

GRASS AND FORAGE SCIENCE

The Journal of the British Grassland Society

Edited by Dr A. Younger *Department of Agriculture, The University, Newcastle upon Tyne NE1 7RU, UK*

Grass and Forage Science publishes the results of research and development in all aspects of grass forage production, management and utilization, occasional reviews of the state of knowledge on relevant topics, and book reviews. Although the main emphasis is on temperate regions, papers relating to other regions are published if they report results which have a wider application than to the region in which the experiments were carried out. *Grass and Forage Science* is now the

foremost organ for the publication of scientific results relating to cultivated temperate grasslands.

Subscription Information

Grass and Forage Science is published quarterly. Subscription rates for 1991 are £79.50 (UK), £89.00 (overseas) and US\$162.50 (USA & Canada) post free.

Order Form

Please tick the appropriate box and return to the address below:

- I would like to subscribe to *Grass and Forage Science*
- I wish to pay by cheque and enclose the sum of £ _____ US\$ _____
- I wish to pay by Access / American Express / Barclaycard / Diners Card / VISA / Mastercard (delete as necessary)

Please debit my credit card no.

Expiry date / / with the sum of £ _____ US\$ _____

Signature _____ Date / /

- Please send me a specimen copy of *Grass and Forage Science*

Name _____

Address _____

BSP

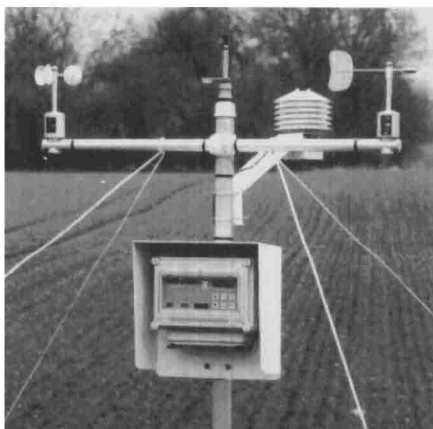
- JOURNALS -

Blackwell Scientific Publications

Osney Mead, Oxford OX2 0EL Tel: (0865) 240201

DELTA-T WEATHER STATION

A complete system of instrumentation for automatically measuring and recording the weather at remote sites.



Standard sensors measure:

- air temperature
- rainfall
- relative humidity
- soil temperature
- solar radiation
- wind direction
- wind speed

- * Memory expandable from 16k to 128k readings
- * User-defined recording
- * Typically 12 months battery life
- * On-site checks using LCD on control panel
- * Remote interrogation via RS232 link

Description All sensors are mounted on a 2m mast, except for the soil temperature probe and the raingauge. An environmental data logger (the Delta Logger) initiates readings, controls the sensors and stores data.

Data collection Stored readings can be collected with a portable computer or printer without interrupting logging.

Programmable The user has independent control over each

sensor to define: sampling interval, valid reading range, engineering units (eg mm of rainfall), and data compression. These are specified using a personal computer.

Special requirements We are able to supply part-systems and non-standard combinations of sensors, (the Logger is expandable and can accept up to 60 analogue/counter inputs). Further information, advice or a quotation will be provided on request.



DELTA-T DEVICES LTD.
128 Low Road, Burwell, Cambridge CB5 0EJ
Telephone: 0638 742922 Fax: 0638 743155
Telex: 817670 ASABSE G *ATTN DELTA-T*

We also supply: Solar and Thermal Radiation Sensors, Psychrometers, Integrators, Area Measurement Systems and Porometers

The Journal of Agricultural Science

SENIOR EDITOR

W. J. Whittington

EDITORIAL ASSISTANT

N. Boston

*Journal of Agricultural Science, University of Nottingham, School of Agriculture,
Sutton Bonington, Loughborough, Leicestershire LE12 5RD*

