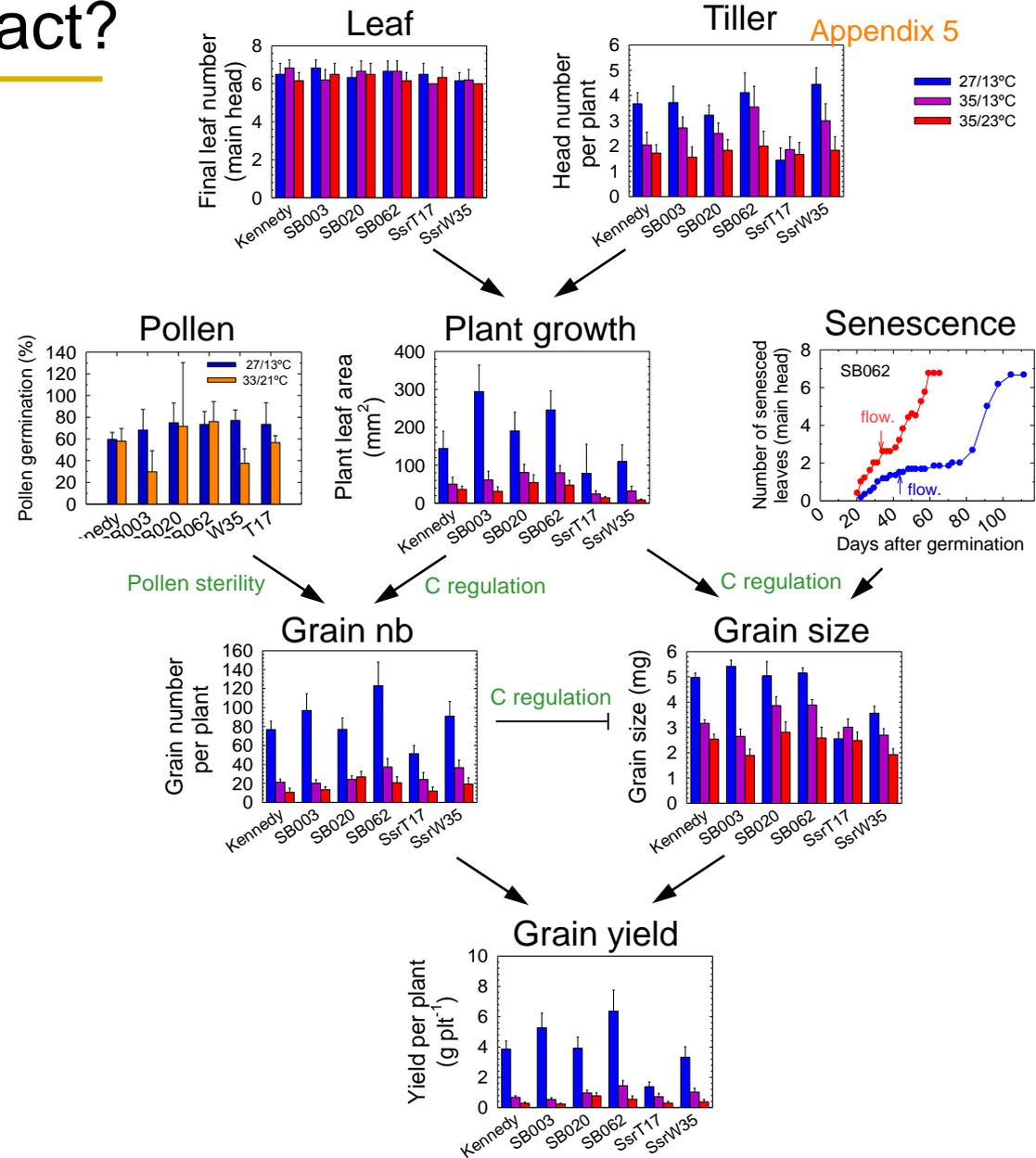


(Source: Karine Chenu, Uni. QLD)

Which trait? Which impact?

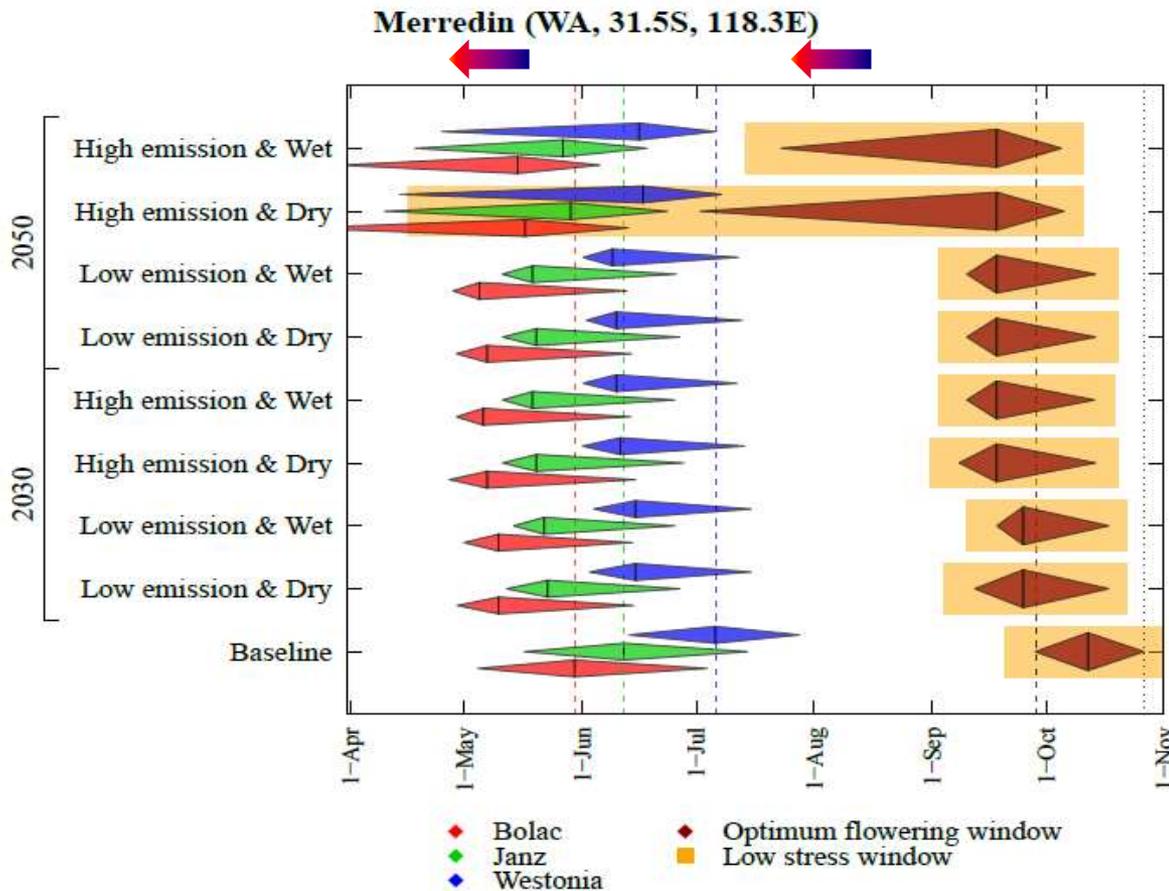


| | | | |
|-------------|------|------|------|
| Day Temp. | 35°C | 35°C | 27°C |
| Night Temp. | 23°C | 13°C | 13°C |



(Source: Karine Chenu, Uni. QLD)

