# THE JOURNAL OF AGRICULTURAL SCIENCE

### EDITED BY

- G. D. H. BELL, C.B.E., PH.D., F.R.S., Plant Breeding Institute, Cambridge
- K. L. BLAXTER, Ph.D., N.D.A. (HONS.), D.SC., F.R.S.E., Rowett Research Institute, Bucksburn, Aberdeen
- G. W. COOKE, Ph.D., F.R.I.C., Rothamsted Experimental Station, Harpenden
- JOHN HAMMOND, Jr., M.A., School of Agriculture, Cambridge
- PROF. SIR J. B. HUTCHINSON, C.M.G., SC.D., F.R.S., School of Agriculture, Cambridge
- SIR BERNARD KEEN, D.SC., F.R.S., 72 Eaton Square, London, S.W.1
- H. L. PENMAN, O.B.E., PH.D., F.R.S., Rothamsted Experimental Station, Harpenden
- H. H. ROGERS, B.SC., DIP.AG.SCI., Plant Breeding Institute, Cambridge
- SIR E. JOHN RUSSELL, D.SC., F.R.S., Woodstock House, Woodstock, Oxon.
  - PROF. E. W. RUSSELL, C.M.G., PH.D., F.INST.P., Department of Soil Science, University of Reading
  - F. YATES, C.B.E., SC.D., F.R.S., Rothamsted Experimental Station, Harpenden

**VOLUME LXV 1965** 

CAMBRIDGE
AT THE UNIVERSITY PRESS
1965

# PUBLISHED BY THE SYNDICS OF THE CAMBRIDGE UNIVERSITY PRESS

Bentley House, 200 Euston Road, London, N.W.1. American Branch: 32 East 57th Street, New York, N.Y.10022

Printed in Great Britain at the University Printing Hovse, Cambridge (Brooke Crutchley, University Printer)

# **Contents**

Part 1 (August 1965)	PAGE
McRoberts, M. R., Hill, R. and Dalgarno, A. C. The effects of diets deficient in phosphorus, phosphorus and vitamin D, or calcium, on the skeleton and teeth of the growing sheep. I. The mineral status of the skeleton and clinical appearance of the teeth. (With Two Plates)	1
McRoberts, M. R., Hill, R. and Dalgarno, A. C. The effects of diets deficient in phosphorus, phosphorus and vitamin D, or calcium, on the skeleton and teeth of the growing sheep. II. Malocclusion of the teeth. (With Two Plates and Two Text-figures)	11
McRoberts, M. R., Hill, R. and Dalgarno, A. C. The effects of diets deficient in phosphorus, phosphorus and vitamin D, or calcium, on the skeleton and teeth of the growing sheep. III. The composition and structure of the teeth. (With One Plate)	15
McRoberts, M. R., Hill, R. and Dalgarno, A. C. The effects of diets deficient in phosphorus, phosphorus and vitamin D, or calcium, on the skeleton and teeth of the growing sheep. IV. The uptake of radioactive phosphorus by the bones and teeth	21
Arnold, M. H. The control of bacterial blight in rain-grown cotton. II. Some effects of infection on growth and yield. (With One Plate and Five Text-figures)	29
FORD, E. J. H. The effect of diet on glucose utilization by sheep	41
Widdowson, F. V., Penny, A. and Williams, R. J. B. Experiments comparing concentrated and dilute NPK fertilizers and four nitrogen fertilizers on a range of crops	45
Thwaites, C. J. Photoperiodic control of breeding activity in the Southdown ewe with particular reference to the effects of an equatorial light regime. (With Two Text-figures).	57
LAZENBY, A. and ROGERS, H. H. Selection criteria in grass breeding. IV. Effect of nitrogen and spacing on yield and its components. (With Seven Text-figures)	65
LAZENBY, A. and ROGERS, H. H. Selection criteria in grass breeding. V. Performance of Lolium perenne genotypes grown at different nitrogen levels and spacing. (With Two Text-figures).	79
Lang, R. W. and Holmes, J. C. The effect of plant population and distribution on the yield and quality of swedes. (With Five Text-figures)	91
Large, R. V. The artificial rearing of lambs. (With Two Plates and Three Text-figures) .	101
Reid, D. and Castle, M. E. The response of grass-clover and pure-grass leys to irrigation and fertilizer nitrogen treatment. II. Clover and fertilizer nitrogen effects. (With Five Text-figures).	109
JONES, D. J. C. The effects of advancing season on the chemical composition of marrow stem kale	121
Jones, L. H. P. and Handreck, K. A. The relation between the silica content of the diet and the excretion of silica by sheep	129
Salmon, R. C. Release of non-exchangeable potassium from some Rhodesian soils cropped with grass. (With Three Text-figures)	135

