DEPARTMENT OF
PRIMARY INDUSTRIES

Nitrous oxide emissions from semi-arid wheat

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GRDC
Grains
Research &
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Corporation

Australian Government
Department of Climate Change

University of
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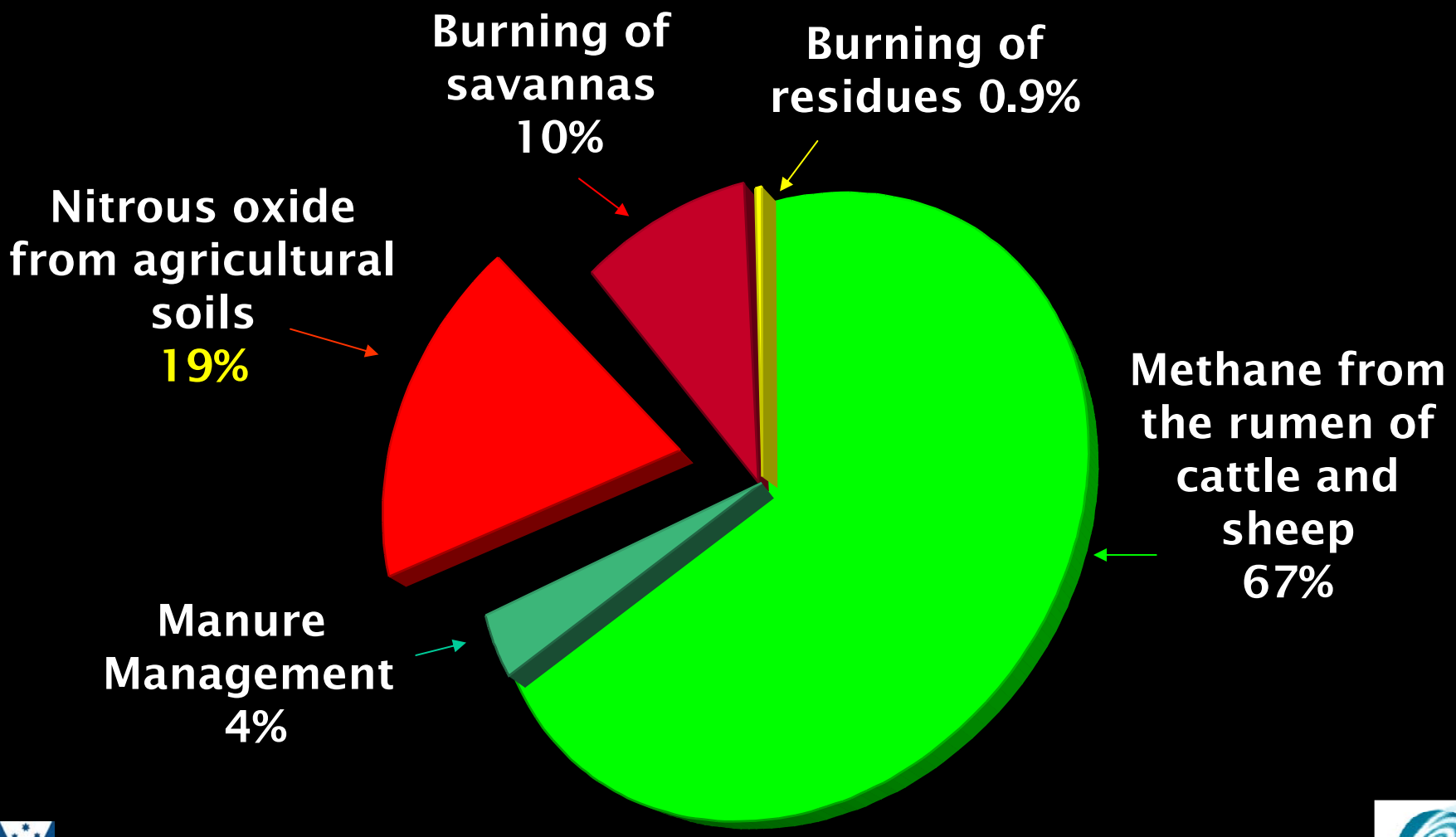
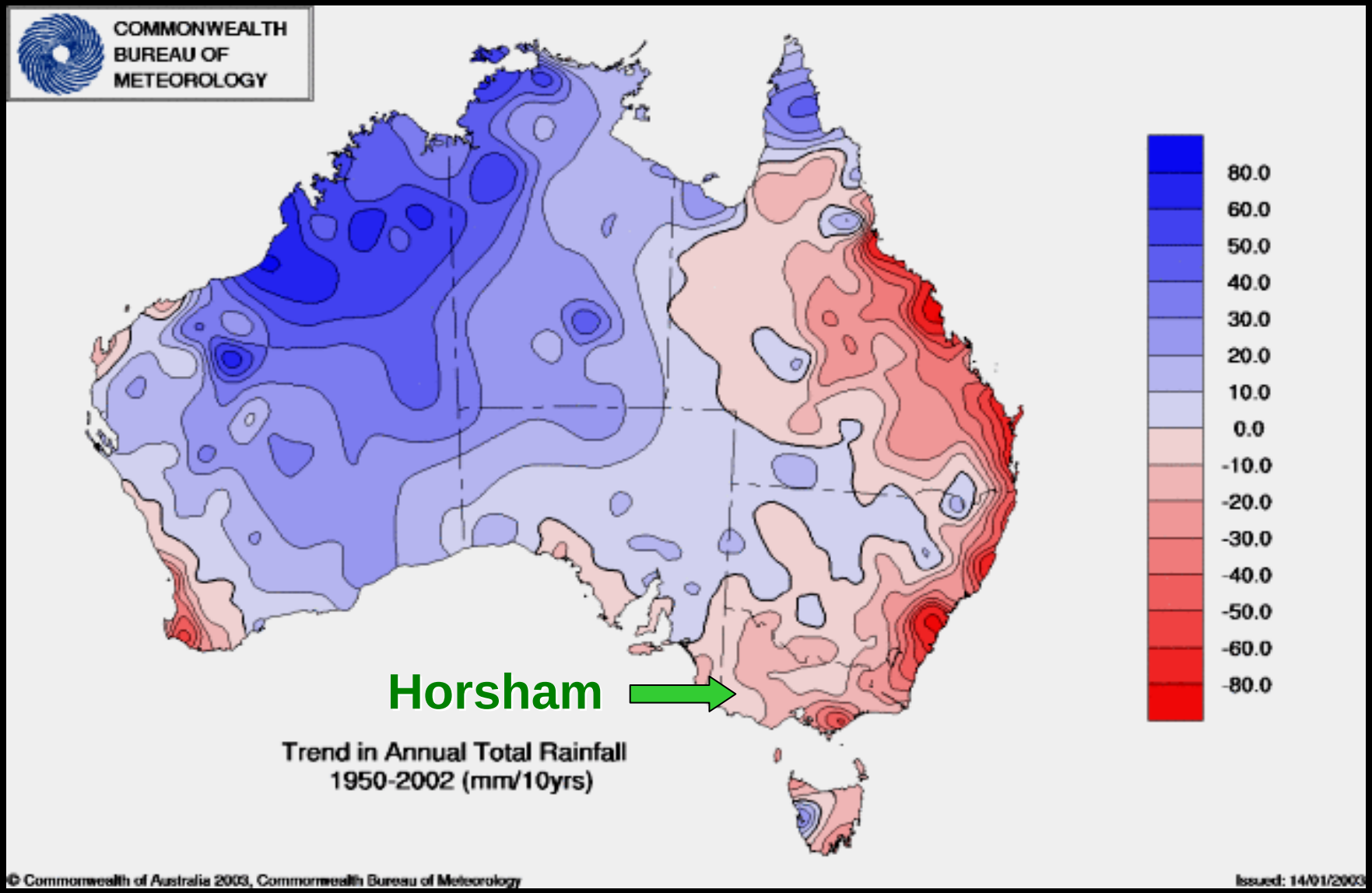
What processes cause N_2O and methane emissions from Australian agriculture?



