

DEAKIN UNIVERSITY

CENTRE FOR RURAL AND REGIONAL FUTURES

GOULBURN BROKEN CLIMATE SMART AGRICULTURAL DEVELOPMENT PROJECT

The Goulburn Broken Climate Smart Agricultural Development Projects (GB CSAD) Project aims to generate and communicate specific long-term data, information and strategic plans that enable Local Government Authorities and the agriculture sector in the Goulburn Broken Region to adapt to climate change effectively with a focus on regional development, infrastructure and agricultural industry transformation.

The project developed practical resources to help the sector adapt to climate change and plan for the future, such as a spatial tool for Local Government and CMA adaption planning. The tool allows planners and decision makers to view the progression of agricultural productivity over time, into the future, 2050, and make decisions around economic development, investment and land-use planning.

To sustain agricultural livelihoods, with the Goulburn Broken Region severely impacted by climate change into the future, it is crucial farm-level adaptation measures are supported by strategic planning using regionallyspecific impact information, regional development and council-supported business development in order to assist agricultural transformation. A key to thinking strategically about agriculture and food production is the understanding that it may not necessarily be possible to produce tomorrow what is produced today.

The project modelled the land use suitability for 17 commodities (in 5 broad groupings) in the Goulburn Broken Region:

- Cropping
 - Canola 0
 - Wheat 0
- Forestry
 - Blue Gum 0
 - 0 Pine
- <u>Fruit</u>
 - Apple (Cripps Pink) 0
 - Apple (Royal Gala) 0
 - Grapes 0
 - Pears 0
 - 0
- 0 Potato 0 Tomato 0

Pasture

0

0

0

Vegetable

0

0

Phalaris

Ryegrass

Brassica

Lettuce

Onion

Early and Late season Stone Fruit

The project uses a Geographical Information System (GIS) to model land-use suitability of the agricultural commodities, represented spatially. The modelling requires the use of various biophysical inputs that determine the growth and production of the commodity of interest:

- Historical and future climate data and projections (temperature, rainfall, wind, chilling units, spring frost index),
- Soils,
- Landscape. .

Importantly, this process uses experts' participation in the modelling process, incorporating the knowledge of experts such as soil scientists, environmental scientists and agricultural managers, who have an in-depth understanding of one aspect of the specific system, for example optimum soil growth or temperature range.

Critically, this knowledge can fill gaps created by poor empirical based knowledge or poor data quality and with the contribution of regional experts in agronomy, soil science and farming (amongst others), a detailed a more accurate representation can be modelled for a particular commodity.





The modelling of the performance of existing agricultural commodities and into the future shows that in some cases, decreased water availability and increased temperature (including chill unit accumulation and evapotranspiration) indicate that the yield of certain commodities will decrease to unprofitable levels.

Concomitantly, yields of others will be unaffected while others will actually perform better as the climatic changes unfold. It is therefore critical that the individual strategic plans for the project's member Local Councils specifically focus on climate as a central driver of change.

It is evident that a significant geographical shift in the maximum attainable yield of stone and pome fruit in the Goulburn-Broken catchment region is likely in the future. Spatial modelling of commodity suitability and versatility can be used at a range of levels:

- Farm Level
 - o Agricultural management planning
 - $\circ \quad \text{Sowing and harvesting times} \\$
- Regional Level
 - Economic development and investment
 - Regional planning
- Industry Level
 - o Fresh or canned varieties
 - o Investment and research opportunities

Spatial representations of suitability of locally grown agricultural crops, or potential crop options can help local governments and the agricultural industry assess the options and make decisions underpinning a holistic and sustainable development of the region into the future. They can use the information to make informed decisions and adaptations including:

- Changes to different species (such as moving from apples to pears), since the expense of renewing a productive apple orchard with a new variety is similar to that of changing from apple production to pear production,
- Changes to different agricultural commodity (pome fruit to viticulture, for example
- Changes to different farming system (irrigated pasture systems to horticulture)
- Moving to a different geographical location,
- Allow for associated business development, infrastructure, transport and labour requirements and arrangements, and
- Establish decision-making tools for Local Government and CMA adaptation planning.

