

Australia Crop Travel Report

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Crop Travel Period: October 16 – November 2, 2008

Objective: This was a familiarization tour aimed at:

1. Gaining an insight and general understanding of Australia's agricultural programs (*organization, implementation, limitations, emerging directions, etc*)
2. Understanding the significance of major agricultural crops to various states or regions (*wheat, barley, cotton, rapeseed, sorghum, rice, etc*)
3. Distinguish, recognize and make interpretations of major crop patterns and natural background vegetations in various agro-ecological regions and the wheat-belt
4. Gaining knowledge of landuse/landcover remote sensing satellite mapping programs (research and operational) at national, state, and/or local level
5. Networking with agricultural industry stakeholders

OUTCOME:

1. FIELD CROP TOUR:

The crop travel was conducted in Victoria, New South Wales, and southern Queensland (Figure 1). We covered a total of roughly 1300 miles starting from Melbourne in Victoria, through the southern part of the Australian wheat belt to Mildura in north-west Victoria. We continued through Hillston, Wagga Wagga, to Canberra in New South Wales (Figure 2). We also travelled to southern Queensland, from Brisbane to Toowoomba and Darby.

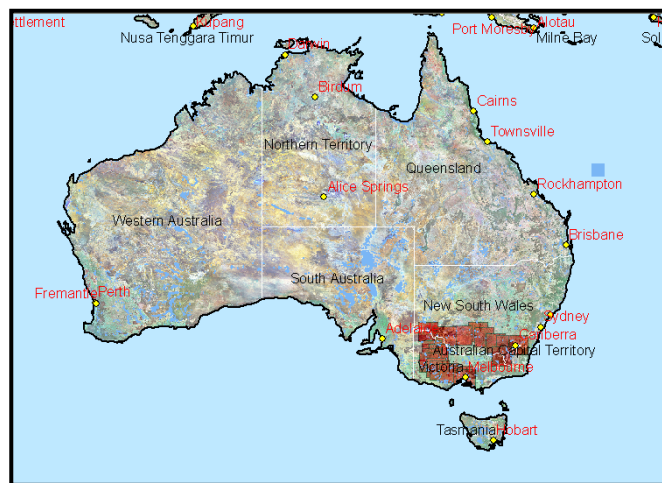


Fig. 1: Map of Australia

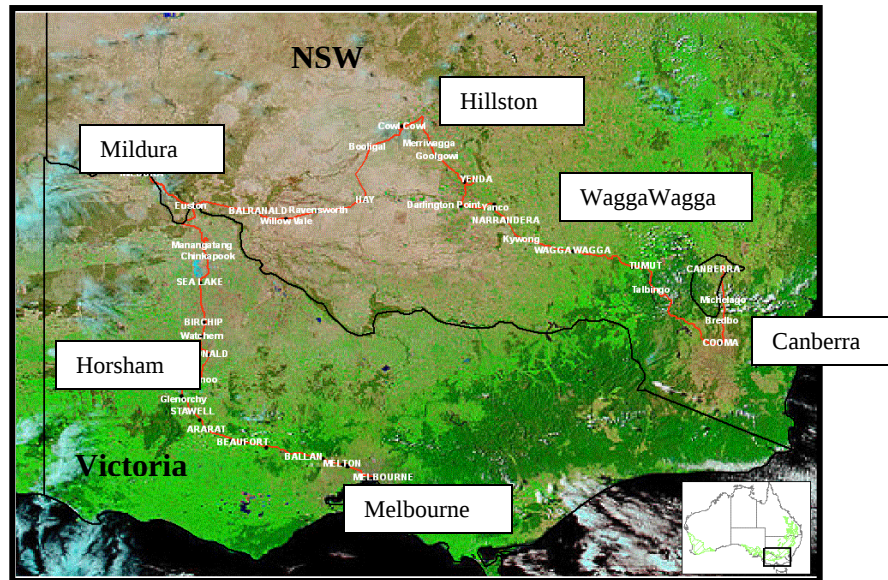


Fig. 2: Map showing the Crop Travel Route in Victoria and NSW. From Melbourne to Canberra.

2. GROUNDTRUTH AND SATELLITE REMOTE SENSING:

One of the tools used on this trip was the interface of GPS, GIS and remote sensing. A GPS system was used for real-time navigation and location solutions. The system was interfaced with GIS and AWiFS satellite images (October observations) in order to locate, label, and ultimately to groundtruth information on satellite images. A total of 370 field waypoints were collected and stored using the system. These waypoints will be used to extract and develop a spectral-signatures library of the observed crops and other land cover. The spectral-signatures will be used in conducting landcover supervised classification.

3. MEETINGS:

In addition to field crop observations the tour also involved meeting with farmers, crop consultants, scientists, and business industry personnel. We met and held discussions with over 34 people representing different groups.

Day 1 (Oct 20): Melbourne, Victoria

Met with representatives from the crop forecasting and trade industry including: Louis Dreyfus Australia [LDA], Australian Crop Forecasters [ACF], Cargill Australia, Australian Grain Exporters [AGE], and Australian Wheat Board Limited [AWB Ltd].

Remarks: The organizations ultimate goal is to serve subscription clients (paying customers) by providing them with high quality and timely crop forecast information at higher frequency (weekly). They also make the information available to the general

public. In general the organizations conduct crop forecasting activities for several reasons:

1. Most government agencies are seen as having limited resources to conduct comprehensive, regular, reliable, and timely crop condition assessments.
2. Some agencies (e.g. ABARE) are more structured toward economic forecasting and less on actual physical production estimates.
3. In order to get reliable information the organizations prefer conducting self-analysis of crop conditions to assist in practical business logistics (such as grain purchasing, bulk handling, storage, and freight) and analysis of business directions.