Horsham N_2O emissions site

Site is on a Department of Primary Industries farm, south west of Horsham in the Wimmera region of Victoria.

The Wimmera is a grain growing region of mainly winter wheat in rotation with canola and legumes.



Rainfall change from 1950-2002

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Rainfall change in the Wimmera

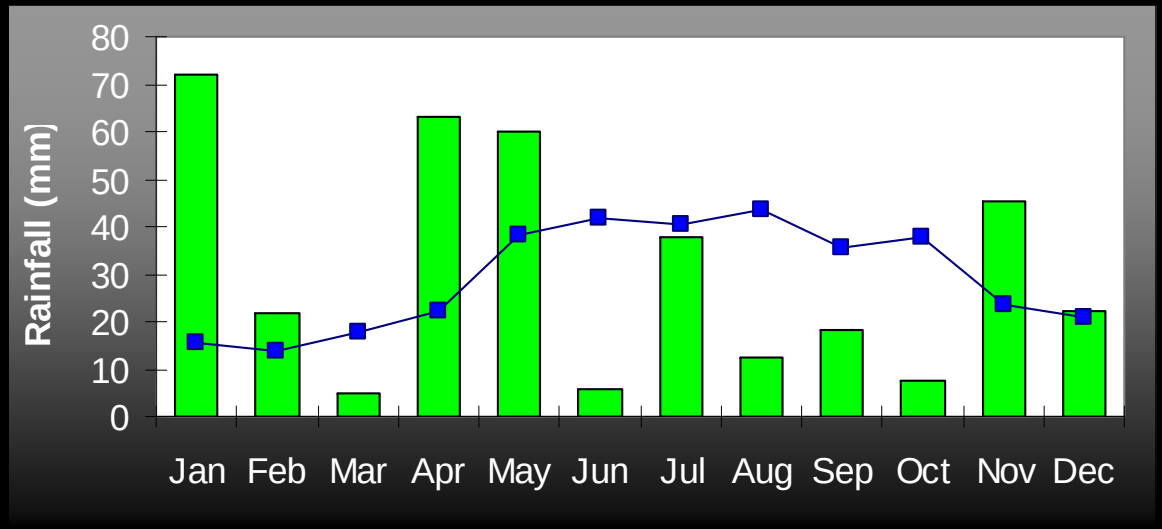
Between 1998 and 2007 the region's average rainfall was 16% below the 1961 to 1990 average.

Decreases in rainfall have been greatest in winter and spring, while the average summer rainfall actually showed a small increase.

