AUTOMATIC DATA COLLECTION
EXPERIENCE IN FIELD CROP-ENVIRONMENT STUDIES

C. W. ROSE*

Summary
This paper is one of a group dealing with the ‘systems approach’ to agricultural research. It describes a user’s experience of automatic data collection, data checking and analysis with a system based on punched paper tape.

I. INTRODUCTION
Using micrometeorological profile techniques to measure energy, water, and carbon dioxide fluxes between a crop and the atmosphere requires the measurement of at least five environmental parameters, at two or more heights, and possibly at more than one site. Frequent measurement (approximately each 10 minutes) is made necessary by the need to evaluate mean values of these fluctuating quantities. This note is based on experience with such techniques at a remote site (Katherine, Northern Territory).

II. EQUIPMENT
The arrangement of the data logging system that was used is shown in Figure 1 (Byrne et al., 1971). The millivolt output of sensors measuring environmental variables were scanned sequentially, measured by a digital voltmeter, and recorded on paper tape. This recording medium has survived despite predictions that it would, by now, be superseded almost completely by magnetic tape. One reason for this is the ready availability of equipment for listing a punched tape record — such as the Flexowriter used for on-site checking (Figure 1). The growing advantages of magnetic tape, especially for unattended remote logging are evident. It is most worthwhile trying to achieve the highest standards in whatever medium one is logging, since the time taken in the painstaking and tedious job of correcting faults can be large for an appreciable body of data. This is especially true if a considerable number of field sensors are used. In this case the maintenance load associated with them is likely to be greater than with the data logging system itself.

III. DATA
We have found it most useful to record the data in telex code. In this way samples of the data can be sent directly to the base and so to the computer. Provided checking and analysis programmes are ready, and there are no problems of tape acceptance by the tape reader at the computing centre, then a within-daily turn around to a field centre in telex communication with a computing centre is

*CSIRO, Division of Land Research, Canberra, Australian Capital Territory, 2601.
Fig. 1.—The systems concept, from sampling the field environment through measurement and recording, to data checking and analysis.
possible. We have found this degree of interaction between logging, checking and
analysis to be most desirable, and to lead to a better and more efficient experi-
mental programme.

Data logging makes possible the collection of a much larger volume of data
than would otherwise be possible. It should be appreciated that often the effort
involved in checking that the data is all correct may be comparable with work on
the final analysis. Especially when dealing with spatial profiles of data,
such as net radiation or humidity, which we expect to change monotonically
through a crop, we have found visual inspection of graphical display on the
line printer to be a most efficient and sensitive method of checking data. The kink
in Figure 2 is evidence that a wet-bulb used to measure humidity has partially dried
out.

Fig. 2.—Example of use of line printer output for visual checking of data from
a number of transducers set at particular heights. Data from five successive scans
is shown (Drawn from computer line printer output.)

If a project involves appreciable data logging a programmer should be asso-
ciated with the team from the beginning of the project. The programmer’s job will
be to ensure that suitable programmes for data conversion and checking are opera-
tional before the data collection programme commences.
IV. REFERENCE