The organizations use different methods such as field sampling, area crop tours, groundtruth, modeling, and comparative analysis of information from other related organization. Their main focus is major crops such as wheat, barley, and canola. Currently very limited forecasting work, if any, is done using satellite remote sensing. This is generally due to the high cost and management of remote sensing projects and the larger volumes of data required.

Day 2 (Oct 21): Rupanyup and Manangatang, (near Horsham, Victoria)

We had a field tour and met with members of the Birchip Cropping Group (BCG) and local farmers

Remarks: The crops grown in this region include wheat (35-40%), barley (20-30%), lentils (10%), chickpeas (15%), and canola (10%). 80% of the wheat is dry sown in May (beginning of the season) and the ideal planting time is the first week in June. Anytime after this period planting can be risky in terms of yield loss. The most critical rainfall period (as far as crop Yield potential) is September 20–October 10. This year's dry weather conditions will result in lower yield potential of about 1.5 T/ha (the average Yield is 3 T/ha). Harvest period is November 20 – December 15.

Yield Prophet Model: Some farmers use the Yield Prophet model as a farming decision support tool. The Yield Prophet is a crop forecasting tool that was developed locally by the BCP. It is used to manage seasonal farm input variability (precision agriculture) to help farmers maximize profit and cut farm costs. Farmers pay approximately AU \$500 per paddock (field) per year to get the BCG's Yield Prophet Services. The model simulation input data include soil data, climate data, crop stage, and management practices. Soil sampling is done in March before the crop is sown in May. Yield simulations are done every day starting in April and throughout the season.

Day 3 (Oct 22): Hillston, New South Wales

We toured the crop fields in the surrounding area and met with local farmers and crop consultants from Cotton Growers Services.

Remarks: Farmers in this region grow winter crops (wheat, barley) and summer crops (cotton, corn). Farmers buy irrigation water allocations in two ways: (1) general allocations, that is, water from river systems or surface overland flow (regarded as high risk availability) and (2) high security allocations from boreholes or ground water aquifers. Irrigation water is generally used on summer crops and in sometimes it is used on winter grains to supplement rainfall.

The current cost of water is AU \$50 per mega liter (1 million liters). The water is generally used for cotton growing and sometimes for wheat. At the current water cost most farmers said that cotton production was probably more profitable than wheat (in addition, they said, it's much easier to market cotton than wheat under the current wheat market deregulation). However, if the cost of water rises to AU \$100 per mega liter, then it's more profitable to sell the water than grow wheat. On the other hand, if the cost of water was at \$400-500 then it's more profitable to sell the water than grow cotton. Use of water for wheat production is generally advisable when the grain price is more than \$300 per Ton and the expected yield is 5 T/ha. Hillston is the southern edge of the cotton growing region. The 2008/09 wheat yield in this region was 1.5 – 3 T/ha.

Day 4 (Oct 23): Griffith, New South Wales

Held discussions with scientists at the Australian Commonwealth and Scientific Research Organization (CSIRO) Land and Water as well as management and staff of Murrumbidgee Irrigation

Remarks: The scientists are currently focusing their research on rice and horticulture crop water use efficiency. While horticultural crops are high value crops (in terms of irrigation water use) the people we visited believed that rice was a reasonable choice and that its water efficiency is improving. The current rice production system is said to be conducive in addition to the area's favorable soils, climate, and low pests/diseases. Rice yield under ponding (flooding) can be up to 10 – 14 T/ha. However, rice still has a stiff competition with other crops because of the current decision making approach (water use efficiency, that is, high value per unit of water) favors horticulture crops over rice. However, when based on overall profits (given variable and fixed costs), rice is likely to compete favorably with other crops. In general the region has experienced a 14% reduction in water availability and this has meant less water for irrigation farming. On going research includes the determination of horticulture crop coefficient (kc) based on NDVI values derived from Landsat/Spot satellite data. The research has revealed a strong relationship between crop coefficient and canopy cover (based on infra red spectral values).

Murrumbidgee Irrigation buys water from the Government (dams/reservoirs in the Snowy Mountains) and sells water rights to the farming community. Murrumbidgee Irrigation manages the water from the point of diversion to the farm outlet point. The water is sold largely to rice, cotton, and horticulture crops farmers. There is increasing high demand for summer crop irrigation water. Normally there is a 30% water carry-over from year to year. The water allocation year starts in August-October. At present there is

a 50% reservoir capacity (about 2.7 million mega liter entitlement). The officials said that at the current water levels, it will possibly take 2 to 3 years of average rainfall to get the reservoirs back to normal or full capacity and also back to normal area planted of rice. The current water delivery cost is estimated at AU \$20-40 per mega liter. The market demand has increased and the price of high security water allocation is at AU \$1600 per mega-liter and \$600-1200 for general security water allocation. These prices reflect a 50-150 increase in the last few years (used to be \$300-400 per mega liter).

Day 5 (Oct 24): Wagga Wagga, New South Wales

Held discussions with Rob Burns of Snowy Hydro

Remarks: The Snowy Hydro has three major reservoirs: Tanagers, Lindabyne, and Lake Eucumbene. The current reservoir capacities are down 12-20% and from operations view the capacity is even worse because of the required minimum operating levels. The current estimates are that from the current minimum operating levels to full levels it might take 12 years. The Snowy Hydro operations were overdesigned and that has been very helpful for dealing with current operating conditions which are essentially outside the normal engineering parameters. Of the total electricity generated by Snowy Hydro, 28% is delivered to NSW, 43% to Victoria and the rest of other areas. The majority of the water from the Snowy Hydro reservoirs is diverted to the Snowy-Murray River development (Victoria) and the other goes to the Snowy-Tumut River basin.