climate change in the
WIMMERA

Rainfall during emissions monitoring

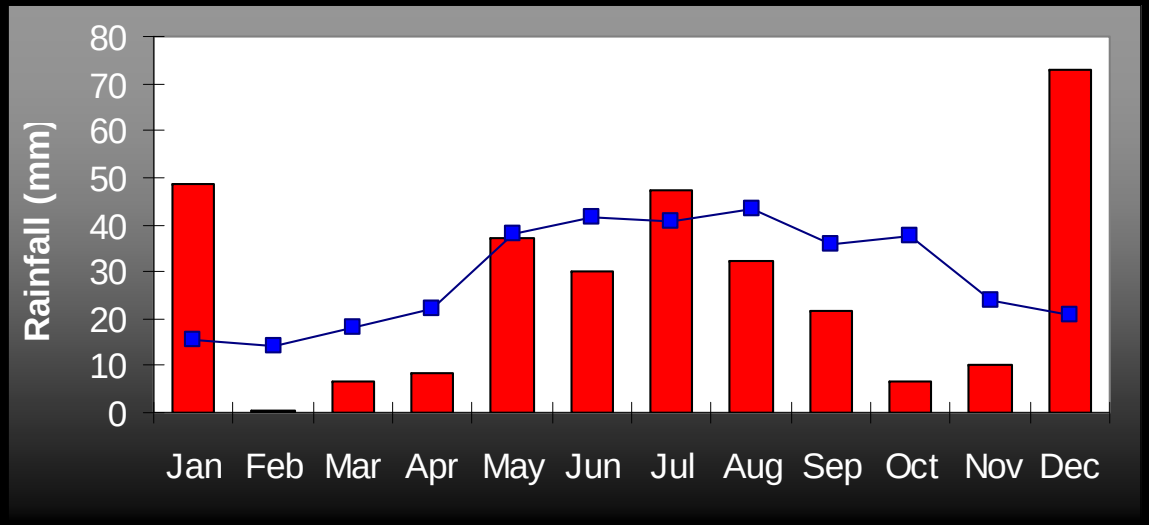
2007



Annual rain
372 mm

GSR rain
205 mm
Decile 2

2008



Annual rain
322 mm

GSR rain
183 mm
Decile 1

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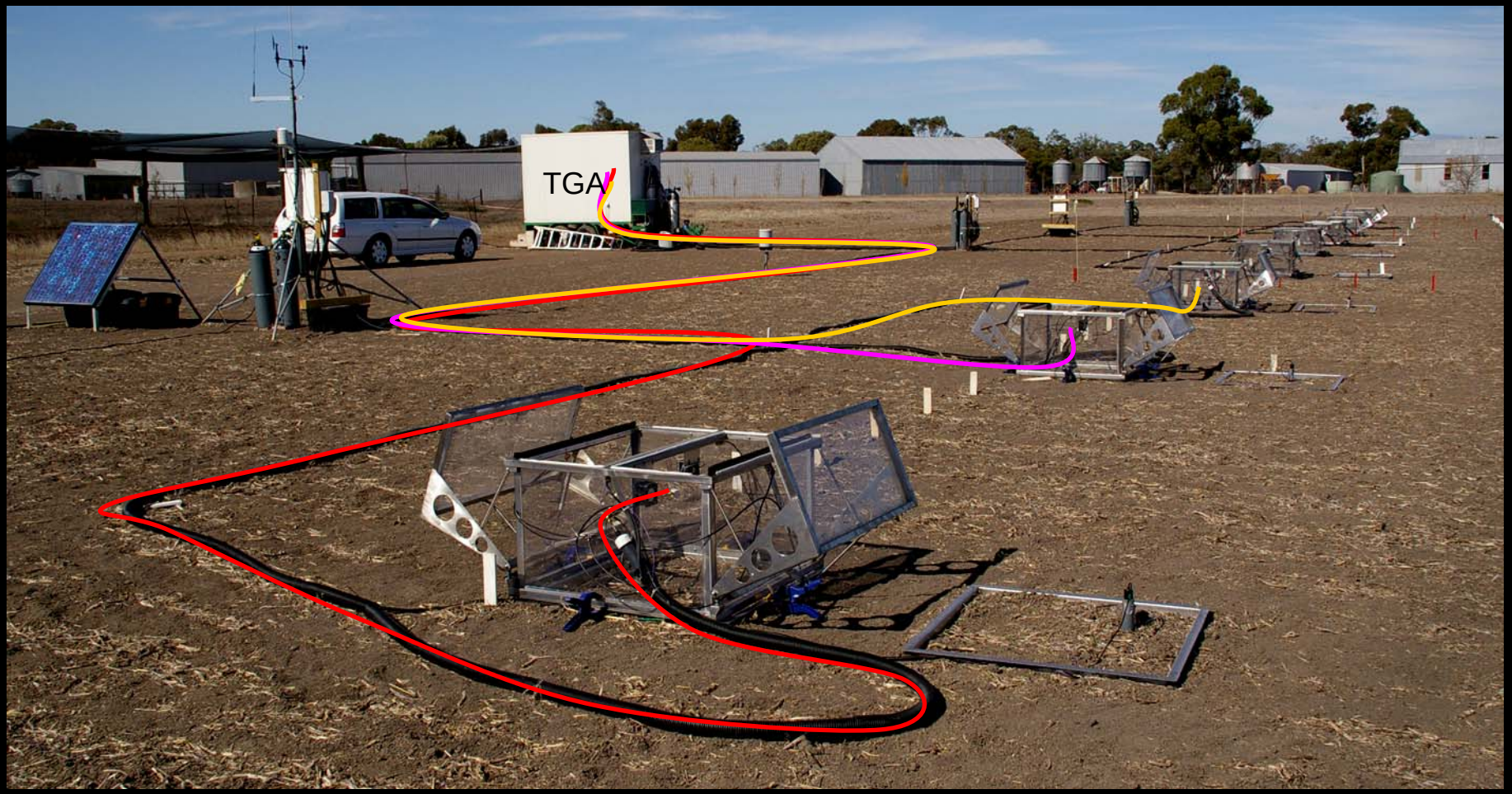
Horsham N_2O emissions system

Horsham N_2O emissions system



- Chambers organised into 3 replicates of 3 treatments
- Flux measured for 30 min, every 1½ hours
- Alternating weekly between two bases

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- Chambers open if the temperature exceeds 50°C
- Chambers open if the site receives 0.5 mm rain in 5 min

Soil moisture and temperature at 0-5 cm in the soil of each base are continuously monitored