EDITORIAL BOARD

E. J. Allen
University of Cambridge, UK

B. W. Bache
University of Cambridge, UK

J. Davis
*Plant Breeding International,
Cambridge, UK*

W. Day
*AFRC Institute of
Engineering Research,
Silsoe, UK*

R. H. Ellis
University of Reading, UK

M. F. Fuller
*Rowett Research Institute,
Aberdeen, UK*

K. E. Giller
Wye College, UK

J. C. Gower
*University of Leiden,
The Netherlands*

J. R. Hillman
*Scottish Crop Research
Institute, Dundee, UK*

A. E. Johnston
*AFRC Institute of Arable
Crops Research,
Rothamsted, UK*

R. N. B. Kay
Aberdeen, UK

C. N. Law
*Cambridge Laboratory,
JI Centre for Plant Science
Research, Norwich, UK*

R. W. Matthewman
University of Edinburgh, UK

T. R. Morris
University of Reading, UK

J. B. Owen
*University College of
North Wales, Bangor, UK*

M. Peaker
*Hannah Research
Institute, Ayr, UK*

C. J. Pollock
*Welsh Plant Breeding
Station, Aberystwyth, UK*

D. A. Preece
*University of Kent,
Canterbury, UK*

T. J. Riggs
*Horticulture Research
International,
Wellesbourne, UK*

P. E. Russell
*Chesterford Park
Research Station,
Saffron Walden, UK*

R. K. Scott
*University of Nottingham,
Sutton Bonington, UK*

D. E. Walters
University of Cambridge, UK

D. Wilman
*University College of
Wales, Aberystwyth, UK*

INTERNATIONAL CONSULTANTS

P. Day
*Rutgers University of
New Jersey, New
Brunswick, USA*

D. B. Lindsay
*Tropical Cattle Research
Centre, Rockhampton,
Australia*

G. M. O. Maloiy
*University of Nairobi,
Kenya*

J. L. Monteith
*International Crops
Research Institute,
Patancheru, India*

S. K. Sinha
*Indian Agricultural
Research Institute,
New Delhi, India*

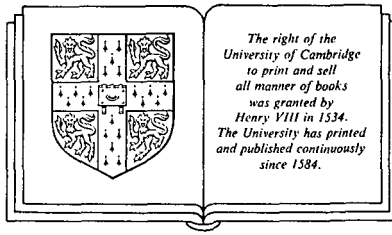
VOLUME 117

CAMBRIDGE UNIVERSITY PRESS

Cambridge

New York Port Chester Melbourne Sydney

1991



PUBLISHED BY
THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE

The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, Victoria 3166, Australia

© Cambridge University Press 1991

Printed in Great Britain by the University Press, Cambridge

CONTENTS

PART I (AUGUST 1991)

	PAGE
Instructions to Authors	
REVIEW	
THOMAS, H. AND HUMPHREYS, M. O. Progress and potential of interspecific hybrids of <i>Lolium</i> and <i>Festuca</i>	1
CROPS AND SOILS	
WEBB, J., FROMENT, M. AND SYLVESTER-BRADLEY, R. Effects of cultivation and nitrification inhibitor on soil nitrogen availability after a grass ley and on the response of the following cereal crop to fertilizer nitrogen	9
WILLIAMS, E. D. AND HAYES, M. J. Growing spring cereals in a white clover (<i>Trifolium repens</i>) crop	23
GARCIA DEL MORAL, M. B., JIMINEZ TEJADA, M. P., GARCIA DEL MORAL, L. F., RAMOS, J. M., ROCA DE TOGORES, F. AND MOLINA-CANO, J. L. Apex and ear development in relation to the number of grains on the main-stem ears in spring barley (<i>Hordeum distichon</i>)	39
WILMAN, D., FISHER, A. AND MARSHALL, A. H. Effects of sowing a companion grass (<i>Lolium perenne</i>), application of grass suppressant and choice of clover variety on the growth and seed production potential of white clover	47
SUD, K. C. AND TREHAN, S. P. Effect of thiourea on tuber yield of potatoes and uptake of phosphorus by tubers in the absence and presence of fertilizer phosphorus	57
FIRMAN, D. M., O'BRIEN, P. J. AND ALLEN, E. J. Leaf and flower initiation in potato (<i>Solanum tuberosum</i>) sprouts and stems in relation to number of nodes and tuber initiation	61
WILLIAMS, I. H., SIMPKINS, J. R. AND MARTIN, A. P. Effect of insect pollination on seed production in linseed (<i>Linum usitatissimum</i>)	75
ESENOWO, G. J. Studies on germination of <i>Adansonia digitata</i> seeds	81
XIA, M. Z. AND XIONG, F. Q. Interaction of molybdenum, phosphorus and potassium on yield in <i>Vicia faba</i>	85
SOMMER, S. G., OLESEN, J. E. AND CHRISTENSEN, B. T. Effects of temperature, wind speed and air humidity on ammonia volatilization from surface applied cattle slurry	91
JARVIS, S. C., HATCH, D. J., ORR, R. J. AND REYNOLDS, S. E. Micrometeorological studies of ammonia emission from sheep grazed swards	101
ANIMALS	
DOMINGUE, B. M. F., DELLOW, D. W. AND BARRY, T. N. Voluntary intake and rumen digestion of a low-quality roughage by goats and sheep	111
ALAM, M. R., POPPI, D. P. AND SYKES, A. R. Comparative energy and protein utilization in kids and lambs	121
ABSTRACTS	
Proceedings of the Twenty-First Meeting of the AFRC Modellers' Group	129
BOOK REVIEWS	135