This project has been funded through the Victorian State Government's *Victorian Adaptation and Sustainability Partnerships* (VAS) program. CSAD is a joint project between:

- Moira Shire Council (Lead Agency),
- Goulburn Broken Greenhouse Alliance,
- Benalla Rural City Council,
- Campaspe Shire Council,
- Mansfield Shire Council,
- Murrindindi Shire Council,
- Greater Shepparton City Council,
- Strathbogie Shire Council,
- Goulburn Broken Catchment Management Authority









CROPPING

- Wheat
- Canola

• Several areas have been identified as suitable for sustaining multiple broadacre cropping systems both currently (left) and into the future (2050, right)

• The versatility of the region soils, landscape and climate presents an opportunity for diversification outside traditional agricultural systems established or the transformation of existing areas into more productive and diverse systems using suitable management practices to mitigate and adapt to changing climate regimes.

• According to this study, changes in climate will have a substantial influence on the performance of grains cropping systems in Goulburn Broken. The analysis showed that projected changes in the values of key climatic variables, primarily rainfall, would impact on wheat production and the potential impact will be greater as we move further into the future:

 Into 2050 areas in the south of the region, between Seymour and Benalla and around Mansfield increase in productivity to highly and very highly suitable.

There is a general reduction in suitable areas into 2050 in the centre and north west areas of the region, with a decline to moderate suitability in the north west, along the Murray and in the Shepparton region.

 Some areas of high suitability remain in the north east however, around Yarrawonga.









FORESTRY

- Blue Gum
 - Pine
- Several areas have been identified as suitable for sustaining forestry systems both currently (left) and into the future (2050, right)

• The versatility of the region soils, landscape and climate presents an opportunity for diversification outside traditional agricultural systems established or the transformation of existing areas into more productive and diverse systems using suitable management practices to mitigate and adapt to changing climate regimes.

• According to this study, changes in climate will have a significant influence on the performance of forestry in Goulburn Broken. The analysis showed that projected changes in the values of key climatic variables, primarily rainfall, would impact on both blue gum and pine production and the potential impact will be greater as we move further into the future:

Into 2050 the Mansfield region remains highly productive for forestry.

There is a significant reduction in suitable areas into 2050 in the northern and central areas of the region, with a decline of over half the region to moderately suitable, particularly evident around Echuca and along the Murray

Some scattered areas of high suitability remain in the south of the region in the Murrindindi area.









FRUIT

- Apples (Cripps Pink and Royal Gala)
 - Grapes
 - Pears
- Stone Fruit (early and late season)

• Several areas have been identified as suitable for sustaining fruit production both currently (left) and into the future (2050, right)

• The versatility of the region soils, landscape and climate presents an opportunity for diversification outside traditional agricultural systems established or the transformation of existing areas into more productive and diverse systems using suitable management practices to mitigate and adapt to changing climate regimes.

• According to this study, changes in climate will have a significant influence on the performance of fruit in Goulburn Broken. The analysis showed that projected changes in the values of key climatic variables, primarily rainfall, would impact on early season stone fruit and apple production and the potential impact will be greater as we move further into the future:

 Into 2050 the southern half of the region remains highly productive for fruit production, with some areas in the Strathbogie region increasing in suitability.

There is a significant reduction in suitable areas into 2050 in the north western area of the region, with a decline to moderate suitability in the Campaspe and Shepparton areas.

 Early season stone fruit show the most significant reduction in suitability into the future, however late season stone fruits sees less reduction Moira area, with some areas there remaining suitable.