Earlier sowing and flowering projected in the future

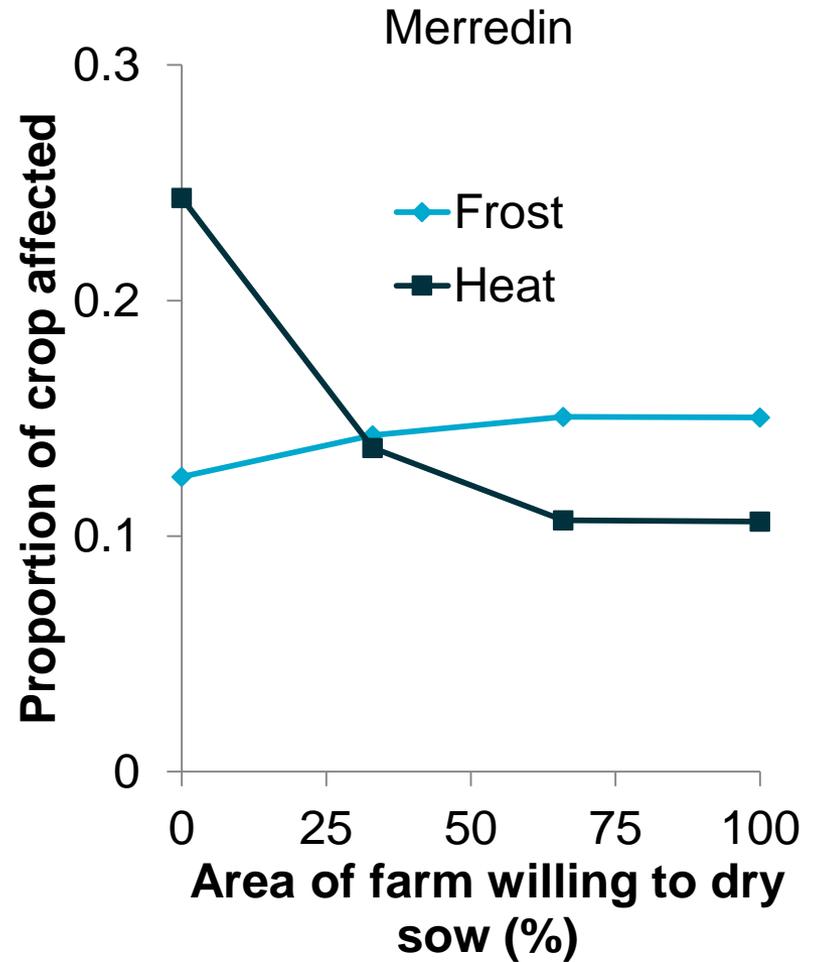
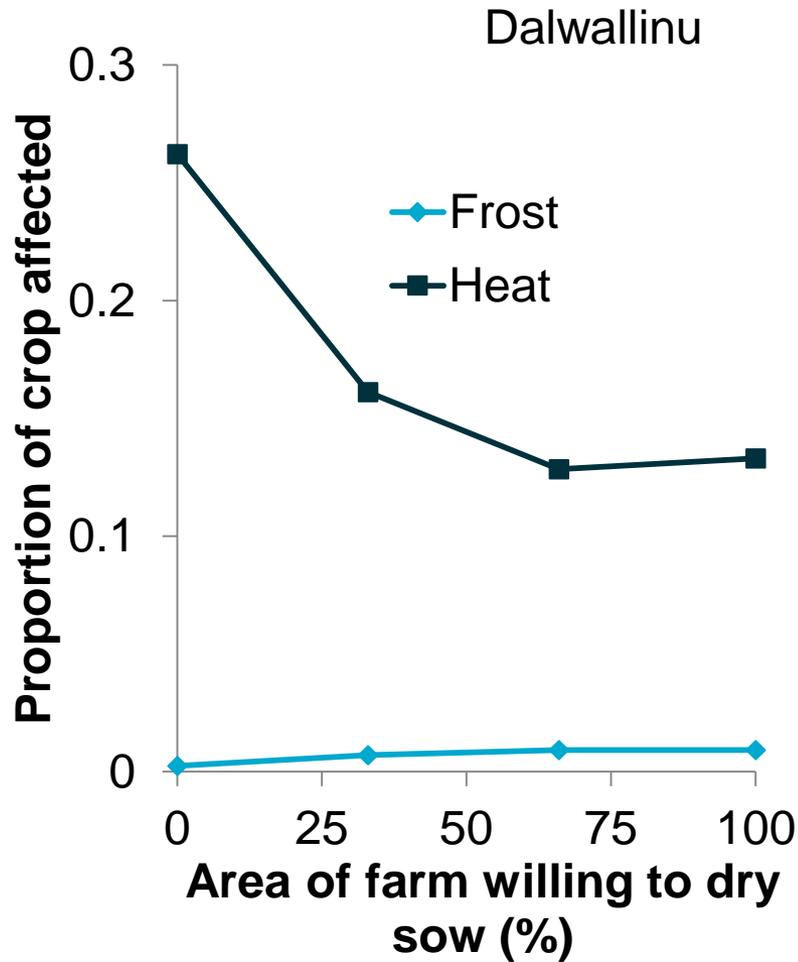


Projection for earlier flowering and earlier sowing window (to escape frost and heat)

Projections for 2030 and 2050

Zheng B, Chenu K, Dreccer MF and Chapman SC (2012) Breeding for the future: what are the potential impacts of future frost and heat events on sowing and flowering time requirements for Australian bread wheat (*Triticum aestivum*) varieties? **Global Change Biology** 18:2899-2914.

Dry seeding - Frost & Heat stress (Heavy soil, 6000 ha program) Appendix 5

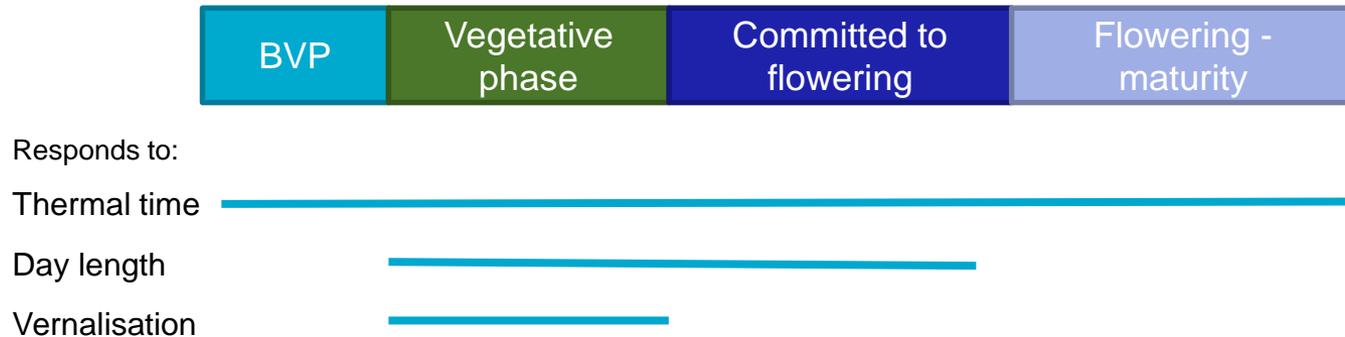


(Source: Andrew Fletcher, CSIRO)

Wheat needs to sense what time of the year it is to flower at the right time
Flowering is controlled by

Temperature
Thermal time
Vernalisation
Daylength

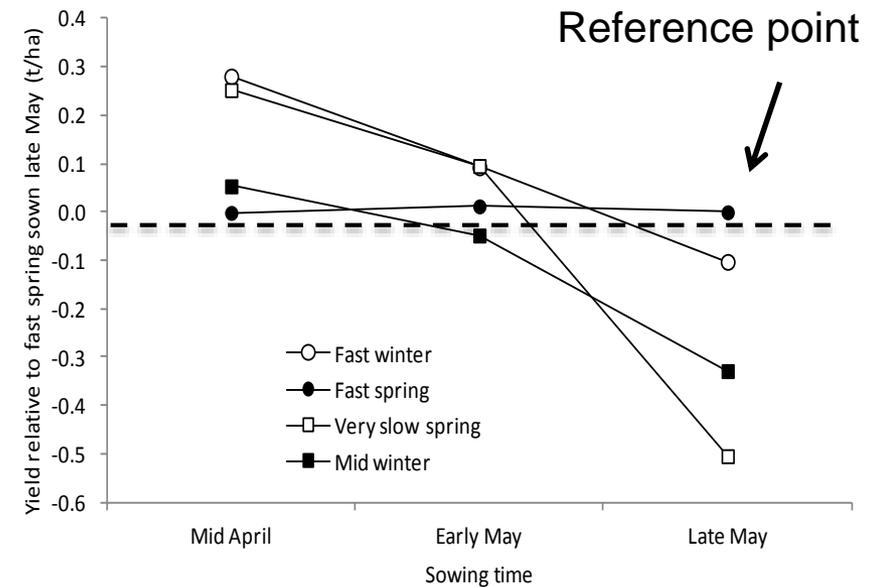
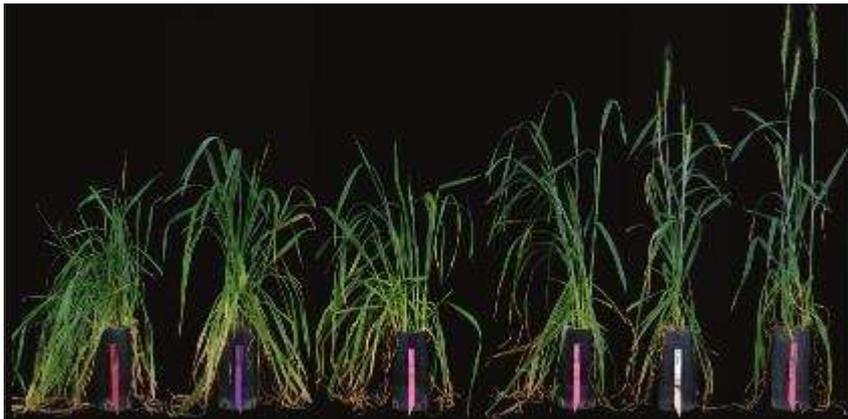
Simplified wheat phases