Day 8 (Oct 27): Canberra

Held discussions Peter Reading and Iftikhar Mostafa at the Grains Research & Development Corporation (GRDC)

Remarks: GRDC primary mission is to provide a single national grain development strategy and portfolio that encompasses basic, strategic, and applied research. The corporation is funded by growers (0.99% of net farm income) and government (0.5% of gross value of production). Currently the major projects include plant breeding (wheat, barley, and canola), variety trials, pre-breeding, farm practices, investment impact assessment, and communication. Biotechnology research is the GRDC's next big initiative. The research projects are subcontracted to the department of agriculture, CSIRO, universities, and growers groups. GRDC also conducts crop forecasting for internal use only. The major purpose of the forecast is to evaluate anticipated revenue. This is done by tracking information from ABARE and other forecasters, by talking to growers, and running simulation models. The GRDC normally expects reliable crop forecast numbers in December-January.

Day 8 (Oct 27): Canberra

Held discussions with Leanne Lawrance and John Hogan, representatives from the Australian Bureau of Agricultural and Resource Economics (ABARE)

Remarks: ABARE provides quarterly crop forecast. However, under special circumstances such as drought executive decisions are made to provide interim reports. They provide forecast at various scales including shire, statistical districts (SDs), state, and national. The forecast information is based on various sources including a national pooling of forecasters, discussions with the forecasting industry, state contacts (departments of agriculture, feedlots, and growers), field observations, and simulation models. The field observations involve groundtruth exercises and making calls to local farmers. ABARE has local area survey offices whose primary role is to conduct farm financial surveys. However, they also report on crop condition observations. In June ABARE's main focus is on area planted data that reflects farmer intentions, in September they get more meaningful area planted data, while in December they get solid production data. ABARE also collaborates with scientists who provide simulation model outcomes. In general, forecast is based on the assumption of normal rainfall and sometimes leads to under or overestimates especially when one considers that BOM provides 3 months of rainfall outlook.

Day 9 (Oct 28): Canberra

Held discussions with Craig Smith and his team at ACRES, Geoscience Australia

Remarks: ACRES conducts operational and research remote sensing projects primarily dealing with geology and geological aspects. They have LANDSAT data archives of over 25 years. In recent years, however, they have expanded their project portfolio to include agriculture or crop production. One of the ongoing research projects involves the use of MODSI NDVI data for monitoring winter crops in Wimmera-Mallee region of Victoria. Their major focus is estimating real-time area planted because it has implications on yield and production estimates. One of the approaches used is HANTS (Harmonic Analysis of Time Series). The HANTS approach is often used to analyze many time series data (e.g. NDVI) because the data are harmonic in nature, that is, has periodic variations that can be measured by phase, amplitude, and mean.

Day 9 (Oct 28): Canberra

Held discussions with Dr Jim Walcott (Project Manager, Climate Impact Sciences) and his team at Bureau of Rural Sciences (BRS)

Remarks: BRS provides science advising to the agricultural sector.

Day 9 (Oct 28): Canberra

Held discussions with Brian Button, Managing Director of AGRECON

Remarks: AGRECON is a private industry company that has created a number of precision agriculture products for the agricultural sector. Some of the products include: Spray-Wise Decisions that allows clients to access information regarding agricultural chemical spraying windows; and Price-Wise used to access information regarding market

prices. The company is now about to release new products such as climate-weather forecast and crop monitoring.

Day 9 (Oct 28): Canberra

Held discussions Dr Richard Davis, Science Advisor at the National Water Commission

Remarks: In Australia water is managed by the state governments. The Federal (Commonwealth) government's role is essentially water planning. This follows the 2004 National Water Initiatives Agreement. The National Water Commission acts independently in the implementation and monitoring of the National Water Initiatives Agreement.

Day 10 (Oct 29): Brisbane, Queensland

We were conducted on a tour of the Port of Brisbane and held discussions with Daryl Wood, Manager, Port of Brisbane Corporation management

Remarks: The Port of Brisbane Corporation manages the grain handling facility which is the 4th largest in the country. They handle wheat and sorghum for the domestic market. Also 60% of the cotton from Queensland and NSW pass through the port. They use ABARE forecasts for planning purposes (storage and shipping logistics).

Day 11 (Oct 30): Toowoomba and Darby, Queensland

We held discussions with Andries Potgieter and other scientists at the Agricultural Production Systems Research Unit (APSRU), Department of Primary Industries and Fisheries (DPI). APSRU conducts research in areas such as farming systems modeling, climate risk and change, crop improvement and adaptation, and education. The APSRU has developed agricultural models based on the APSIM modeling framework (Agricultural Production Systems Simulator). In addition we were also conducted on a crop observation field trip in Darby and Toowoomba.

Remarks: Andries Potgieter is a scientist at the APSRU, Department of Primary Industries and Fisheries. Andries Potgieter developed the **Oz-Wheat model** to predict shire-scale wheat yields as well as at state and national scales. The Oz-Wheat model is a simple agro-climatic model that is used to generate water limited stress index values of a wheat crop based on climate data (rainfall, temperature), soil properties, crop phenology, and management practices. Currently the model is run in 245 wheat producing Shires (with about 90% wheat areas). The final stress index is converted to yield forecast. The model is a very important decision support tool that provides high levels of predictive capability of wheat yield throughout the Australian wheat belt. We discussed a number of topics about the model including development, validation, assumptions, operational use, challenges, etc. Currently the model is also being used by Crop Insurance companies. The model is used for sorghum yield forecast as well.