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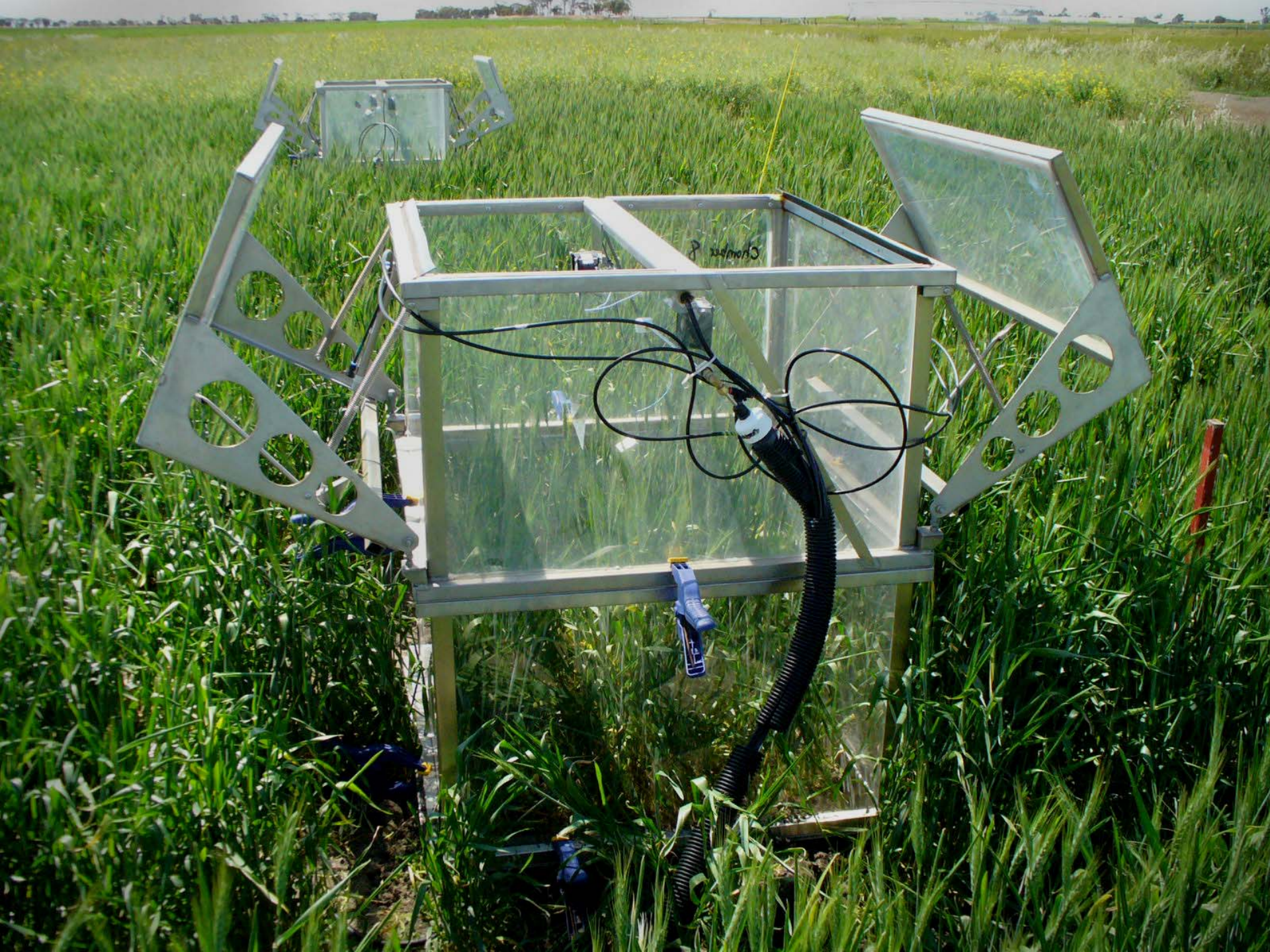