(Source: Andrew Fletcher, CSIRO)

Development genes: PPD and vrn genes override thermal time Appendix 5

- Different major maturity genes crossed into the same background (Sunstate)
- Backcrossed until 97% genetically identical
- Tool to compare wheat maturity without other genetic baggage



Early sowing and the need for fast-maturing winter wheats? Appendix 5

Fast winter wheats well suited to early sowing in central wheat belt

Stable flowering time = wide sowing window, low frost risk
Only need one extra silo

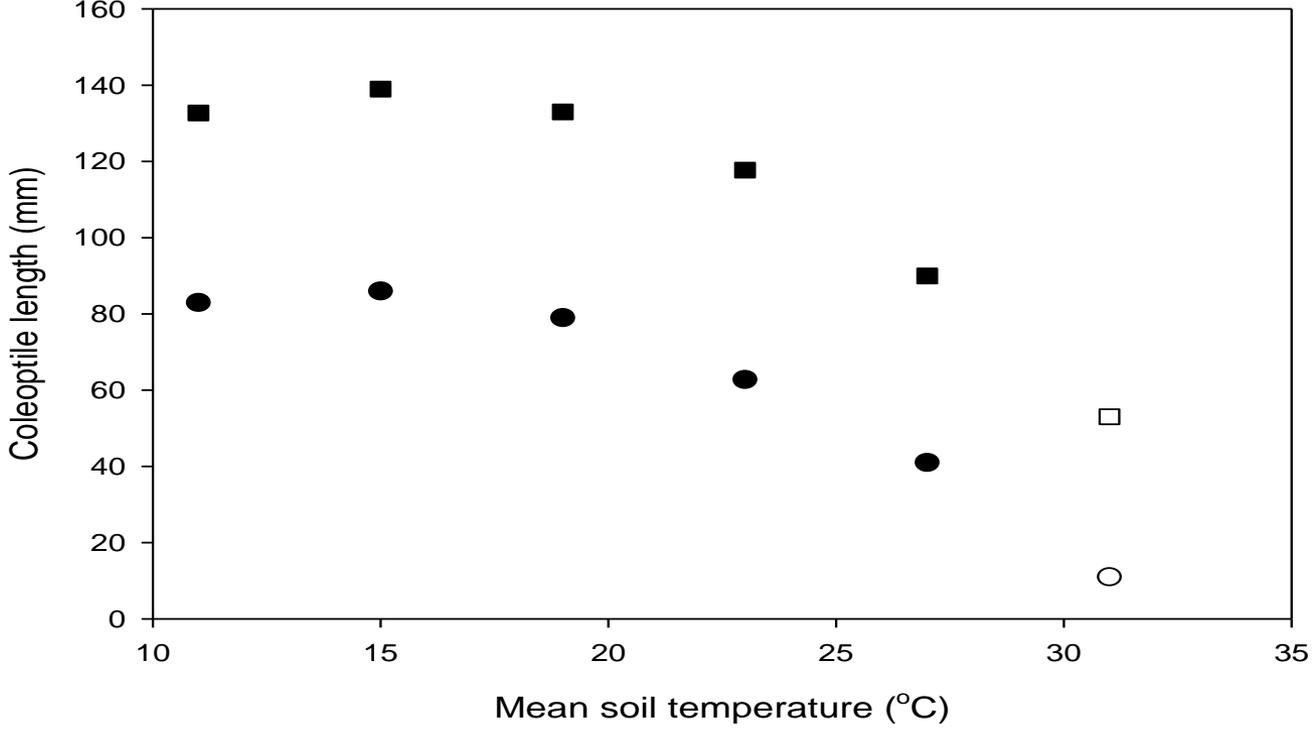
Bad news –

There aren't any!

Won't work everywhere – need vernalising temperatures. Northern wheatbelt?

Good news – AGT, Advantage (Dow) and Longreach have all started selecting winter lines

Heat shortens coleoptiles



Maximum coleoptile length for tall (■) and semi-dwarf (●) wheat varieties vs. soil T

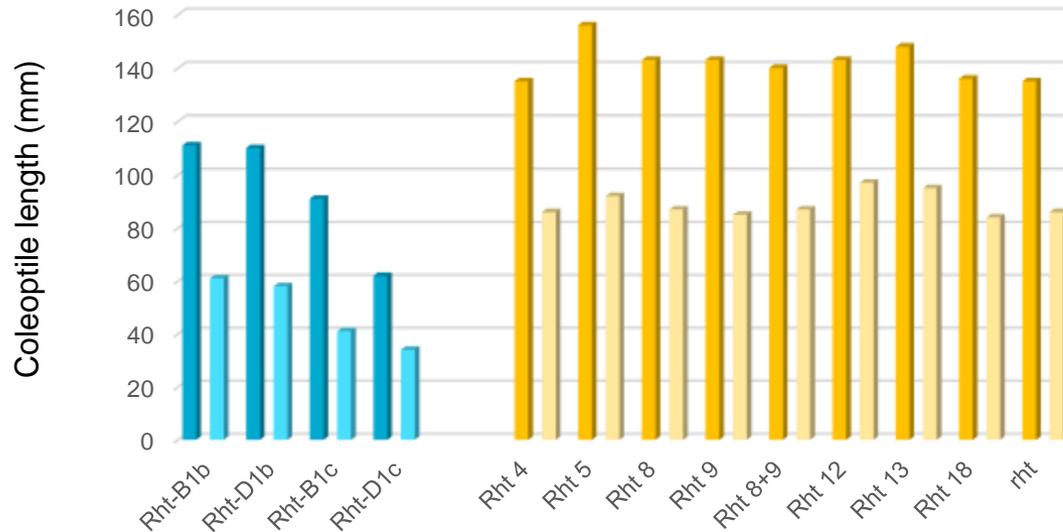
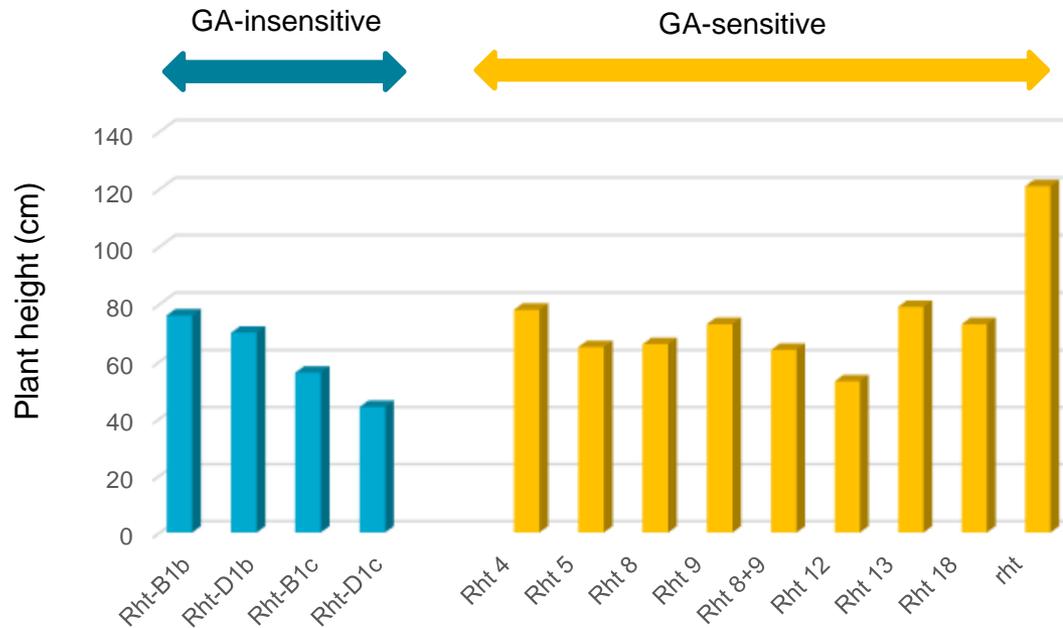
Chasing moisture and potential for poor establishment with early sowing - coleoptile length at daily mean soil temperatures of 27°C (max 32°C)