Agriculture: Agriculture in Toowoomba and Darby is mixed: including livestock grazing, feedlots, horticulture, and field crops (wheat, cotton, soybean, sorghum, corn etc.). Wheat and cotton is irrigated. Because of inadequate irrigation water, in recent years farmers have been cutting back cotton area. However, this year cotton area is likely to increase (more than double last year's) due to improved irrigation water availability. A lot of cotton was planted on rain this year starting September 29. Farm irrigation storage facilities (rain tanks) range in capacity from 500-1000 mega liters. The majority of the storage facilities were at 30-40% capacity. The water sources include ground pumping, river systems, and overland flow. 70 % (26 inches) of the rain falls in summer. On average the area experiences wheat yields of up to 3 T/ha and this year's expected yield will be around 2 T/ha. Wheat was about 4-5 weeks before harvest.

There are no restrictions on the use of GM varieties and to date 90% of the cotton grown in Queensland is GM varieties (BT cotton). GM cotton varieties have to be planted before November 15 while traditional seeds can go up to November 24. Cotton farmers are required to plant refugee crops (part of insect resistance program) such as sorghum and pigeon peas. Improved cotton price has resulted in land shifting from sorghum to cotton. However, sorghum planting is expected to increase because of expansion of the feedlot industry and the development of ethanol plants. These factors may push up sorghum prices and create a positive farmer response. There was a big sorghum crop last year. There are minimal changes/shifts in corn acreage because farmers are involved in long term contracts.

3. CROP CONDITIONS:

In general there was significant variability in crop condition across the wheat belt in Victoria, New South Wales, and Queensland. The crop conditions ranged from total cross loss (abandoned fields), poor crop cut for hay, below average to average yield crop, and very high yields. The following figures (Fig. 3-9) illustrate the crop conditions observed along the travel route.

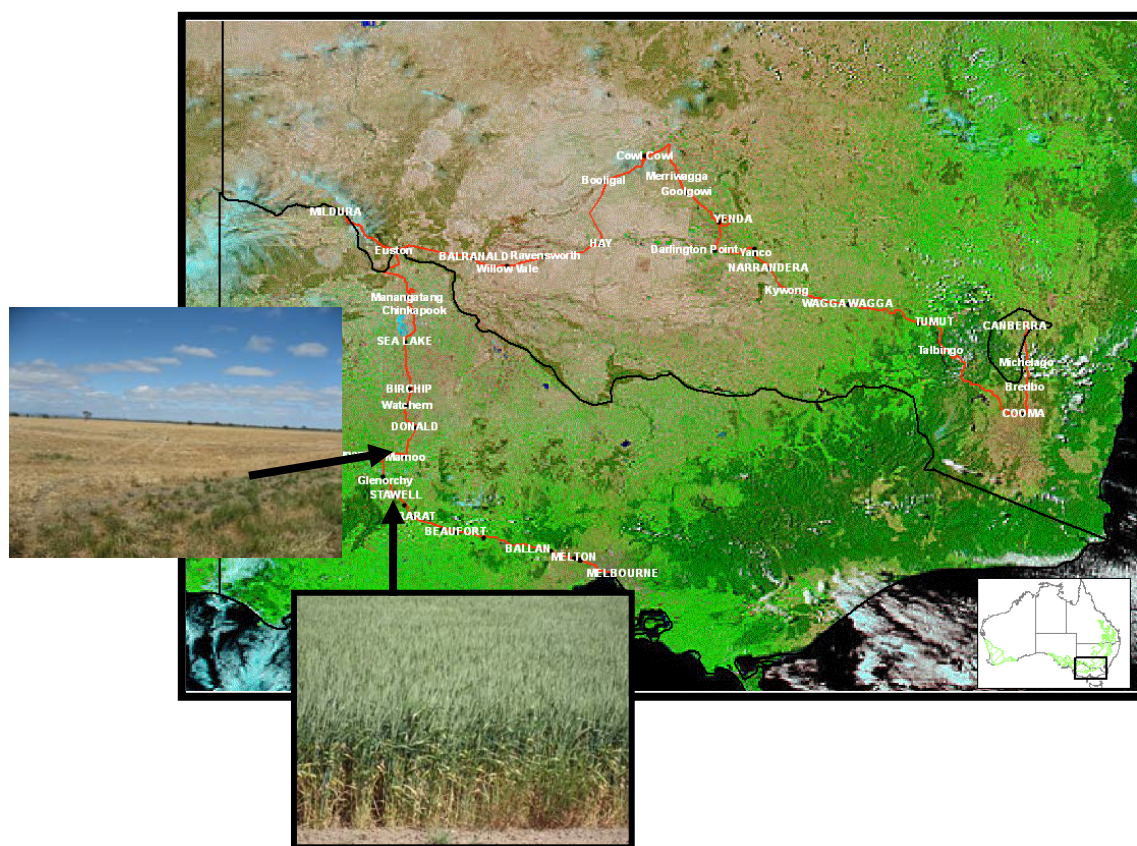


Fig. 3: Mixed crop conditions in Rupanyup and Birchip areas in west central Victoria. The crop was at average condition (1.5T/ha) to poor condition (abandoned or cut for hay). The crops grown in heavy soils performed poorly compared to those in light soils. Expected Y = 0 - 1.5 T/ha; Normal Y= 2 - 3 T/ha