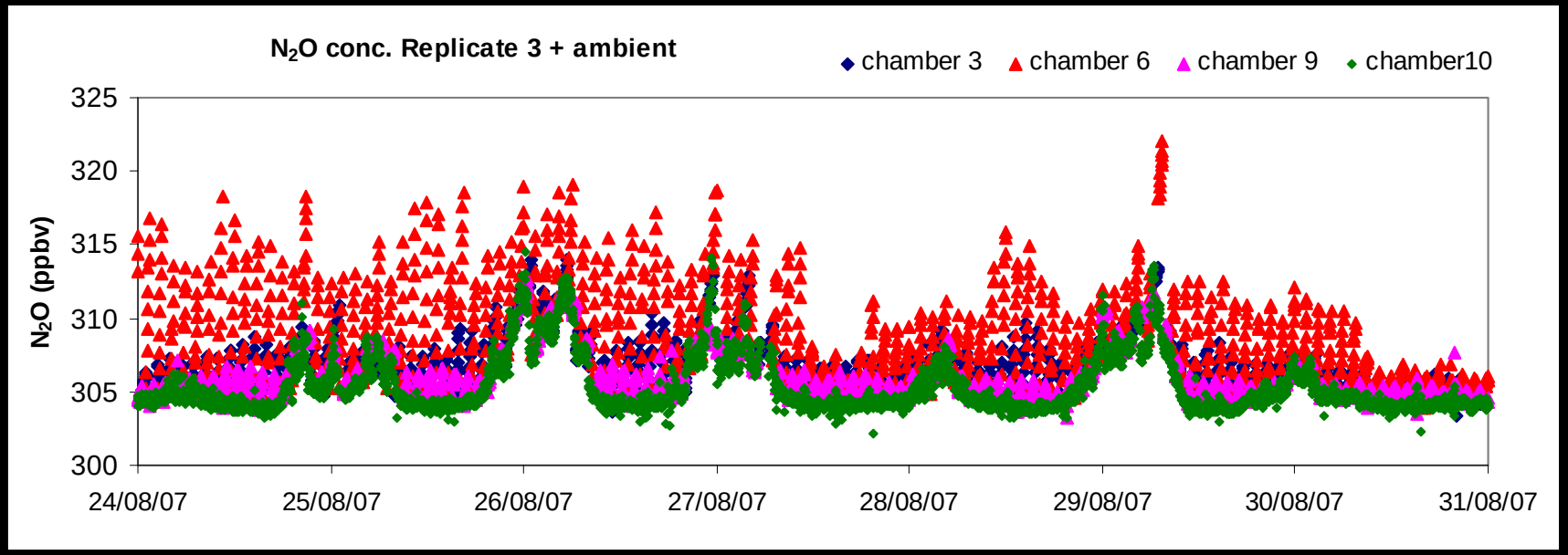
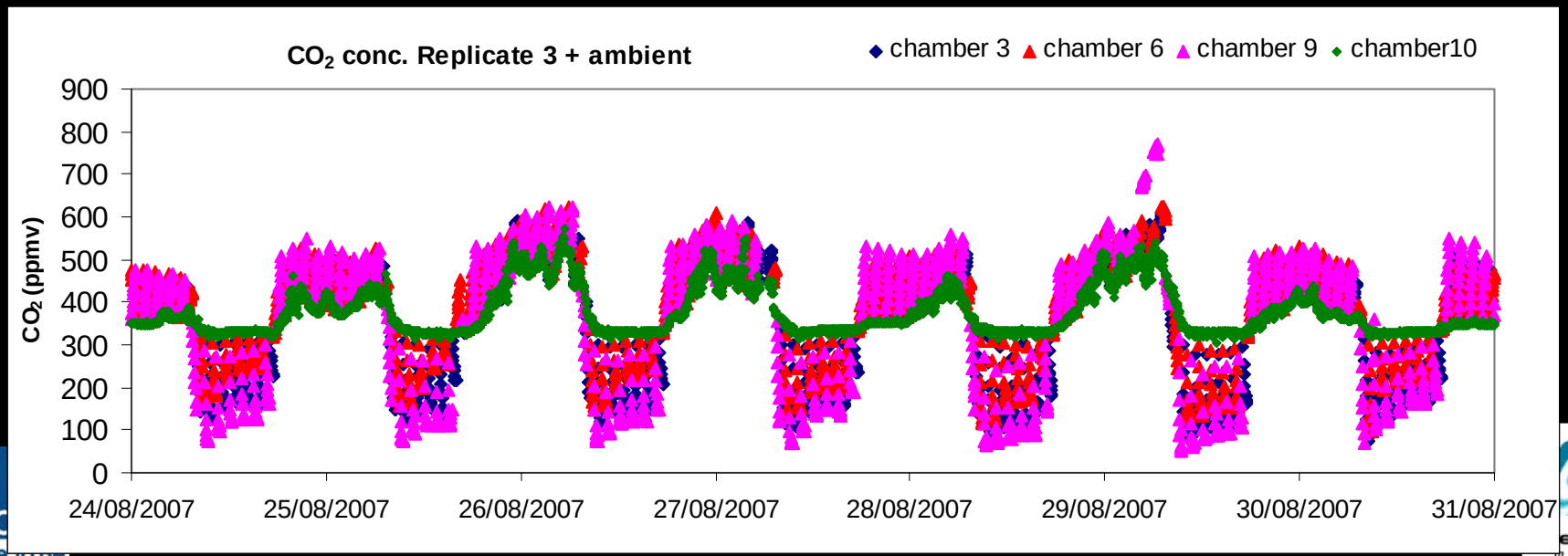
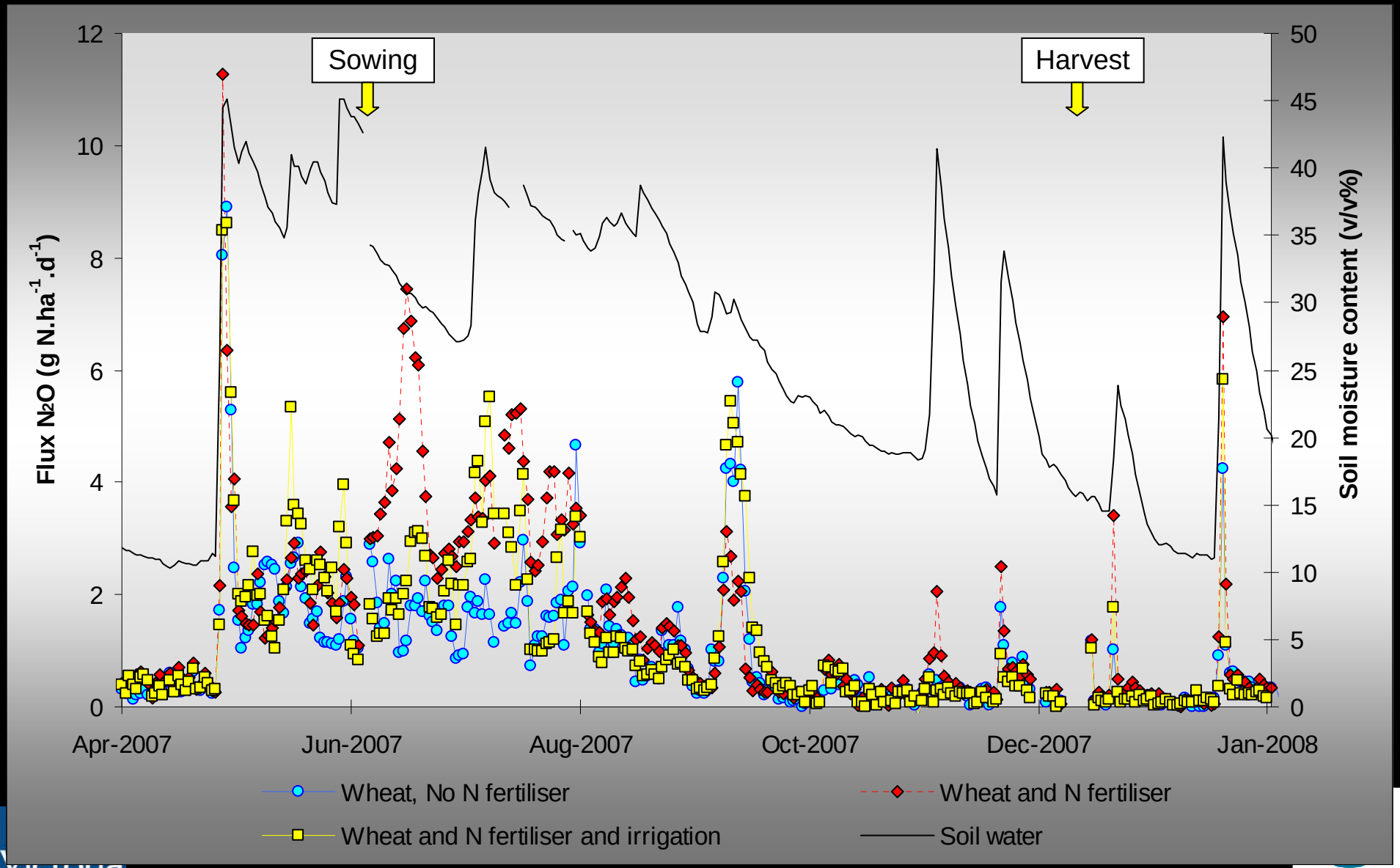