Appendix 5



Plant height and coleoptile length with new dwarfing genes

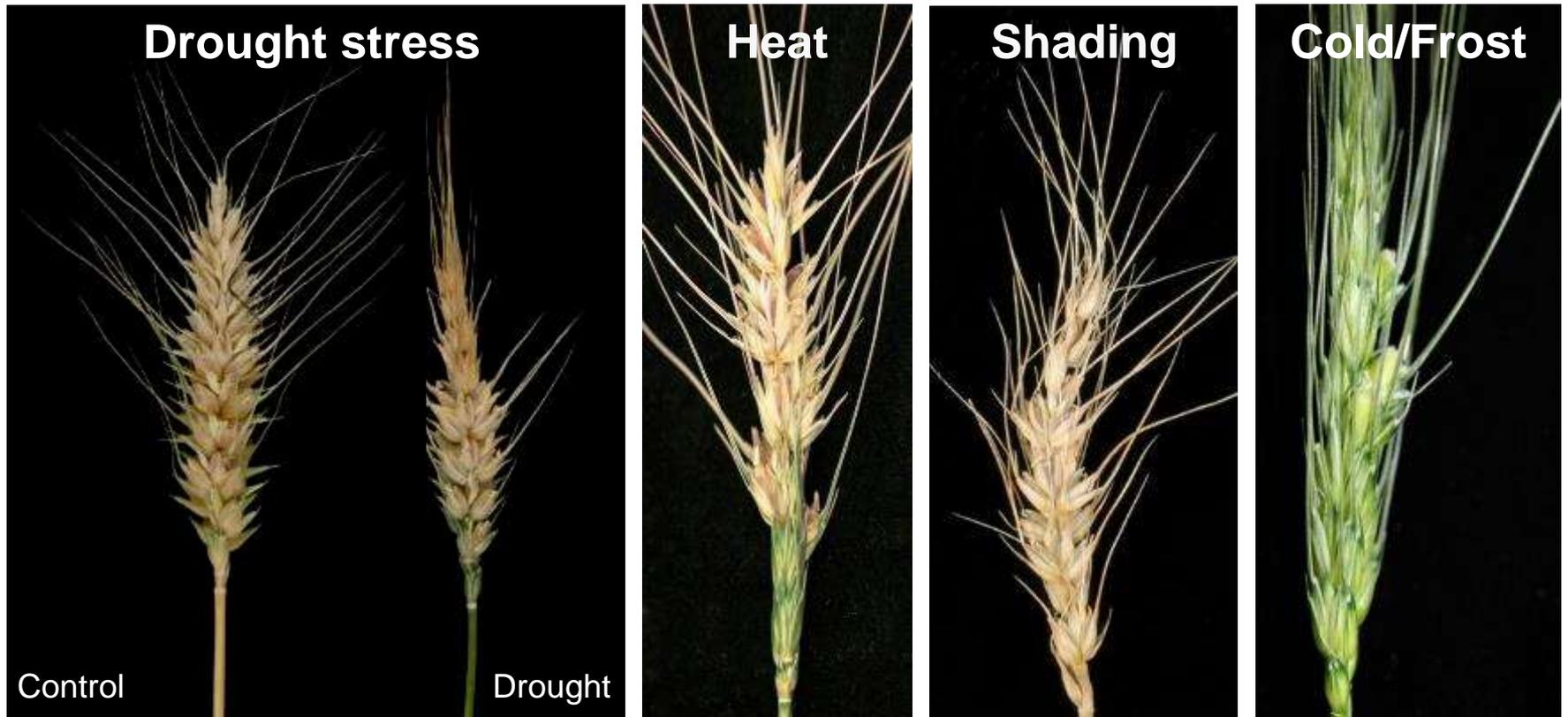
Appendix 5



Darker bars = 15°C; lighter bars = 27°C

(Rebetzke et al. 2015)

Direct heat effects

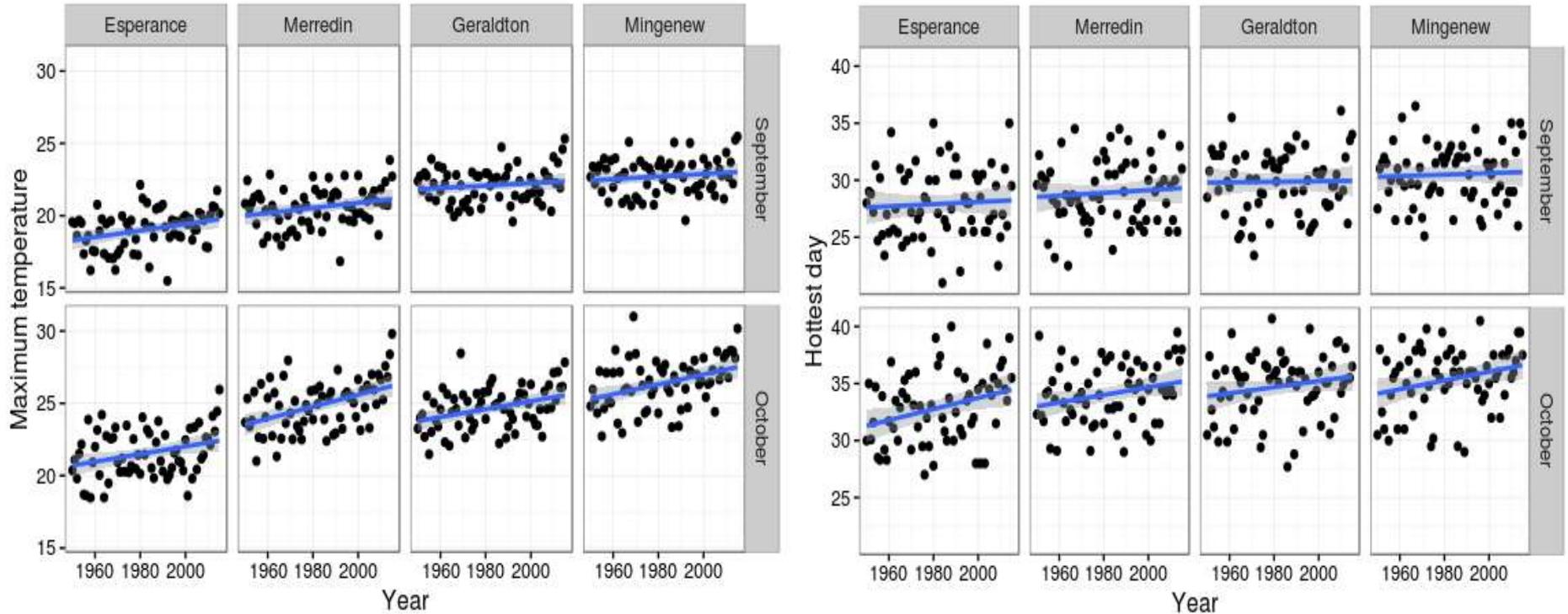


(Source: Rudy Dolferus, CSIRO)

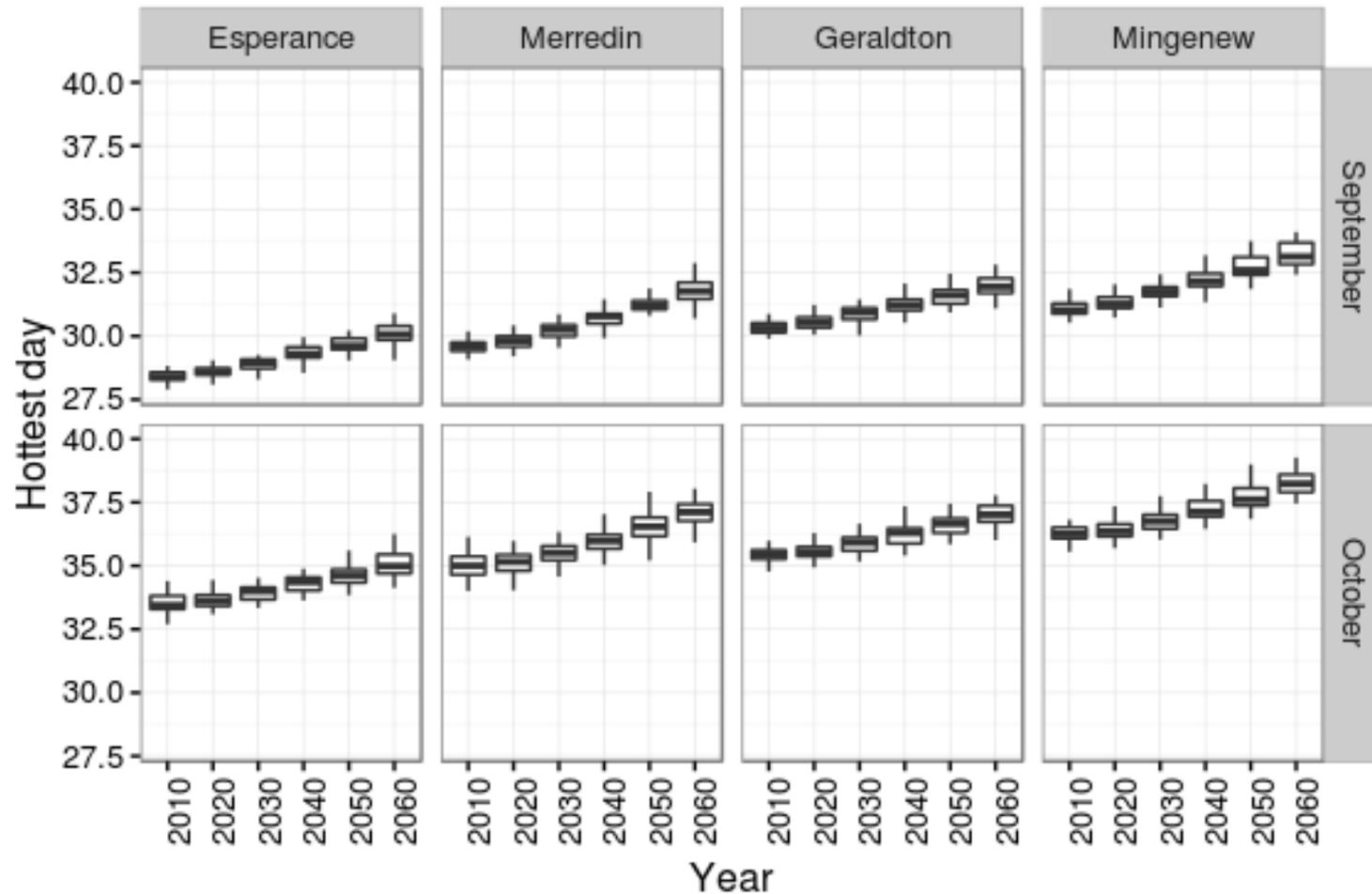
Criteria for heat stress during flowering and grain filling