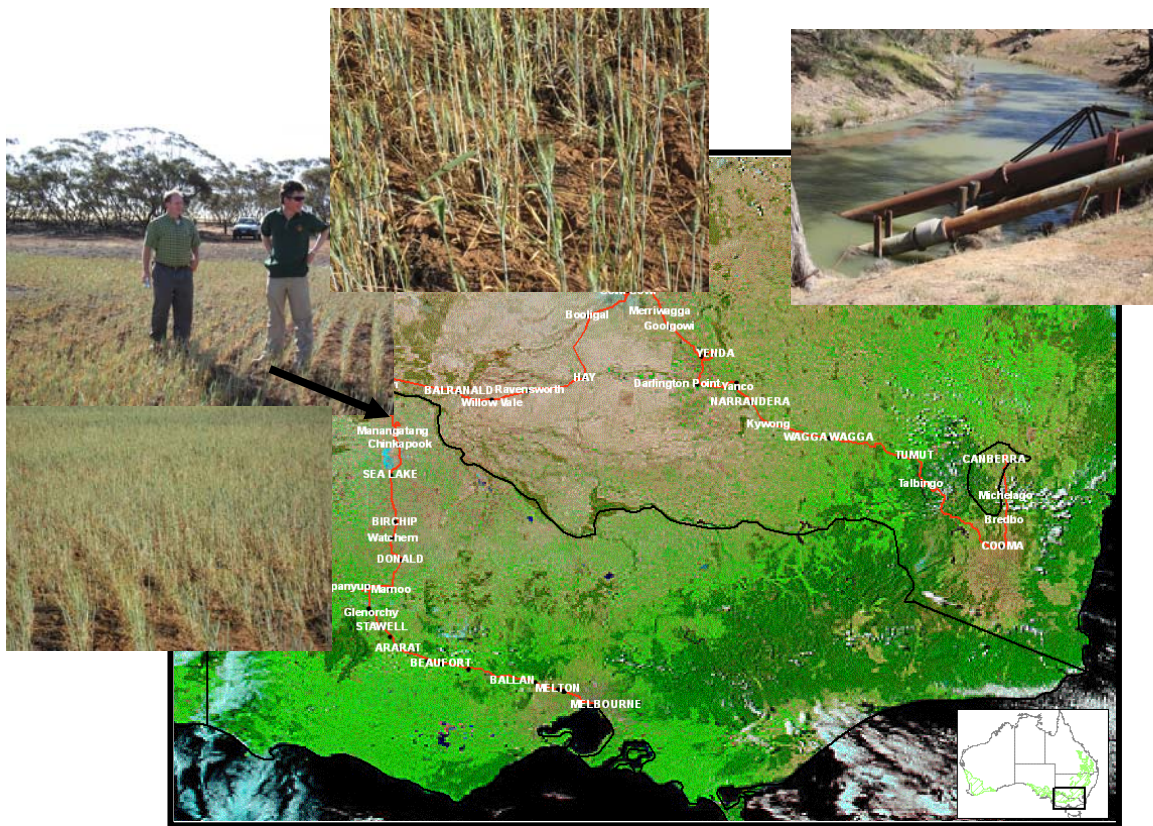


Fig. 4: Mixed crop conditions around Manangatang area in north-west Victoria. The wheat crop conditions ranged from average to below average with expected yield between 1-1.5T/ha

