

## The soils beneath Australia's first successful wheat crop: evidence from archaeological sites in Parramatta

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### Introduction

After the failure of the first crop at Farm Cove in Sydney, the agricultural settlement at Rose Hill (later Parramatta) was established, 23 km to the west. In November 1788 a group of 40–50 convicts, guarded by a detachment of marines started clearing the ground for the Government Farm on river flats about 1 km upstream of the tidal influence. The crop was sown late, in June and July 1789, after waiting for a fresh supply of seed grain from Cape Town. The harvest, in December 1789, produced over 200 bushels (7280 litres) of wheat, equivalent to about 600 kg/ha, and 35 bushels (1274 litres) of barley, together with a small amount of oats and maize. The fields were cultivated with hoes and no manure or other fertilizer was used, apart from the ashes of the native vegetation. More land (200 acres, equiv. to 81.1 ha, including 40 acres for wheat and 30 acres for maize) was cleared for the 1790 crop on the flats south of the river. Yields up to 13–14 bushels/acre (870–943 kg/ha) were achieved, enough to supply seed for the pioneer farmer James Ruse in 1790.

In July 1790 the township of Parramatta was laid out on the south side of the river, in the original area used for cropping. Cultivation continued in areas immediately adjoining the early township, including the land at Ruse's farm on the eastern side of town. Cropping did not persist on the same field for more than a couple of crops due to declining yields largely brought about by the absence of any livestock to supply the manure needed to replace nutrients taken up by the crops.

### Archaeological sites

Soil data from two sites associated with the earliest period of cropping are presented. One, where the A<sub>1</sub> horizon did not survive on the site, is on the northern edge of the Government Farm. The other is from beside the former Post Office (now 3 Parramatta Square), in the middle of Parramatta's CBD on Macquarie Street, only one block south of the original main street. Here the soil chemical properties and pollen data showed that the A horizon had been protected from disturbance by burial under a layer of sandy fill.

Soils were analysed at the Wollongbar laboratories of the NSW Dept. of Primary Industries for a range of major nutrients and trace metals. Phosphorus sorption testing was done at the Scone laboratory of the Soil Conservation Service.



Figure 1, left, Government Farm, *A view of Government Farm at Rose Hill N.S. Wales, 1791*, Port Jackson Painter, Watling and Lambert Collection, Natural History Museum, British Museum.



Figure 2, right, Plough lines in former Civic Place, 3 Parramatta Square. Casey & Lowe 2017.

### The Government Farm – Western Sydney Stadium site

This part of site of the original farm (painting, above left), lies at an elevation of 5–12.5m AHD on a series of eroded river terraces. The higher ground is 2–3m above the 1 in 100 year flood level (about 9m AHD in this area). Preserved from subdivision as part of the Government Domain, and later Parramatta Park, part of the high northern section of the Farm was covered by up to 3m of modern fill (some of which contained asbestos) to create a level training field for the football ground immediately to the north. Archaeological studies were undertaken as part of the requirements for the redevelopment of the new Western Sydney Stadium.

The soil was examined in July 2017, north of the fenced-off former training field, in places where the remainder of the profile appeared to be undisturbed. A total of ten samples from the main horizons exposed in excavated test pits were subject to chemical analysis with the aim of assessing the impacts, if any, of land uses that may have affected soil properties in the past.

There appear to have been at least two older terraces at the Stadium site, both of which have been partly eroded long before British settlement. Alluvial sediments up to 10m thick were found during site investigations for the new stadium.

Differences in the natural development and separation of soil horizons suggest that there is an age difference between the two profiles examined at the stadium site. The younger profile, with a low-contrast solum (and lighter-textured subsoil) about 2m thick, was found perched on top of a third much older terrace, distinguished by its spectacular coarse mottling. The higher pH (7.0 in CaCl<sub>2</sub>) below the sandy loam A<sub>2</sub> horizon of the other profile suggests leaching from a surface that was made alkaline by additions of ash. The younger profile is quite acidic (pH 5.2) at a similar depth. Phosphorus sorption, trace metal, organic matter and nutrient levels are low to very low in both profiles.

The soils are particularly low in total phosphorus (hot acid extract), with five of the ten samples having less than 50 mg/kg. A low phosphorus content is strong evidence for the absence of any colonial dwelling in the near vicinity (Lawrie, 1999). The potential impact of any ancient Aboriginal activity on the subsurface soil properties here has not been obliterated by subsequent colonial or more recent settlement. On the main part of the Farm closer to the river the soil properties await future investigation.

#### **Ploughed field – 3 Parramatta Square site, south of the river**

The site sits at the junction of an alluvial terrace of the Parramatta River (450 m to the north) and the base of rising ground to the south. The elevation is between around 10 m and 12.5 m AHD. At the time of clearing and settlement and the drainage pattern, across the wavy, undulating surface of the alluvial terrace, was erratic with several small, probably natural, depressions up to 1m lower than modern street level. Of the eight profiles inspected in late 2015/early 2016, the best preserved one was seen next to the Macquarie Street footpath, located only 20m from well preserved plough lines uncovered beneath the roadway of Civic Place (see photo, above right).

Beneath a layer of sandy fill was a firm, crumbly, friable grey silty light clay containing abundant plant roots. It became gradually paler with depth as the organic carbon content decreased (from 0.71 to 0.49%). The phosphorus content also fell (Colwell P from 6.3 to 2.5 mg/kg); hot acid extractable P went from very low (85 mg/kg) to extremely low (23 mg/kg). The underlying B horizon is a light yellowish grey silty clay with rusty mottles, unlike the lighter textured and more brightly coloured sediments seen in the terraces on the other side of the river, 400m upstream.

## **Conclusion**

Soil properties at archaeological sites around Parramatta are usually changed considerably by human activity, especially as a consequence of British settlement. An elevated phosphorus content associated with early urban development (Lawrie, 1999) is negligible or absent at the sites described above. This suggests that early cropping may only have been successful for a couple of crops at these Parramatta sites because the soils had been depleted of this essential plant nutrient. Levels were sufficient initially to support the relatively low yields. More detailed studies are needed to detect changes to soil chemical properties that may arise for example from repeated low-temperature Aboriginal fires to see if they had an impact on soil phosphorus.

**Keywords:** archaeology, phosphorus, wheat production

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