| Level | Daily Temperatures (min/max) | Sensitive Wheat Zadoks Growth Stage | Yield Reduction per Day |
|--------------|-----------------------------------------|----------------------------------------------------|----------------------------------------|
| Mild | 32 to 34°C | 60 to 79 | 10% |
| Moderate | 34 to 36°C | 60 to 79 | 20% |
| Severe | > 36°C | 60 to 79 | 30% |

Historically, increases in mean maximum air temperatures throughout WA

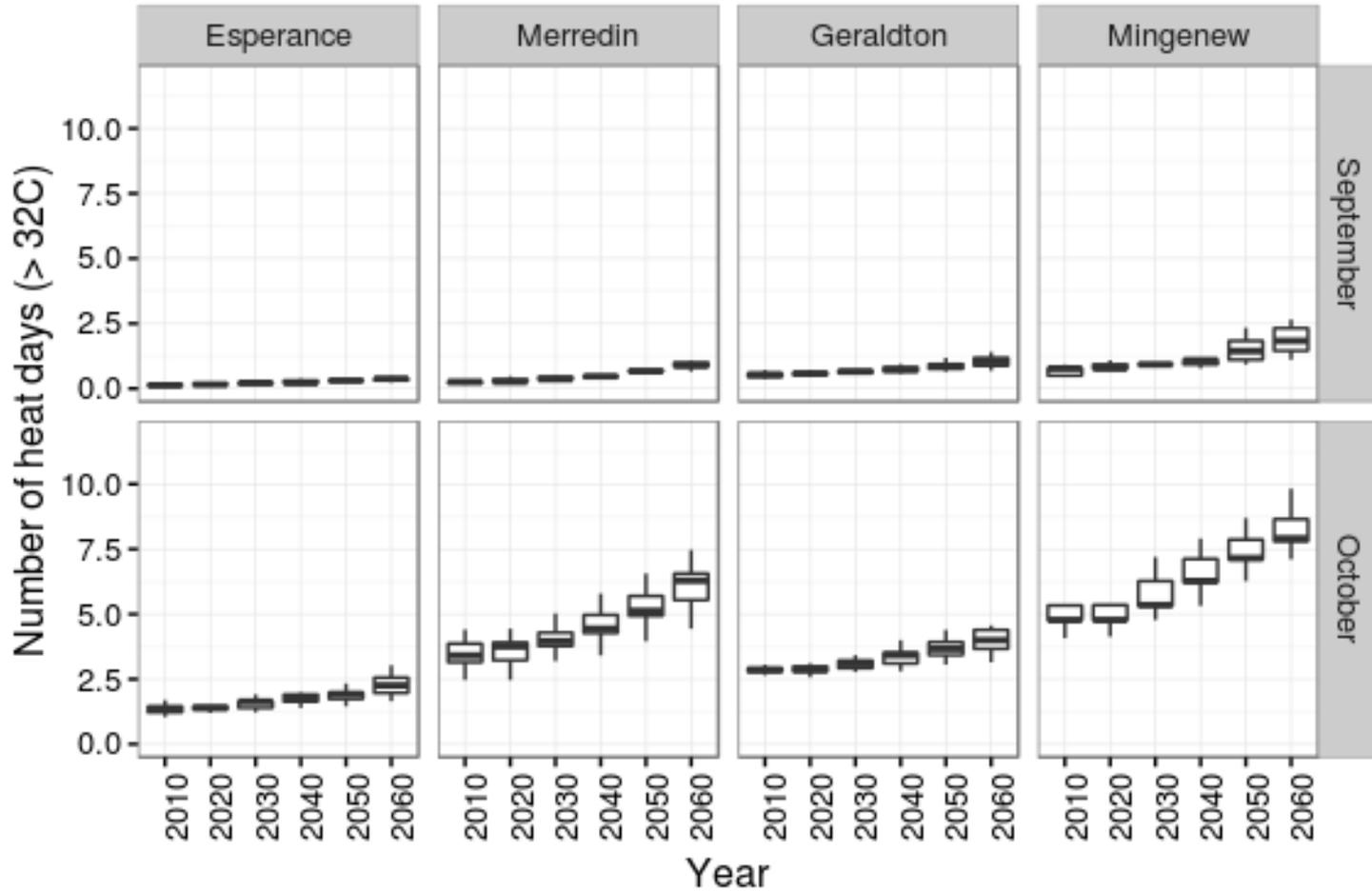


Into the future - Maximum temperature of the hottest day (33 GCM)



(Source: Bangyou Zheng, CSIRO)

Numbers of hot days into the future?



Assessing genetic variation for high temperature extremes - Roseworthy heat chamber

Appendix 5



Heat stressed 10 days post anthesis

- Three days at 36°C and 40 km hr⁻¹ winds, eight hours per day
- Watered to remove confounding drought effects

Paul Telfer, Dion Bennett AGT

Validated separately in the field (Uni Sydney, Narrabri)

Appendix 5



How heat affects the plant

Heat stress leads to:

Leaf senescence

Reduced photosynthetic rate

Reduced seed set

Reduced grain fill duration

Reduced grain size

Ultimately leading to reduced grain yield

(Source: Paul Telfer, AGT)