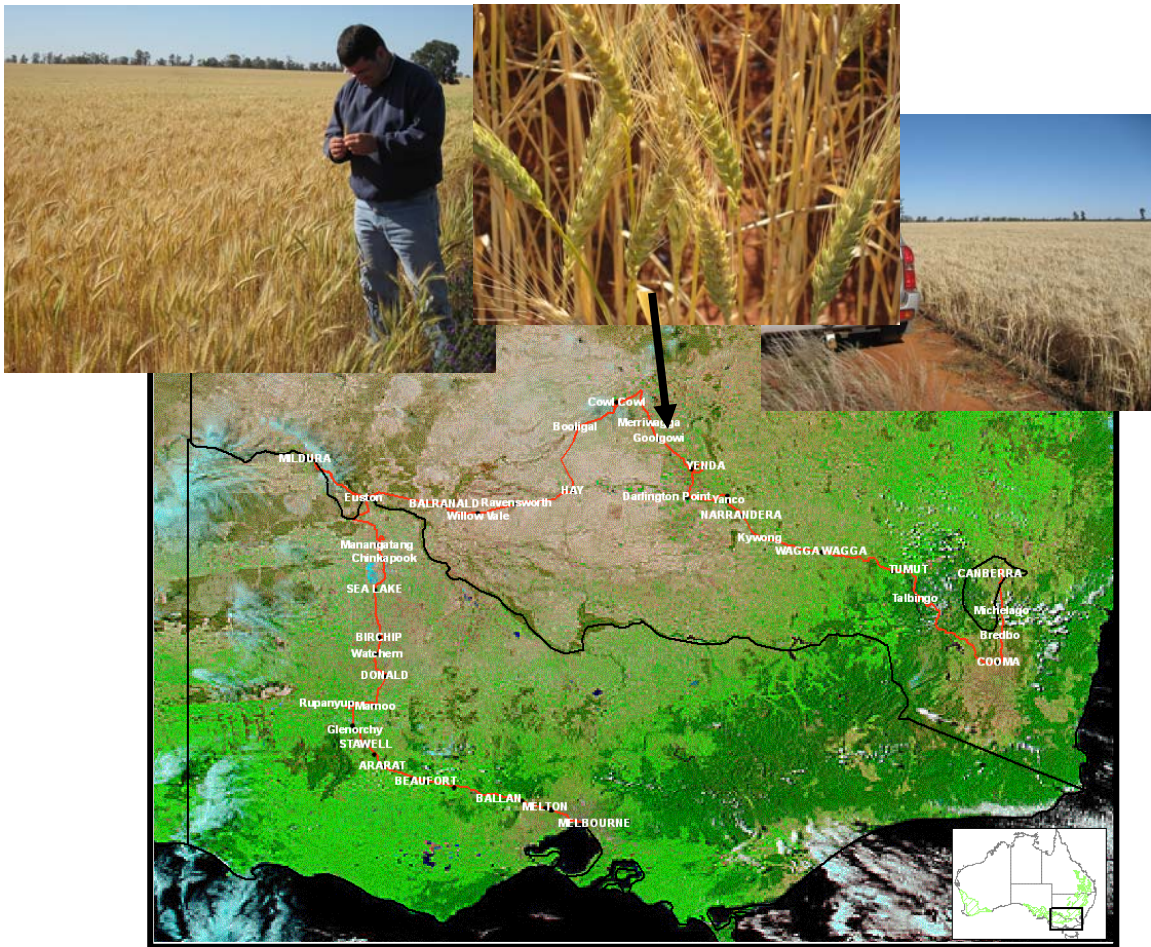


Fig. 5: Good crop conditions around Hillston and Goolgowi areas in south central New South Wales. The expected Yield was about 2-2.5T/ha

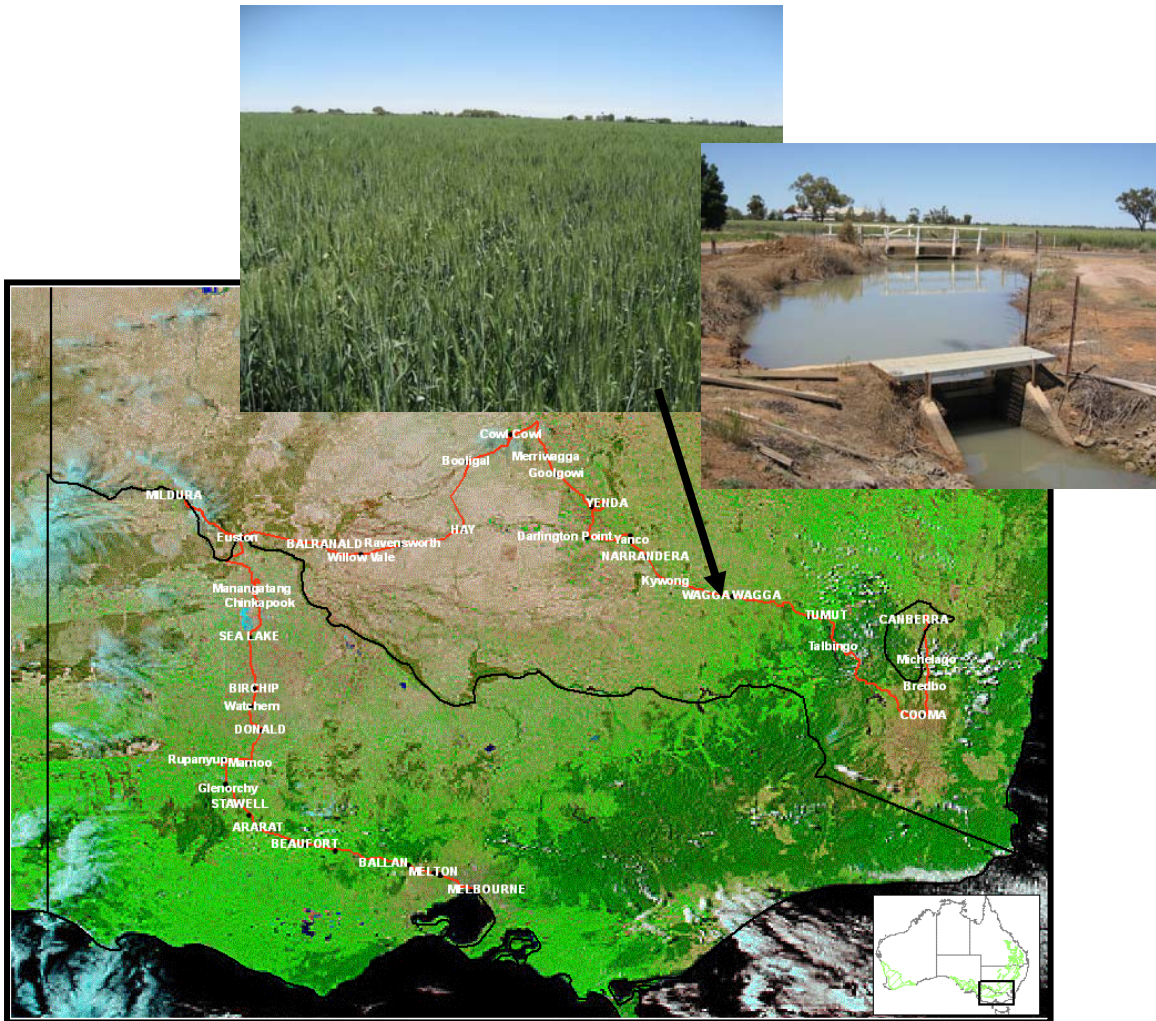


Fig. 6: Good crop conditions around WaggaWagga area in south New South Wales. The expected Yield was about 2-2.5T/ha. With improved rainfall conditions the crop was irrigated and performed better than in rainfed areas.

