SECTION 6
Field measurements of carbon loss from soil following ploughing
Part 2: Carbon content of soils along the proposed ‘flux’ transect at Poldean Farm prior to ploughing.

Loss of carbon from soil following ploughing.
Part 2: Carbon content of soils along the proposed 'flux' transect at Poldean Farm prior to ploughing.

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Progress report

Fieldwork to collect samples to measure soil carbon content prior to ploughing was carried out on 12/13 October 2000.

Sampling Procedure

1. The position for the sonic point (micromet station) was chosen in the top NE corner of the field, 10 m from the corner gatepost.
2. A transect was laid from the corner gatepost south westwards to line up with the electricity pylon in the adjacent field. This should allow accurate re-siting of it for the end-point soil sampling.
3. The transect was marked at 10m, 30m, 70m and 130m from the sonic point, so distances to be sampled increased from 10m to 20m, 40m and 60m successively (see Fig. 1). The reason for the spacing was that the area closest to the instrumentation (<50 metres) is the area where changes are most likely to be recorded by the gas flux method.
4. Three points were selected for coring at each of the 10m (sites 1, 2, 3) and 30m sites (sites 4, 5, 6), at right angles to the transect, i.e. on the transect itself, and two further ones at approximately 10m (site 7) and 20m (site 8) distances, to the north west side. Thus a total of 8 sites were sampled. Because of the extreme wetness of the site after prolonged heavy rain, it was necessary to select the specific points to avoid waterlogged areas. In the extreme case, this meant displacement by 3 metres. Site 6, ie one of the three at the 30m point was wetter than the other sites, and difficult to sample. Precise points were identified by co-ordinate positions from the field boundary fence posts.
5. At each point there were 5 coring spots, at equi-distances around a circle of 1 metre diameter, centred on the point. Soil cores were taken by the soil coring method described in the last phase of the work (Jones et al. 1998), from 0-5, 5-10 and 10-15 cm. At one of the five spots at each point, cores were also taken at 15-20 and 20-25 cm. It was not possible to use the bulk density corer for deeper sampling, as the soil was too stony. However, samples were taken with a fine auger as deep as was possible. At some points this was only to 35 cm and the deepest was to 50 cm. The implication for the lack of bulk density data at the deeper points is that there will be no measurements of carbon per unit area for the deeper soil. Approximately 10 cm of the surface soil was dark and organic, below that it rapidly changed colour to a light sandy to reddish shade, was of a sandy texture and contained many stones.

The samples were broken up and dried at 80^0C, then passed through a 2mm sieve. The sieved soil and stones were weighed and the volume of stones determined by displacement of water. Bulk density of the soil was determined on the volume remaining, to allow accurate determination to convert carbon concentrations into weight per unit area. The sieved samples were analysed for LOI, and sub samples await Tinsley analysis for % organic carbon. A regression of LOI against Tinsley carbon will allow estimates of %C to be calculated on all the LOI samples.

Results

1. Bulk density

Variation in bulk density (BD) of the soil at positions along the transect, and at different sampling depths in the soil, is shown in Fig.2. The low BD of the top 5 cm was closely related to the high organic matter content at that depth.

2. LOI
LOI data are shown in Fig.3. There was a steep decline in the top 15 cm at all the sites, and below 15 cm, the value was less than 10% (equivalent to approximately 5% organic carbon, but awaiting accurate conversion using the Tinsley regression). Thus, although it will not be possible to calculate the weight of carbon in the deeper layers, due to lack of direct measurement on bulk densities, the amount of carbon held there, compared with the surface layers, will be small. It is proposed to make approximate weight estimates of the deeper soil carbon, based on estimates of BD.

3. Tinsley analyses for organic carbon content.
These will be presented at the annual progress meeting on May 18th.

4. Weight of carbon per unit area
As for 3. When the LOI/Tinsley regression has been computed, the weight of carbon in the layers 0-5, 5-10 and 10-15 cm can be calculated and the weight in the deeper layers estimated.