Instructions to Authors	PAGE
REVIEW	
HAGGARTY, P. Potential of the doubly labelled water method for estimating heat production in farm animals	141
CROPS AND SOILS	
GOODING, M. J., KETTLEWELL, P. S. AND HOCKING, T. J. Effects of urea alone or with fungicide on the yield and breadmaking quality of wheat when sprayed at flag leaf and ear emergence	149
AGGARWAL, G. C. AND SEKHON, N. K. Changes induced by cowpea green manure and farmyard manure in the timing of phenological events in maize (<i>Zea mays</i>)	157
CUERO, R. G., DUFFUS, E., OSUJI, G. AND PETTIT, R. Aflatoxin control in preharvest maize: effects of chitosan and two microbial agents	165
NGEVE, J. M. Evaluation of the performance of sweet potato genotypes by joint regression analysis	171
RAO, M. S. S. AND MENDHAM, N. J. Comparison of chinoli (<i>Brassica campestris</i> subsp. <i>oleifera</i> × subsp. <i>chinensis</i>) and <i>B. napus</i> oilseed rape using different growth regulators, plant population densities and irrigation treatments	177
RAO, M. S. S., MENDHAM, N. J. AND BUZZA, G. C. Effect of the apetalous flower character on radiation distribution in the crop canopy, yield and its components in oilseed rape (<i>Brassica napus</i>)	189
RAO, M. S. S. AND MENDHAM, N. J. Soil-plant-water relations of oilseed rape (<i>Brassica napus</i> and <i>B. campestris</i>)	197
WILCOCKSON, S. J. AND ABUZEID, A. E. Growth of axillary buds of Brussels sprouts (<i>Brassica oleracea</i> var. <i>bullata</i> sub var. <i>gemmifera</i>)	207
ACOSTA-GALLEGOS, J. A. AND ADAMS, M. W. Plant traits and yield stability of dry bean (<i>Phaseolus vulgaris</i>) cultivars under drought stress	213
WITHERS, P. J. A. Removal of phosphorus and potassium from the soil in wheat and barley straw	221
BLESS, H.-G., BEINHAEUER, R. AND SATTELMACHER, B. Ammonia emission from slurry applied to wheat stubble and rape in North Germany	225
ASH, A. J. AND ELLIOTT, R. Tropical crop and crop by-product additives can improve the quality of taro leaf (<i>Colocasia esculenta</i>) silage	233
ADDISCOTT, T. M. AND DARBY, R. J. Relating the nitrogen fertilizer needs of winter wheat crops to the soil's mineral nitrogen. Influence of the downward movement of nitrate during winter and spring	241
ANIMALS	
NG'AMBI, J. W. W. AND CAMPLING, R. C. Effects of sodium hydroxide and of energy and protein supplements on the voluntary intake and digestibility of barley, oat and wheat straw by cattle	251
PHIPPS, R. H., MADAKADZE, C., MUTSVANGWA, T., HARD, D. L. AND DE KERCHOVE, G. Use of bovine somatotropin in the tropics: the effect of sometribove on milk production of <i>Bos indicus</i> , dairy crossbred and <i>Bos taurus</i> cows in Zimbabwe	257
OSUAGWUH, A. I. A. Influence of doe age on incidence of multiple births and perinatal reproductive wastage in West African Dwarf goats	265
RITAR, A. J. AND BALL, P. D. Fertility of young Cashmere goats after laparoscopic insemination	271
BOOK REVIEWS	275

PART 3 (DECEMBER 1991)