Raw N_2O and CO_2 data, early growing season, adjusted for offset calibration tank

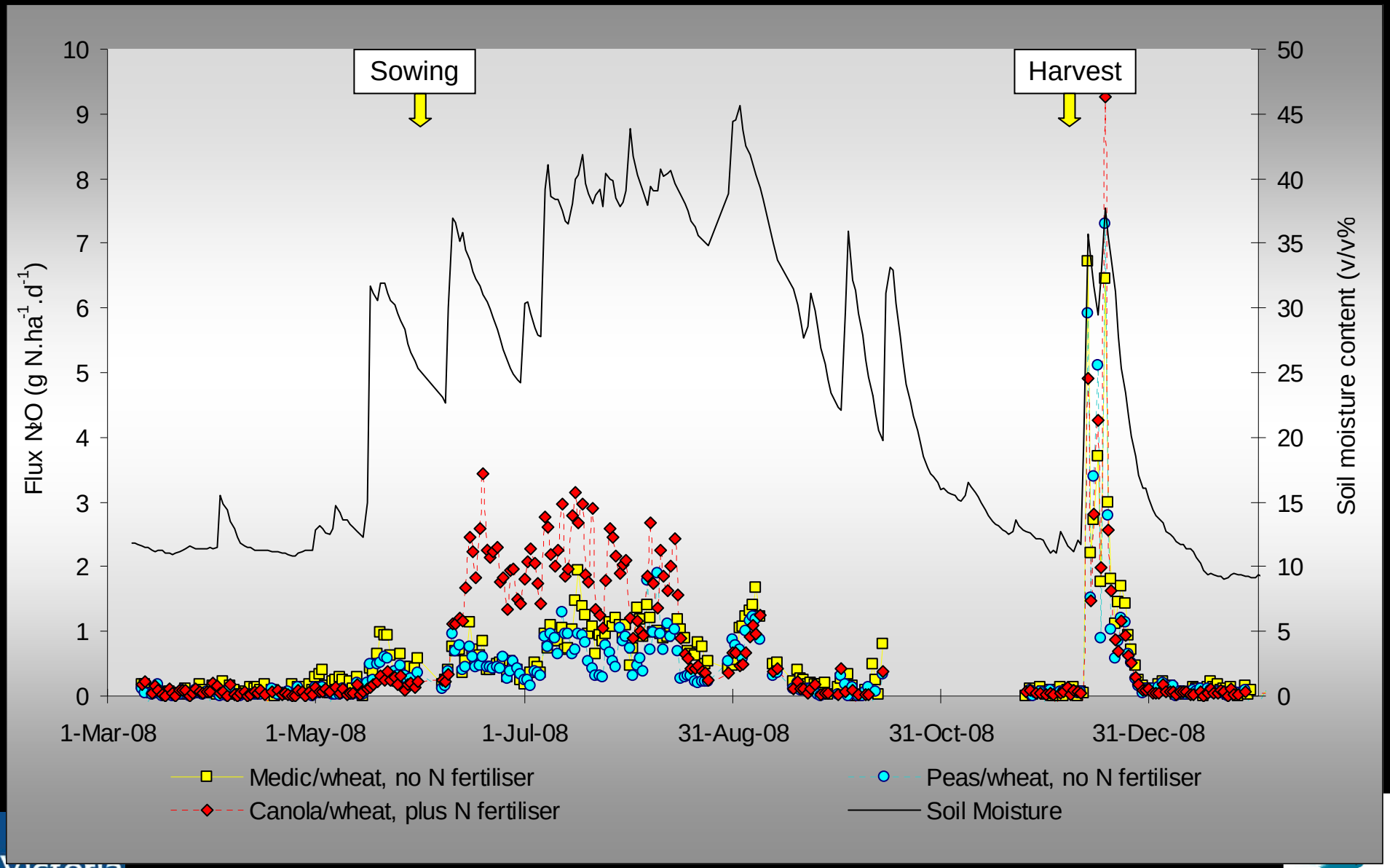


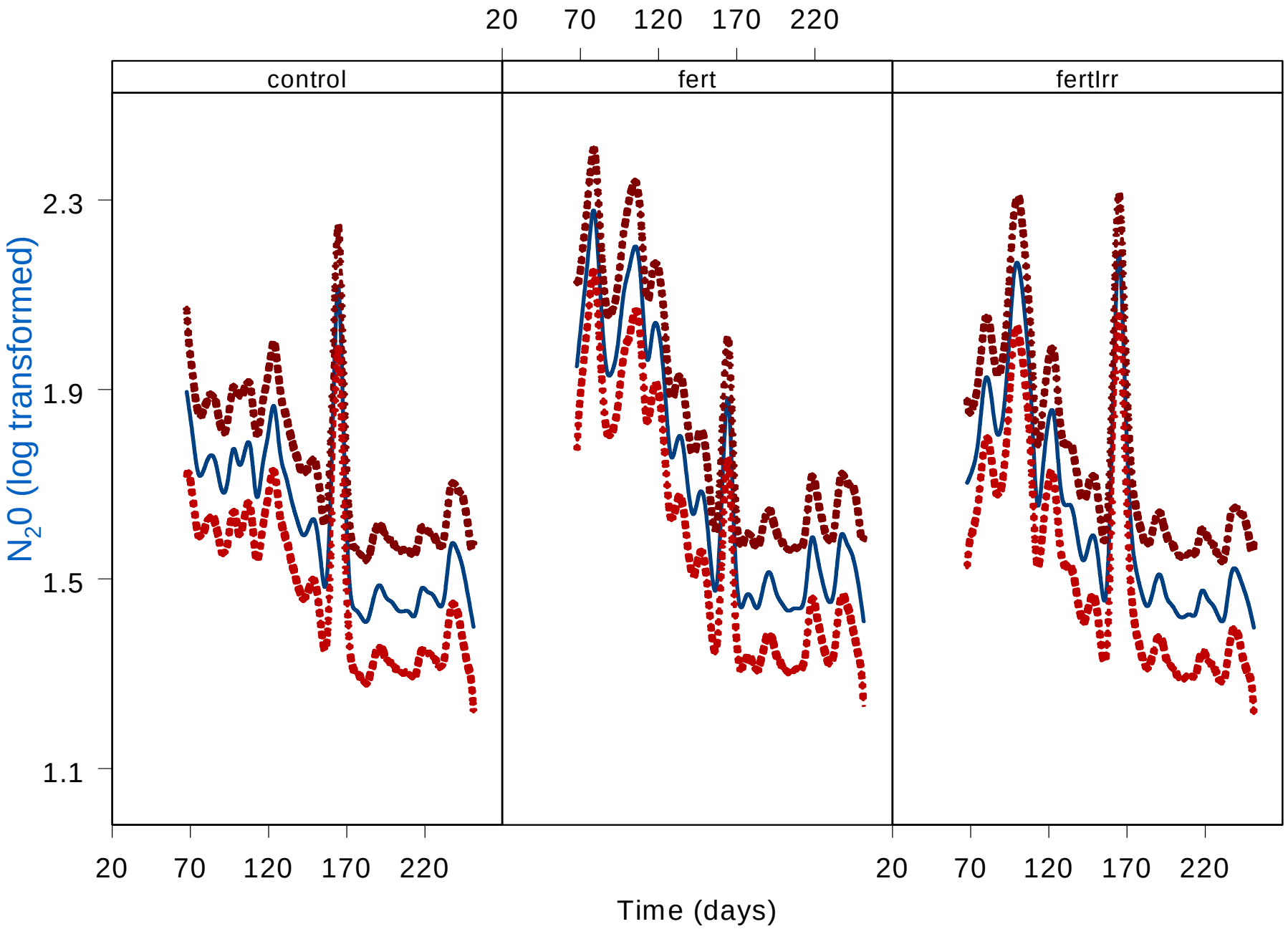


Daily average emissions and soil moisture 2007

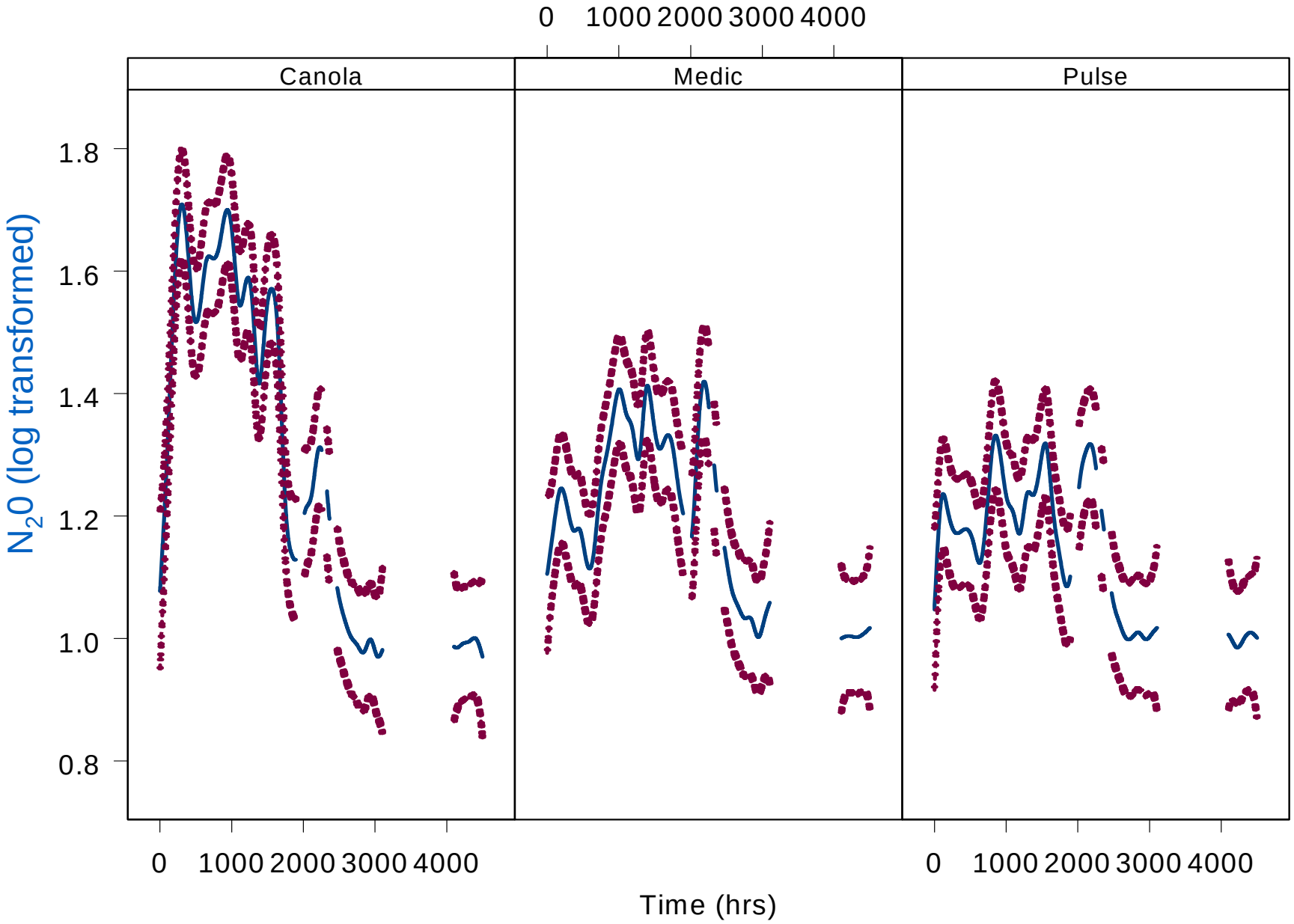


Daily average emissions and soil moisture 2008

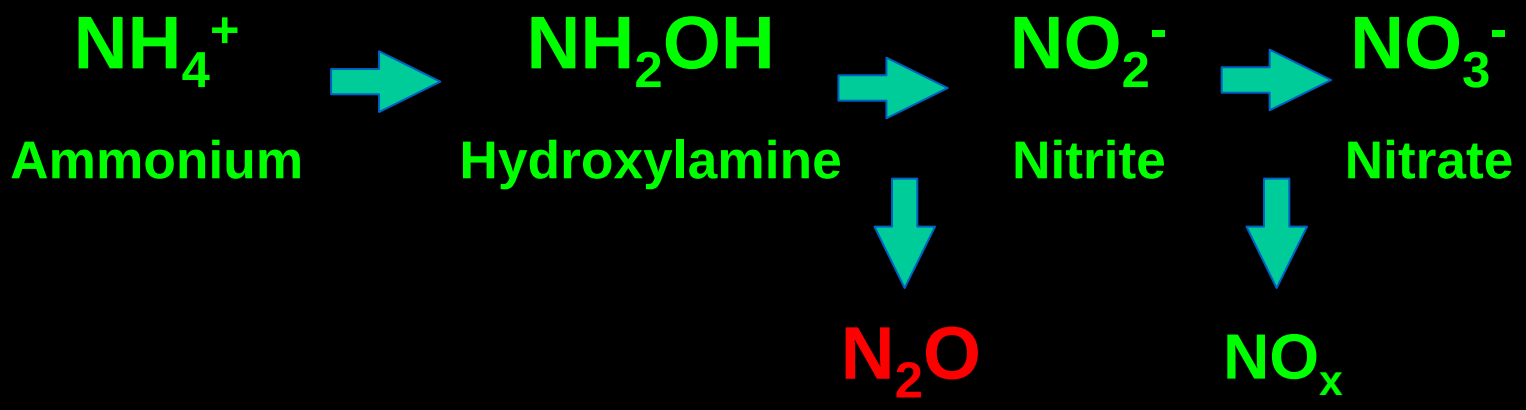