vi Contents

Part 2 (October 1965)	PAGI
Waring, J. J. and Brown, W. O. A respiration chamber for the study of energy utilization for maintenance and production in the laying hen. (With Two Text-figures)	139
KHANDEKAR, V. N., GOLDSTONE, C. L. and McManus, W. R. Some indices of the carcass composition of Dorset Horn Top Cross lambs. I. Measurements on the live body and carcass, the composition of sample joints and their relationship to carcass composition. (With One Text-figure)	147
KHANDEKAR, V. N., McManus, W. R. and Goldstone, C. L. Some indices of the carcass composition of Dorset Horn Top Cross lambs. II. Specific gravity as an index of the fat content of the carcass and of various joints. (With One Text-figure)	155
HANLEY, F., JARVIS, R. H. and RIDGMAN, W. J. The effects of fertilizers on the bulking of Majestic potatoes. (With Nine Text-figures)	159
Patterson, H. D. The factorial combination of treatments in rotation experiments	171
Doggett, H. Striga hermonthica on sorghum in East Africa. (With Three Text-figures) .	183
Widdowson, F. V. and Penny, A. Experiments measuring the residual effects of nitrogen fertilizers	195
BINGHAM, J and Jenkins, G. Techniques for assessing the cold resistance of cereals in the selection of hybrid material. (With One Plate and Two Text-figures)	201
TINKER, P. B. H. The effects of nitrogen, potassium and sodium fertilizers on sugar beet. (With Four Text-figures)	207
DAVIES, ALISON. Carbohydrate levels and regrowth in perennial rye-grass. (With Six Text-figures)	213
Sharafeldin, M. A. Wool characteristics of Iraqi Awassi sheep	223
BROSTER, W. H., SUTTON, J. D., TUCK, VALERIE J. and BALCH, C. C. The effect of the addition of large amounts of cod-liver oil to the rations of yearling heifers on their rate of live-weight gain. (With Two Text-figures)	227
BUTTERWORTH, M. H. Some aspects of the utilization of tropical forages. I. Green elephant grass at various stages of growth	233
DAVIES, B. E. and DAVIES, R. I. Changes in exchangeable cations and exchange capacity of soil consequent on oxidation of its organic matter.	241
HAWKINS, R. P. Factors affecting the yield of seed produced by different varieties of red clover	<b>24</b> 5
BUTTLE, H. R. L. and HANCOCK, J. L. Sterile boars with 'knobbed' spermatozoa. (With One Plate)	255
Ledger, H. P. The body and carcass composition of East African ruminants. I. The composition of 'Improved Boran' Bos indicus steer carcasses. (With Three Plates and Seven Text-figures)	261

Contents vii

Part 3 (December 1965)	PAGE
Wilson, D. Nutritive value and the genetic relationships of cellulose content and leaf tensile strength in <i>Lolium</i> . (With Four Text-figures)	285
WILMAN, DAVID. A note on drought-resistance in the lucerne plant	293
MURRAY, D. M. A field study of coat shedding in cattle under conditions of equal day-length but different temperatures. (With Two-Text-figures)	295
WILDMAN, A. B. The post-natal development of the follicle population in English Romney lambs. (With Five Text-figures)	301
Pearson, Lucia. An assessment of dairy bull station progeny tests carried out at two centres in Britain	315
DRYSDALE, A. D. Liquid manure as a grassland fertilizer. III. The effect of liquid manure on the yield and botanical composition of pasture, and its interaction with nitrogen, phosphate and potash fertilizers. (With Three Text-figures).	333
Begg, J. E. The growth and development of a crop of bulrush millet ( <i>Pennisetum typhoides</i> S. & H.). (With Five Text-figures)	341
STILES, W. and WILLIAMS, T. E. The response of a rye-grass/white clover sward to various irrigation régimes. (With Five Text-figures)	351
STODDART, J. L. Post-harvest changes in seed of Lolium species. (With Two Text-figures) .	365
RICKARD, M. D. and TERNOUTH, J. H. The effects of the increased dietary volatile fatty acids on the morphological and physiological development of lambs with particular reference to the rumen. (With Four Plates and Three Text-figures)	371
BEVERIDGE, J L., JARVIS, R. H. and RIDGMAN, W. J. Studies on the nitrogenous manuring of winter wheat. (With Two Text-figures)	379
BUTTERWORTH, M. H. and BUTTERWORTH, JUANITA P. Some aspects of the utilization of tropical forages. 2. Pangola and coastal Bermuda hays	389
LAZENBY, ALEC and ROGERS, H. H. Selection criteria in grass breeding. VI. Effects of defoliation on plants growing in small plots in field and controlled environment conditions	397
Robinson, D. W. The protein and energy nutrition of the pig. V. The effect of varying the protein and energy levels in the 'finishing diets' of heavy pigs. (With Two Text-figures)	405
GRIEVE, C. M. and OSBOURN, D. E. The nutritional value of some tropical grasses	411