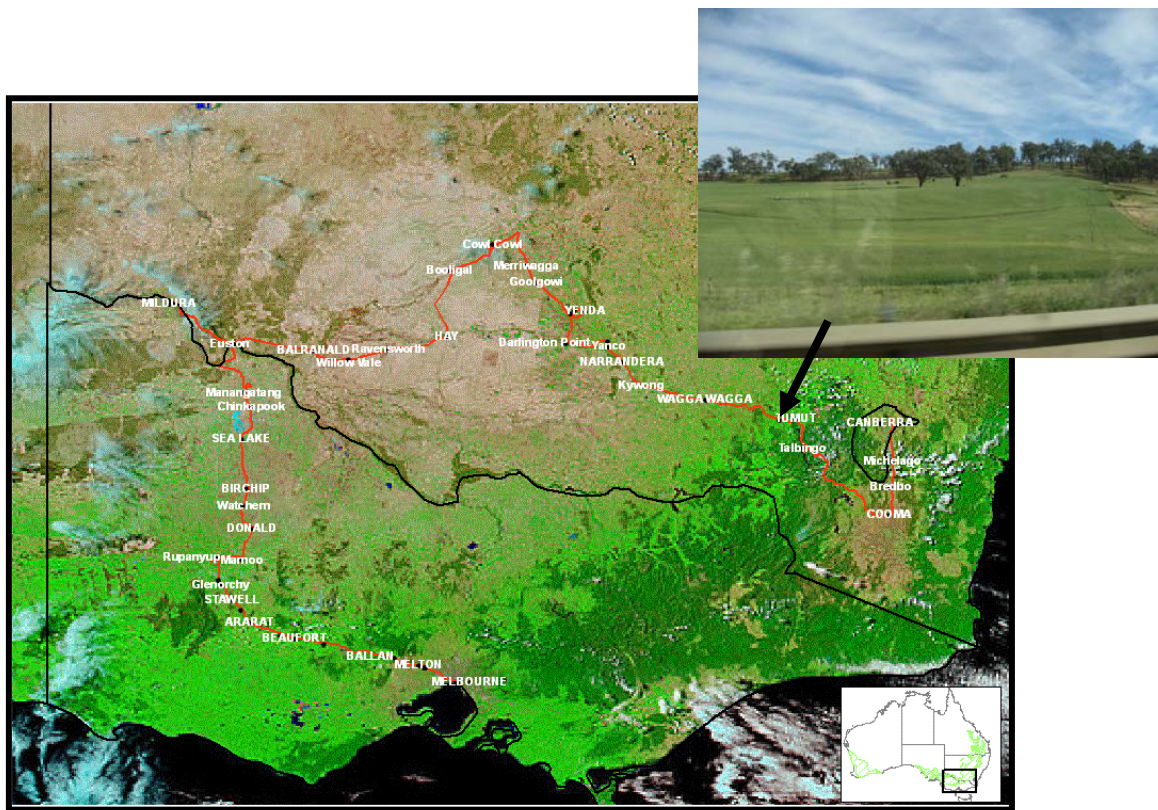


Fig. 7: Average crop conditions around Tumut in south east New South Wales. The expected Yield was about 1-1.5 T/ha.