Instructions to Authors	PAGE
CROPS AND SOILS	
WALKER, K. C. AND MATTHEWS, S. Effect of autumn nitrogen on the growth and yield of winter barley in the north of Scotland	279
JENKYN, J. F., GUTTERIDGE, R. J. AND TODD, A. D. Effects of fungicides, applied in autumn, and a growth regulator, applied in spring, on the growth and yield of winter barley grown on contrasting soil types	287
BACHE, B. W. AND ROSS, J. A. M. Effect of phosphorus and aluminium in the response of spring barley to soil acidity	299
BLUM, A., GOLAN, G. AND MAYER, J. Progress achieved by breeding open-pollinated cultivars as compared with landraces of sorghum	307
SHARMA, A. R. AND MITTRA, B. N. Effect of different rates of application of organic and nitrogen fertilizers in a rice-based cropping system	313
REDDY, M. D., SHARMA, A. R. AND PANDA, M. M. Flood tolerance of rice grown under intermediate deepwater conditions (15–50 cm) as affected by phosphorus fertilization	319
RISI, J. AND GALWEY, N. W. Effects of sowing date and sowing rate on plant development and grain yield of quinoa (<i>Chenopodium quinoa</i>) in a temperate environment	325
ERSKINE, W., DIEKMANN, J., JEGATHEESWARAN, P., SALKINI, A., SAXENA, M. C., GHANAIM, A. AND EL ASHKAR, F. Evaluation of lentil harvest systems for different sowing methods and cultivars in Syria	333
MCKENZIE, B. A. AND HILL, G. D. Intercepted radiation and yield of lentils (<i>Lens culinaris</i>) in Canterbury, New Zealand	339
ASGHAR ALI, KEATINGE, J. D. H., ROIDAR KHAN, B. AND SARFRAZ AHMAD. Germplasm evaluation of dual-season lentil (<i>Lens culinaris</i>) lines for the arid highlands of west Asia	347
ANIMALS	
LAREDO, M. A., SIMPSON, G. D., MINSON, D. J. AND ORPIN, C. G. The potential for using n-alkanes in tropical forages as a marker for the determination of dry matter by grazing ruminants	355
LOPEZ, S., CARRO, M. D., GONZALEZ, J. S. AND OVEJERO, F. J. Rumen degradation of the main forage species harvested from permanent mountain meadows in North-western Spain	363
GRAHAM, N. MCC., SEARLE, T. W., MARGAN, D. E., SPENCE, F. B. AND WYNN, P. C. Physiological state of sheep before and during fattening	371
ABSTRACTS	
Modelling Agriculture Under Pressure	381
BOOK REVIEWS	
	385
INDEX	
	389

Copying. No contents may be reproduced by any means without the permission of Cambridge University Press. This journal is registered with the Copyright Clearance Center, 27 Congress Street, Salem, MA 01970. Organizations in the USA who are also registered with the C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per-copy fee of \$5.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0021-8596/91 \$5.00+0.00.

ISI Tear Sheet Service. 3501 Market Street, Philadelphia, PA 19106, USA, is authorized to supply single copies of separate articles for private use only.

For all other use, permission should be sought from Cambridge or the American Branch of Cambridge University Press.

CAMBRIDGE UNIVERSITY PRESS

The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, Victoria 3166, Australia

Printed in Great Britain by the University Press, Cambridge

CONTENTS

	PAGE
Instructions to Authors	
CROPS AND SOILS	
WALKER, K. C. and MATTHEWS, S. Effect of autumn nitrogen on the growth and yield of winter barley in the north of Scotland	279
JENKYN, J. F., GUTTERIDGE, R. J. and TODD, A. D. Effects of fungicides, applied in autumn, and a growth regulator, applied in spring, on the growth and yield of winter barley grown on contrasting soil types	287
BACHE, B. W. and ROSS J. A. M. Effect of phosphorus and aluminium in the response of spring barley to soil acidity	299
BLUM, A., GOLAN, G. and MAYER, J. Progress achieved by breeding open-pollinated cultivars as compared with landraces of sorghum	307
SHARMA, A. R. and MITTRA, B. N. Effect of different rates of application of organic and nitrogen fertilizers in a rice-based cropping system	313
REDDY, M. D., SHARMA, A. R. and PANDA, M. M. Flood tolerance of rice grown under intermediate deepwater conditions (15–50 cm) as affected by phosphorus fertilization	319
RISI, J. and GALWEY, N. W. Effects of sowing date and sowing rate on plant development and grain yield of quinoa (<i>Chenopodium quinoa</i>) in a temperate environment	325
RSKINE, W., DIEKMANN, J., JEGATHEESWARAN, P., SALKINI, A., SAXENA, M. C., GHANAIM, A. and EL ASHKAR, F. Evaluation of lentil harvest systems for different sowing methods and cultivars in Syria	333
MCKENZIE, B. A. and HILL, G. D. Intercepted radiation and yield of lentils (<i>Lens culinaris</i>) in Canterbury, New Zealand	339
ASGHAR ALI, KEATINGE, J. D. H., ROIDAR KHAN, B. and SARFRAZ AHMAD. Germplasm evaluation of dual-season lentil (<i>Lens culinaris</i>) lines for the arid highlands of west Asia	347
ANIMALS	
LAREDO, M. A., SIMPSON, G. D., MINSON, D. J. and ORPIN, C. G. The potential for using n-alkanes in tropical forages as a marker for the determination of dry matter by grazing ruminants	355
LOPEZ, S., CARRO, M. D., GONZALEZ, J. S. and OVEJERO, F. J. Rumen degradation of the main forage species harvested from permanent mountain meadows in North-western Spain	363
GRAHAM, N. MCC., SEARLE, T. W., MARGAN, D. E., SPENCE, F. B. and WYNN, P. C. Physiological state of sheep before and during fattening	371
ABSTRACTS	
Modelling Agriculture Under Pressure	381
BOOK REVIEWS	
	385
INDEX	
	389