Reference
Jones, H.E., Howard, D.C., Culling, A.S.C., Gillespie, M.K., Harrison, A.F. and Hornung, M. (1998). Land use change and soil carbon. Section 4 in 'Carbon Sequestration in Vegetation and Soils'. Report on DETR Contract EPG1/1/39.

Figure 1. Sampling strategy on the field at Poldean Farm

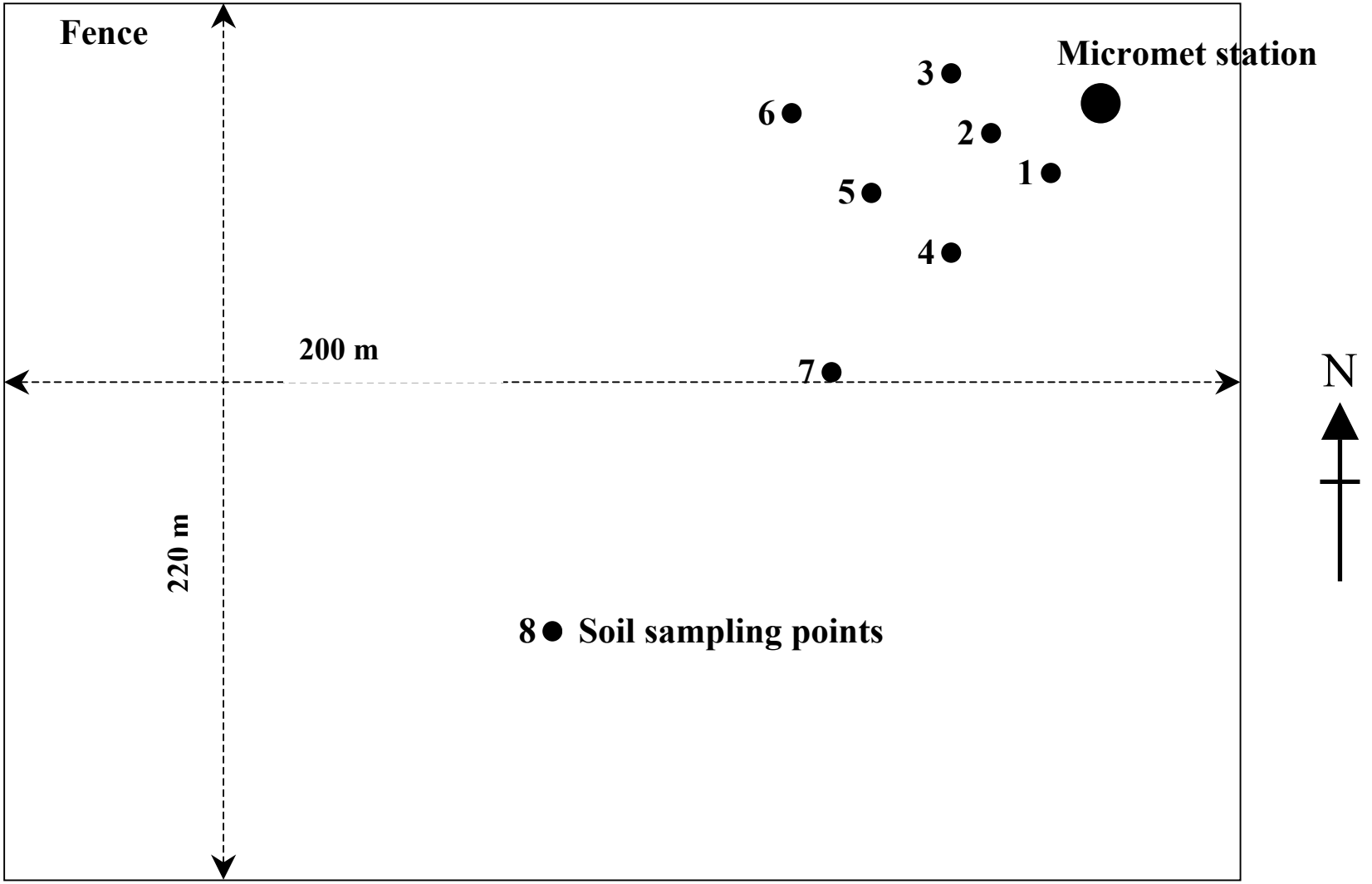

Figure 2. Bulk density (g cm^{-3}) for the sampling sites at Poldean Farm

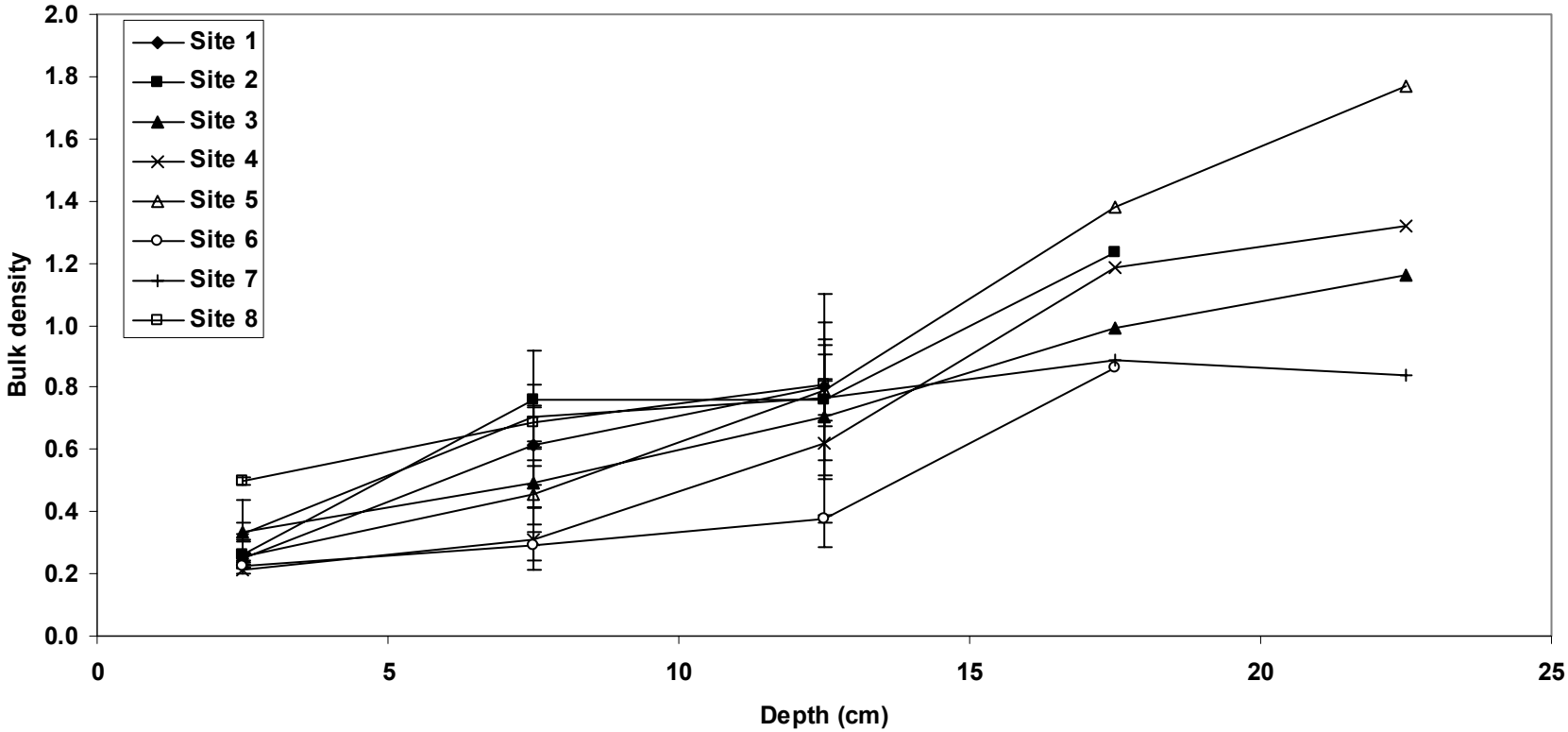

Figure 3. Loss on ignition (LOI) for sampling sites at Poldean Farm