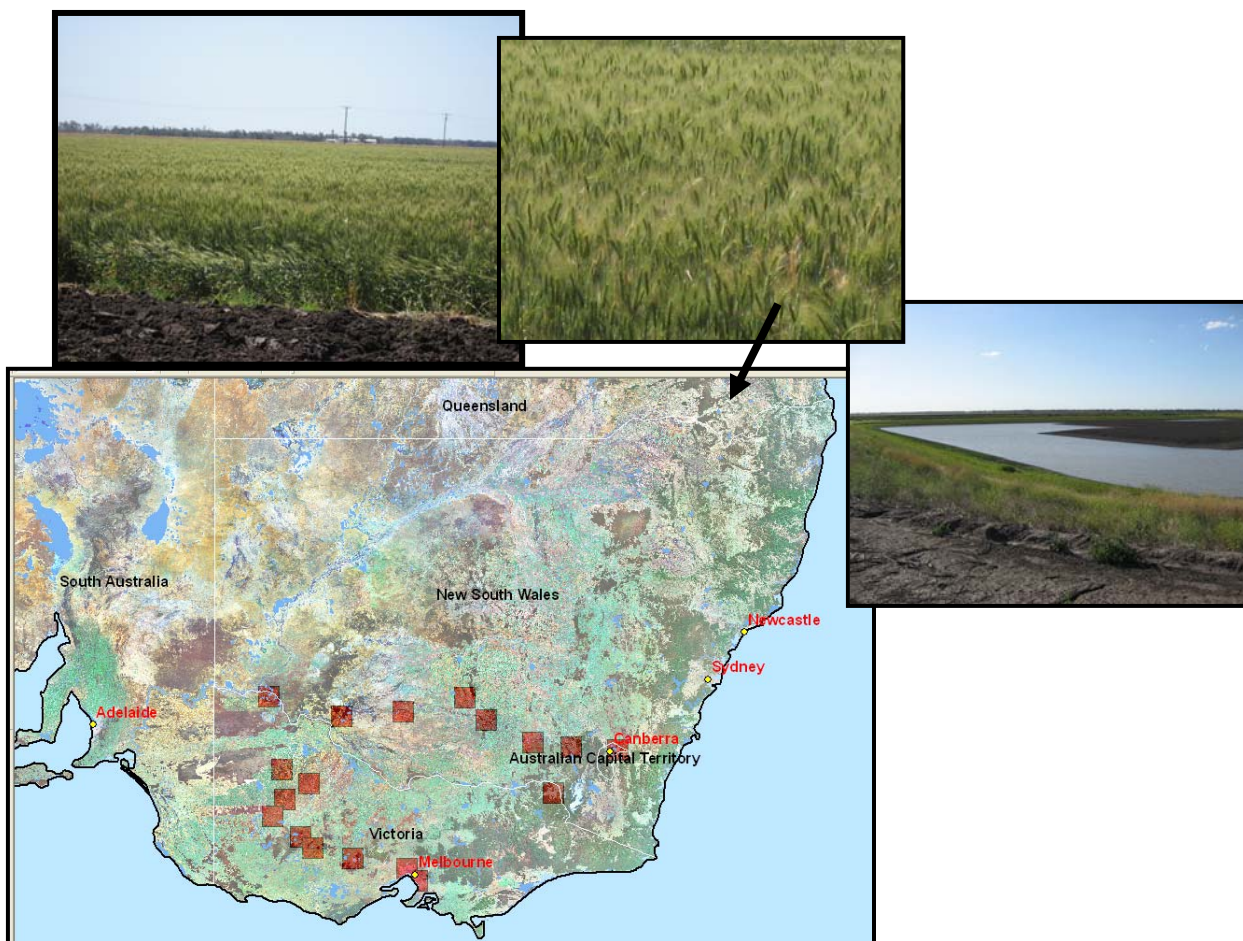


Fig. 8: Very good crop conditions around Toowoomba area, in south Queensland. The crop was irrigated using water allocation from river systems, overland flow, and borehole. The region had good rainfall conditions. The expected Yield was about 2.5 T/ha.

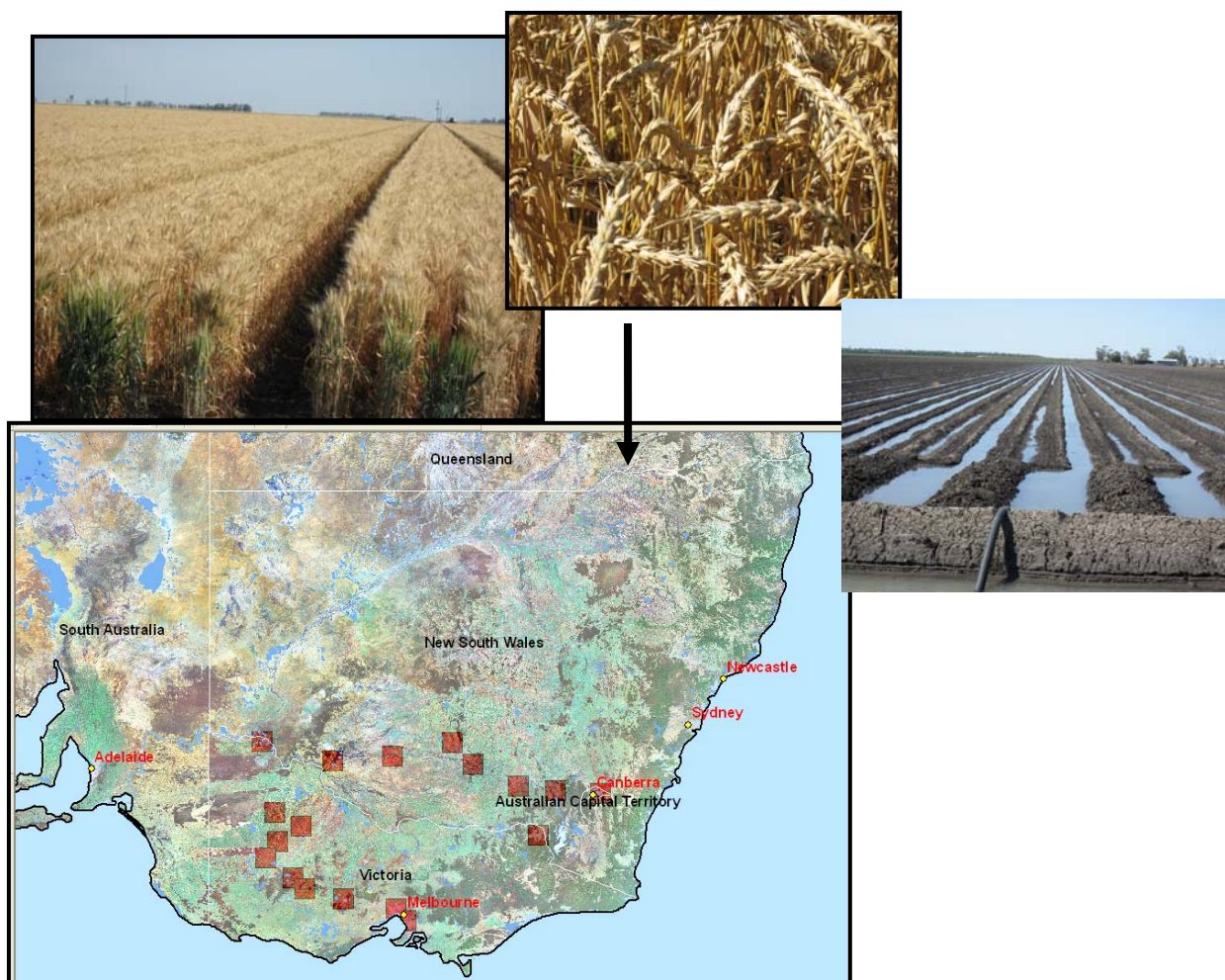


Fig. 9: Very good crop conditions around Darby area, in southern Queensland. The expected wheat Yield was about 2.5 T/ha or more. The crop was irrigated. The region had good rainfall conditions. The water allocations are enough for the upcoming cotton summer crop.

CONCLUSION:

1. The continued lack of spring rainfall in New South Wales, Victoria, and South Australia has resulted in significant abandonment, haying, and declining yields. The majority of the wheat growing regions in New South Wales, Victoria, and South Australia experienced well below average rainfall in September and October. Rainfall in September and October is critical to wheat production in these regions.
2. In general, wheat prospects have significantly deteriorated in Victoria and South Australia due to crop failures. The condition of wheat in New South Wales is mixed. The northern and central New South Wales are likely to experience average to above average yields, whereas, the crop in the west and south is in poor condition. In addition, while there may be some crop losses in Western

Australia due to late frost, the overall crop prospects are promising to be above average. Queensland is also expected to have higher yields and production compared to last year.

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