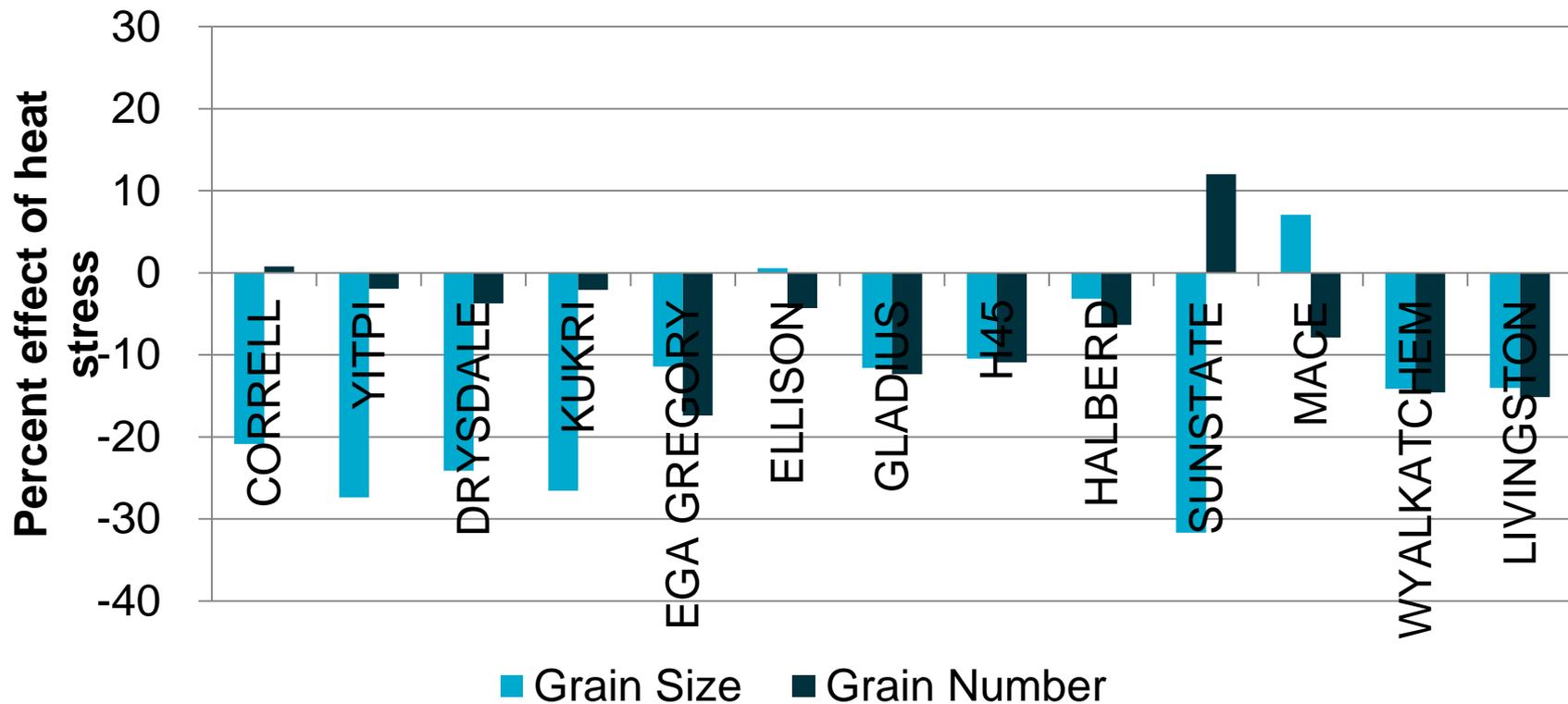


Results – Heat Chamber

Spikelet fertility and grain size retention identified as key traits
Significant variation in current varieties

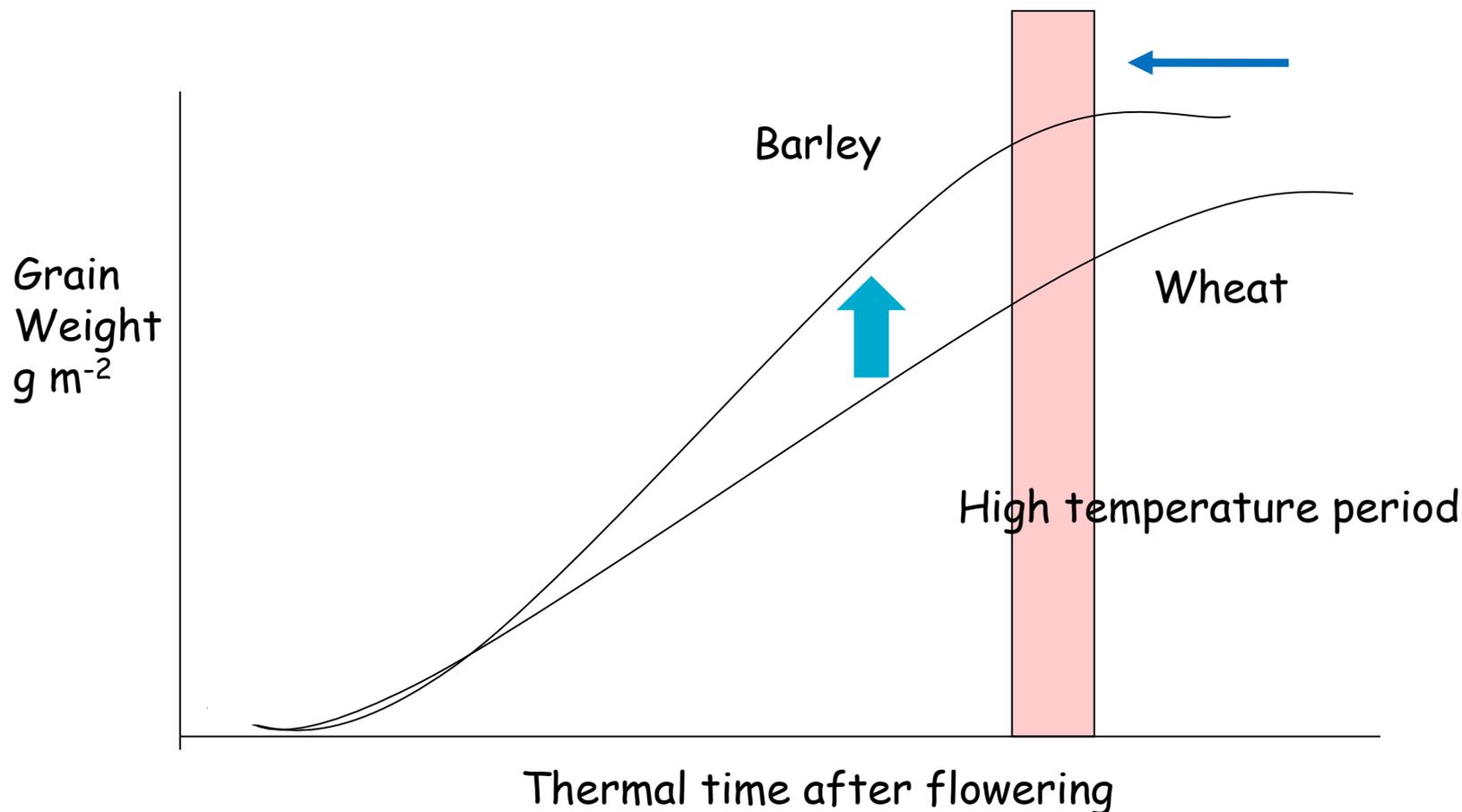
Primary tiller data

Paul Telfer, AGT



Avoiding high temperature - Reproductive sinks in wheat and barley

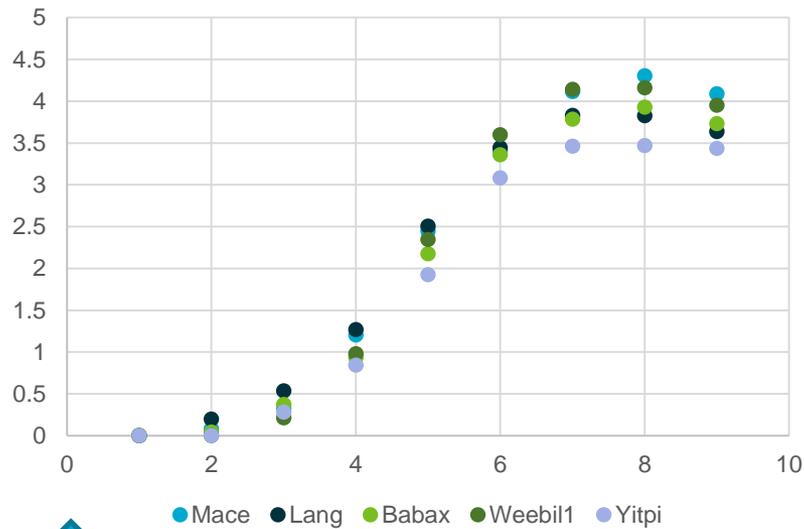
Increase in grain weight per unit area between anthesis and maturity



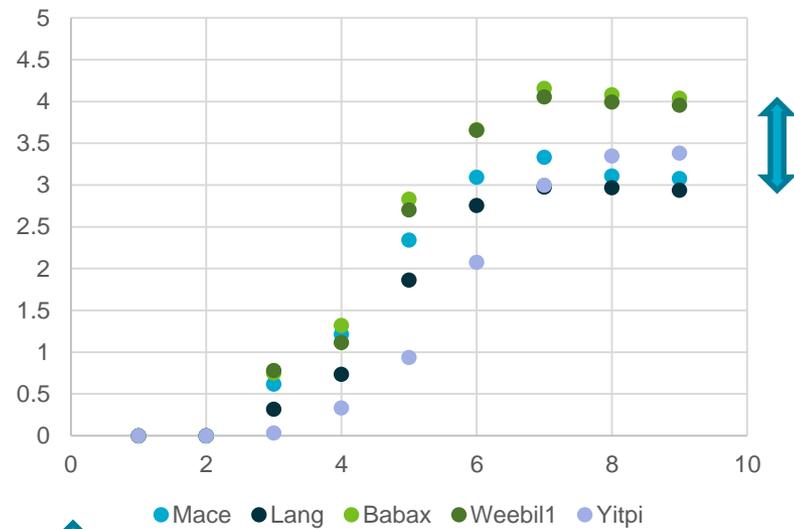
Can we make wheat more like barley?