PASTURES

- Phalaris
- Ryegrass

• Several areas have been identified as suitable for sustaining pasture based systems both currently (left) and into the future (2050, right)

• The versatility of the region soils, landscape and climate presents an opportunity for diversification outside traditional agricultural systems established or the transformation of existing areas into more productive and diverse systems using suitable management practices to mitigate and adapt to changing climate regimes.

• According to this study, changes in climate will have a significant influence on the performance of pasture based in Goulburn Broken. The analysis showed that projected changes in the values of key climatic variables, primarily rainfall, would impact ryegrass in particular, and the potential impact will be greater as we move further into the future:

Into 2050 the Murrindindi and Mansfield region remains highly productive for pasture based systems.

There is a significant reduction in suitable areas into 2050 in the north western area of the region, with a decline to moderately suitable in much of the Campaspe, Moira and Shepparton areas.

Much of the centre of the region however, remains highly suitable into the future, based mainly on the improved performance of phalaris in this area into 2050 under hot and dry conditions.









VEGETABLES

- Brassica
- Lettuce
- Onion
- Potato
- Tomato

• Several areas have been identified as suitable for sustaining vegetable production both currently (left) and into the future (2050, right)

• The versatility of the region soils, landscape and climate presents an opportunity for diversification outside traditional agricultural systems established or the transformation of existing areas into more productive and diverse systems using suitable management practices to mitigate and adapt to changing climate regimes.

• According to this study, changes in climate will have a significant influence on the performance of vegetables in Goulburn Broken. The analysis showed that projected changes in the values of key climatic variables, primarily rainfall, would impact onion and tomato in particular, and the potential impact will be greater as we move further into the future:

 Into 2050 the Strathbogie and Mansfield regions remains highly productive for a variety of vegetables.

There is a reduction in suitable areas into 2050 in the northern areas of the region, with a decline to moderately suitable in much of the central areas driven by the sharp decrease in suitability of potato, onion and tomato in the northern half of the region.

Commodity specific, lettuce and brassica production however, remains highly productive moving into 2050, across the entire region.









AGRICUTLRAL VERSATILITY

• The Goulburn Broken region has highly diverse soils, landscape and climate, making it a rich and productive region for a wide variety of crops.

• Historically, there are four key production areas in the region that have a high level of suitability for one of more commodity grouping, that is, they are highly versatile:

- Yarrawonga
- Shepparton
- Strathbogie
- Mansfield

• Into 2050 the Mansfield and Strathbogie production areas remain highly suitable for agricultural diversity, and retain their versatility.

• However, into the future, the northern production areas of Shepparton and Yarrawonga decline in versatility, moving towards a more moderate suitability for a number of commodity groupings.







SPATIAL TOOLS AND ONLINE MAPPING

Spatial Tool

The project team developed a spatial tool for integration into Council GIS systems in which the outputs can be viewed in the context of the local planning system. This tool allows council planners and decision makers to view the progression of agricultural productivity over time into the future, 2050, and make decisions around economic development, investment and land-use planning. The tools can be used in conjunction with land-use planning, particularly in identifying and prioritising prime agricultural land and facilitating sustainable regional development.

The spatial tool can be overlayed with planning zone layers, environmental overlays and other planning overlays for a complete view of the economic and environmental context and possibilities within local government regions. The tool allows for collaboration with farmers and investors, to develop sustainable agricultural planning of highly suitable commodities now and into the future.

Online Mapping

Together with the Goulburn Broken Greenhouse Alliance and the Goulburn Broken CMA, Deakin created an <u>online interactive mapping tool</u> also displaying the outputs of the modelling that was undertaken. Interactive maps allow users to see what the yield for a particular commodity may be and the geographical areas where yield is predicted to be high or low.

The site creates a narrative around the current and future climate and economic contexts within the Goulburn Broken Region. The site explores current and future agricultural suitability for the five main commodity groupings, with interactive maps that users can explore online, along with background of the region, irrigation districts. The site develops a context for agriculture in the region currently and the changes it faces in the future under climate change, however highlights the opportunities for the region in the future implementing adaptation actions.