Fitted treatment values for 2007 crop season using cubic splines
20
70
120
170
220
control
fert
fertIrr
2.3
1.9
1.5
1.1
N2O (log transformed)
20
70
120
170
220
Time (days)

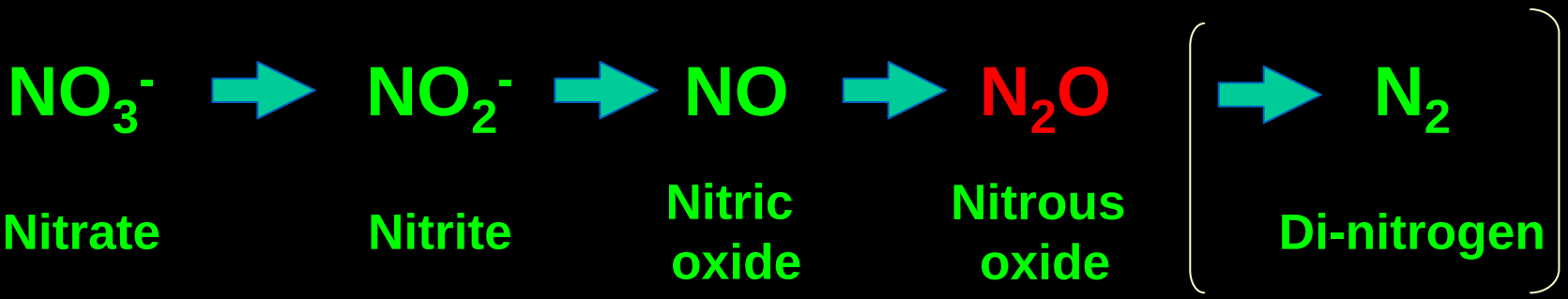
Fitted treatment values for 2008 crop season using cubic splines



Nitrification pathway



Denitrification pathway



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Emission factors

Emission factors for fertilised wheat at Horsham

2007, N Fertiliser, no irrigation = 0.34% of fertiliser N

(2007, N Fertiliser, irrigated = 0.13% of fertiliser N)

2008, Fertilised = 0.16% of fertiliser N

Much greater estimate than similar studies (0.02 and 0.04 in WA and eastern Vic)

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