Genetic differences in the duration of grain-filling? Appendix 5

Grain growth (potential/irrigated)



Grain growth (rainfed/water-limited)



Anthesis date

Anthesis date

Protection from sunburn



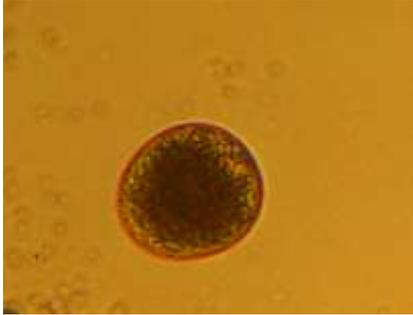
Erect canopy
(heat avoiding)

Canopy with
floppy leaves

Canopy with floppy
leaves after a hot spell

and...glaucousness (waxy coating) doubles reflection and reduces sunburn

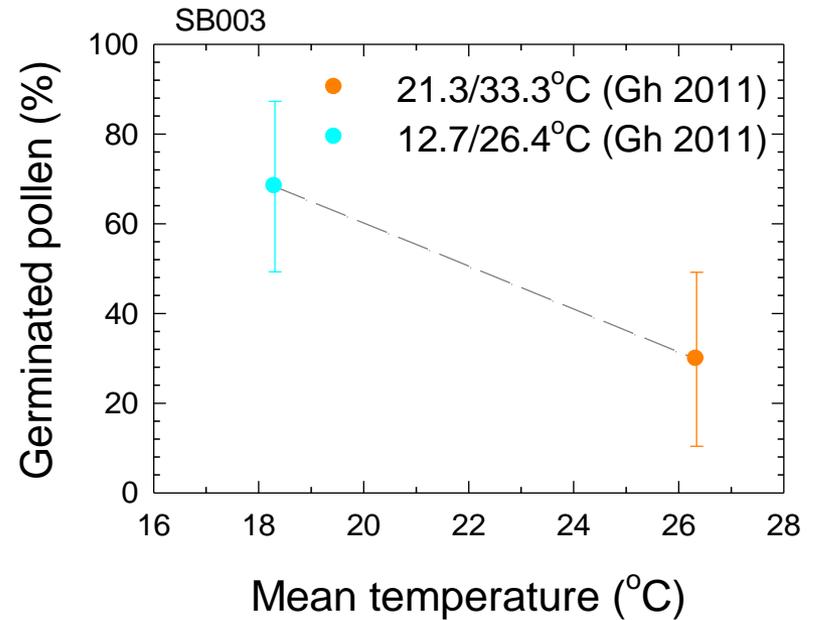
Reduced pollen fertility and reduced grain set Appendix 5



Non germinating pollen

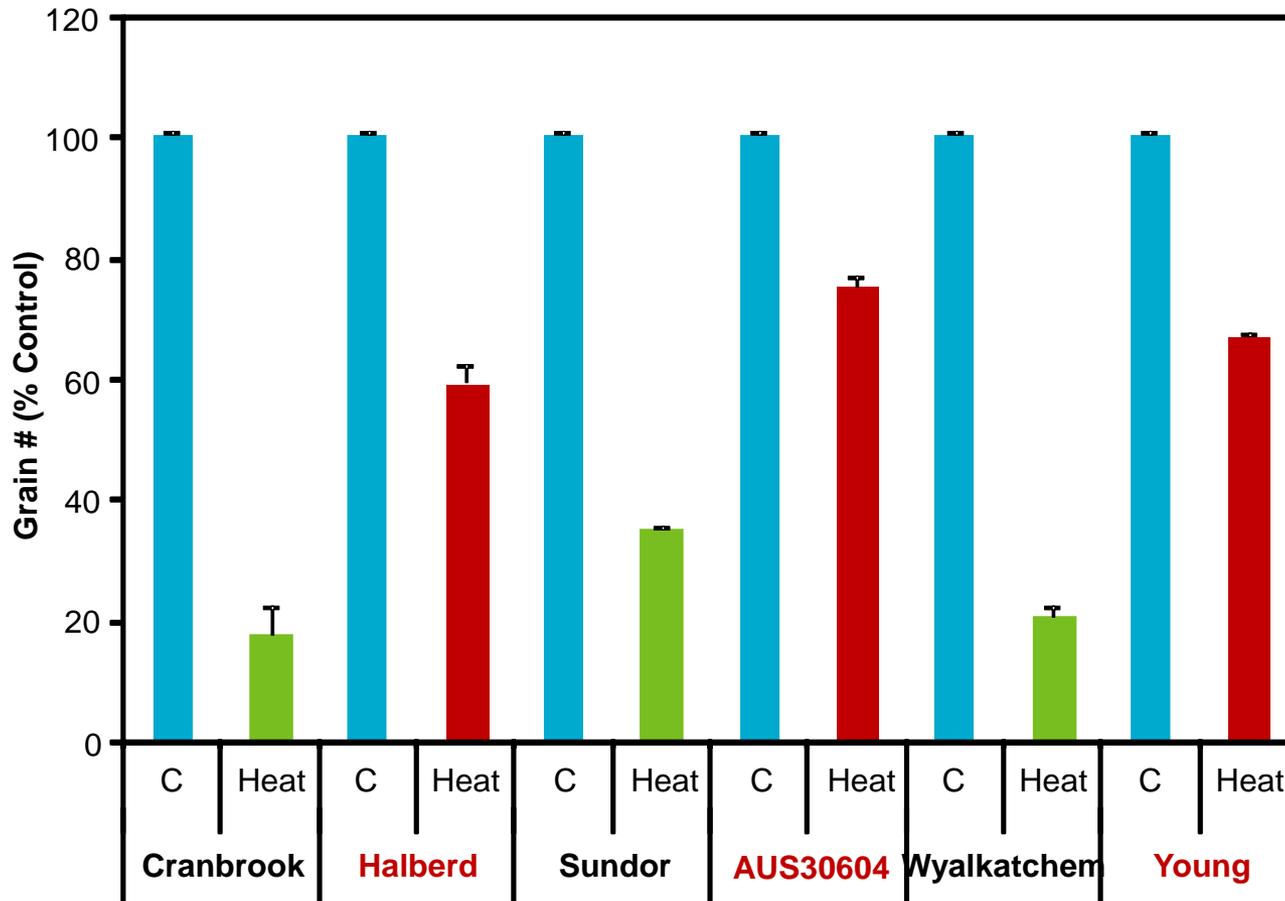


Germinated pollen



(Source: Karine Chenu, Uni. QLD)

Drought-tolerant wheat is also heat-tolerant Appendix 5



Take away messages

We don't know a lot!

Two 'heat effects' to address -

Indirect : new 'flowering' and dwarfing genes (longer coleoptile) being deployed for breeding and regional assessment with early sowing (5+ years)

Direct : more challenging as genetics likely complex requiring extensive screening and breeding. Further which of the many traits do we focus on? (10+ years)

Dear Commissioners, I pray that you listen, forgive me if I speak poorly, the stress is immense. We are R24. Appendix 6

I am unsure why I bother speaking today. Nobody listens and I beat my head against a brick wall. All our concerns are sourced, researched and real, but no one is giving protection whilst ramifications at other sites become true.

Where are the answers, mitigation and measurable conditions? What happens when conditions are not met? What happens if we have loss? How will we be compensated? The recommendation is subjective favouring the NSW Government Energy Agenda with no real concern for neighbouring farmers or the true loss of agriculture.

The wording is skewed in the cut and paste document and NSW Planning and DPI amongst others have missed the mark with potential rural impacts.

We are one of many NSW families struggling to deal with neighbouring solar developers and government bureaucracy that leaves no clear certainty as to peoples future. NSW Planning is facilitating poor consideration of neighbouring farm businesses through allowing these companies to do as little as possible with no ramifications of impacts nor sufficient measurable conditions to which they must comply. This needs to stop now and developers must be shown that responsible projects are the only way forward. It can be achieved and then people can sleep at night including yourselves.

Why do we have to defend and protect our exceptionally productive farming land, our way of life, the environment, our future and our childrens future. We have agriculturally prospered whilst farming elsewhere has most seriously struggled. Land here is a gift from god, next door is no different, despite the landowners efforts to market it as poor to suit their application. When other areas lack to produce our reliable feed source is extremely valuable and strongly contributes to the sustainability of livestock production in our country. Such need is undervalued. At the enormous size with a surrounding L Shape an increased impact is placed on 2 neighbours, this development is most definitely incorrectly placed.

What we have endured for the last 3 years is deplorable. People have been rudely and incorrectly labelled as solar protesters and efforts to discredit our name were perhaps a tactic to avoiding appropriate consultation and to diminish concerns away from the community and stop people speaking their view. We are, quite simply, neighbours exceptionally concerned about the risks of this massive size development seeking responses to questions we are not confident are being truthfully answered or receiving the appropriate action. People were so frustrated they just stopped asking.

With little ground truth or evidence, why should we trust the marketing of this massive foreign company with a financial agenda set to increase their share price on the Paris Stock Exchange. The French would not allow this development on their productive agricultural land so why here?

This development is repulsive and way too huge for our agriculturally viable location. We have successfully farmed here since 1909 supporting 5 generations. Our success is proof that land in our area has consistent and reliable climatic conditions for productive cereal cropping.

A sensible measured approach to renewables should form part of the energy transition in our country. Arid marginal zones that will come from the NSW Renewable Infrastructure strategy must be the target for extremely large footprint developments. This will protect food for the future. Small scale opportunities to support farmers direct use is a more sensible approach where land use conflicts exist. Sustainability is key, this is stupidity. Concerns of climate that may produce hotter and drier seasons with increased incidents of drought reflect an increased importance to protect strong agricultural land.

I believe in a sensible medium for most things, but Culcairn Solar Farm has no fair sensible medium, the size, that it does not need to be, is negligent from a planning perspective. It misses the intent of numerous pieces of legislation, and has no balanced outcome. The community fracture has been horrendous and opposes the aim of the Renewable Energy Action Plan to build community support for renewable energy. The cumulative impacts of multiple developments and the massive size of Culcairn Solar will no doubt see great regret and anger towards renewable energy in our area. Many people now pass Winton on the Hume Freeway and say WOW that's huge without realising that the development here will be 8 times its size. Afterthought will be too late and changes must be made now. **This development, in its current form could start massive uproar towards large scale solar. As neighbours with a view to all we will ensure every effect is published, made public and those people involved with the development and the approval of such will be referenced as being accountable.**

How can NSW Planning say that the amendment adequately responds to concerns to the loss of agricultural land, impact on native vegetation, aboriginal heritage and local amenity as the company states is its purpose? It is still massive and little has been alleviated. The landowners initially told us this development would be 400 hectares, why did that size need to increase. Our family has quietly considered that on the primary landholders large holding that 100 or 200 hectares of solar in the centre of their property could allow for mitigation and tolerance. 400 is still huge, but 900 with a surrounding L shape

is just ridiculous, intolerable and far too much risk. We sent options thought possible to the department but achieved no response.

Council also agreed to forward to NSW Planning our suggestions to achieve a more balanced medium as can be seen in the departments agency correspondence.

For me, proof of bias is confirmed where NSW Planning says the project is not inconsistent with the objectives of the RU1 zone. This is worded backwards to facilitate their agenda. The worst is that the recommendation totally misses the LEP aims it contradicts being:

- To encourage sustainable primary industry production
- To minimise conflict between land uses and;
- To maintain the rural landscape character of the land.

The Rural SEPP and the ministerial direction are just totally forgotten.

Permissibility may be allowed under the infrastructure SEPP but should we really just dump the rest of the law and its truthful intent. The protection of agriculture AND the economic benefits can both be achieved IF we locate these massive developments out west on less productive land. We need not destroy one for the other, we just need sensible planning and infrastructure which is already in the process of occurring.

And what of the massive number of objections. I feel that the government should just be truthful and tell communities that the Government energy agenda will proceed at any cost if it be the case. As far as I know none are declined. It is just ticking boxes, following process but not truly considering why the process is in place. Giving a free ticket to ride for developers to do as little as possible. The large scale solar guidelines objectives are certainly not being met here, many issues of constraint exist particularly the land soil capability class and the fact that this land was potentially to be mapped as Important Agricultural Land amongst other issues.

The NSW DPI has not competently assessed the land regardless of their knowledge of problems with land soil capability mapping. The land is not Land Soil Capability Class 4 and I implore the commissioners to read that section of the Agricultural Assessment properly as NSW Planning has incorrectly read it and I will provide further information in writing. I am sick to death of that lie and don't believe that DPI has acknowledged that classification as NSW Planning refers.

The land use conflict risk assessment does not mention conflicting agricultural activities such as livestock with construction noise and cropping production with heat impacts. Our rear paddocks in the L shape section are sown to grazing crops for the location of our cows and sheep which during noisy

construction in lambing and calving season could result in death due to mismothering. Research exists and was provided with our EIS submission confirming that stress can impact the health, fertility and growth of livestock, but again no answers.

The landscaping plans defining vegetation as a minimum of 2 rows shows such disregard. Without spacing or how many trees there is no comfort of alleviating any visual or heat impact. **There is absolutely no way possible that within 3 years the miniscule number of tubestock trees suggested will be able to meet the departments recommended condition to “minimise views” (and what does that mean anyway). What happens at the end of the 3 years when they do not meet that requirement. This condition does nothing and must be more precise.**

The land use conflicts will be exacerbated in the surrounding L shape. In a hot windy September/October when crops can be thirsty an increase in heat can result in reduced yield or death of our crops and significant loss. Research is lacking on developments of this scope. You cannot compare a 350MW development to a 1MW development. Even the Clean Energy Council acknowledges heat concerns. There is research that shows heat extending 700 metres. Who knows what it will be in a surrounding design. It is incorrect for NSW Planning to say that a 30 metre buffer will ensure heat impacts will be negligible when THERE IS NO SUITABLE VEGETATION SCREENING AT ALL IN MANY AREAS. The locations of concern will be included in my written submission.

The vegetation screening proposed for this development is an absolute joke.

How can you say there would be no significant visual impacts on surrounding residences and receivers and that the rural character and visual quality of the area will be preserved when there is minimal screening and nothing along Cummings Road where local residents drive every day?

A fire recently occurred on the solar site at the rear of our property. We now see much greater risk. Under panels that day fire suppression could not have occurred. The 10 metre APZ would not protect us from embers and whirl winds. Back Creek is mapped as bushfire prone with limited access and will be surrounded by the volatile fire risk of crops and trees. A Bush Fire Emergency Management and Operations Plan as required should be considered as part of the approval process for such a massive development to ensure the community and towns are safe. How can this be trusted to a developer?. Brigades and RFS are not being adequately consulted. To call RFS members to these fires would probably breach WHS laws.

How will electrical infrastructure and shorts increase our risk, is lightning a [Appendix 6](#) concern with so much metal and transgrid alerted us to cockatoos chewing wires being a problem. Where is the correspondence from RFS on the website?

We all remember the dire consequences of the Walla Gerogery fires, I will never forget the conversations with those that suffered. The Precautionary Principle must be applied.

Stormwater at other solar sites are now a real issue. The flood study confirms changes will occur. Will increased runoff from the site through our property via the waterway in front of our house increase flooding to our house and land. Why should we incur the risk? We are truly worried that chemical leaching into our waterway could be seen in the future. We may need to call Erin Brokovich.

This waterway is an important area that we value due to the abundance of wildlife, birds and frogs that give us the most beautiful peaceful amenity. It has been previously fenced in a riparian landcare project. In our very first meeting we pleaded to avoid the area surrounding this woodland with this knowledge in mind. Again, no consideration whatsoever.

I consider the true environmental impact of this development as hypocrisy, destroying the environment to save the environment. So many trees will be removed. I don't think there has been enough realisation of the ecological impact here, the birdlife is unreal, we have migratory birds come to the lagoon including the impressive Brolgas, spoonbills, cormorants, pelicans, herons and more and we regularly see many different animals such as echidnas and goanna's. We know there are swift parrots and have seen a curlew. Squirrel gliders locally exist and although we are not environmental greenies the words you don't know what you've got till its gone rings heavily in our ears.

At this size the only way to mitigate many issues and to truly keep the agricultural landscape alive from the very start would be to establish an earth bank to the height of the panels to screen the development. This could insulate noise, mitigate heat and avoid stress to livestock from the outset. Another suggestion we offered but again no consideration in trying to do as little as possible for the cause.

Imagine you will spend almost every day surrounded by 900,000 solar panels with electrical infrastructure, substation, hazardous Battery Storage Systems and the industrial outlook. Imagine the place you once went to bed listening to the roar of frogs and have woken to the song of birds is now overcome with the high pitched ring of 67 inverters and the night time noise of humming Battery Energy Storage Systems. Imagine driving in and out of our property looking at solar infrastructure every time we cross the road between our Roseview and Avalon properties opposite each other on Cummings Road. Imagine the next few years surrounded by construction, dust and pile

driving that we have been told requires double ear protection for workers yet no indication of how we as neighbours will manage this. Imagine the stress of our beautiful neighbours that have been given little choice but to move away from their beloved homes through this disgusting development.

Stephen and I have built an amazing family home and most resilient farm that we intended we would spend the rest of our lives with our family and be handed down through generations to our boys with a love of farming... but now I feel that my only future peace may be in my grave. Now imagine the stress, sadness, frustration and health of the people within our family with what our future will endure. Stephen has the soil of this land in his veins and to move would kill him but for me it will kill me to stay, either way we are screwed.

Personally I would be ashamed to be involved in this development, the stress caused to families is disgraceful, I am comfortable we made the decision not to be involved.

We will include further information in our written submission for your consideration as much of our concern is difficult to explain verbally and requires detailed explanation.

Thank you for your time.