## CONTENTS

	PAGE
Wilson, D. Nutritive value and the genetic relationships of cellulose content and leaf tensile strength in <i>Lolium</i> . (With Four Text-figures)	285
WILMAN, DAVID. A note on drought-resistance in the lucerne plant	293
Murray, D. M. A field study of coat shedding in cattle under conditions of equal day-length but different temperatures. (With Two Text-figures)	295
WILDMAN, A. B. The post-natal development of the follicle population in English Romney lambs. (With Five Text-figures)	301
PEARSON, LUCIA. An assessment of dairy bull station progeny tests carried out at two centres in Britain	315
DRYSDALE, A. D. Liquid manure as a grassland fertilizer. III. The effect of liquid manure on the yield and botanical composition of pasture, and its interaction with nitrogen, phosphate and potash fertilizers. (With Three Text-figures)	333
Begg, J. E. The growth and development of a crop of bulrush millet ( <i>Pennisetum typhoides</i> S. & H.). (With Five Text-figures)	341
STILES, W. and WILLIAMS, T. E. The response of a rye-grass/white clover sward to various irrigation régimes. (With Five Text-figures)	351
STODDART, J. L. Post-harvest changes in seed of Lolium species. (With Two Text-figures) .	365
RICKARD, M. D. and TERNOUTH, J. H. The effect of the increased dietary volatile fatty acids on the morphological and physiological development of lambs with particular reference to the rumen. (With Four Plates and Three Text-figures)	371
Beveridge, J. L., Jarvis, R. H. and Ridgman, W. J. Studies on the nitrogenous manuring of winter wheat. (With Two Text-figures)	379
BUTTERWORTH, M. H. and BUTTERWORTH, JUANITA, P. Some aspects of the utilization of tropical forages. 2. Pangola and coastal Bermuda hays	389
LAZENBY, ALEC and ROGERS, H. H. Selection criteria in grass breeding. VI. Effects of defoliation on plants growing in small plots in field and controlled environment conditions.	397
ROBINSON, D. W. The protein and energy nutrition of the pig. V. The effect of varying the protein and energy levels in the 'finishing diets' of heavy pigs. (With Two Text-figures).	405
GRIEVE, C. M. and OSBOURN, D. F. The nutritional value of some tropical grasses	411

The Journal of Agricultural Science is issued every other month in parts of about 150 pages with plates and figures, three parts constituting a volume. Two volumes yearly.

Quotations for available back volumes and parts may be obtained on application to the Cambridge University Press.

Papers for publication should be typewritten or written in a very legible hand, and may be sent to Dr G. D. H. Bell, Plant Breeding Institute, Maris Lane, Trumpington, Cambridge, or to the Associate Editors. Other communications should be addressed to the University Press, Cambridge.

If Plates in excess of one per 24 pages of text or coloured plates are submitted the author may be asked to bear the cost of such Plates,

The lettering on text figures should be clear of the illustration and indicating by blue pencilled lines the desired position.

Bibliography should be given in the form of 'References' in the following form:

Surname of authors (in alphabetical order), initials, date of publication (in brackets), title of Journal (abbreviated according to the *World List of Scientific Periodicals*), volume and page of reference. In the text a reference should be quoted by the author's name and date (in brackets).

All names of Journals and books are set in italics; they should be indicated on the typescript by underlining. Contributors will receive twenty-five copies of their papers free.

The subsciption price, payable in advance, is 75s. net per volume (post free); single numbers 32s. 6d. net. Subscriptions may be sent to any bookseller, or to The Cambridge University Press, Bentley House, 200 Euston Road, London, N.W. 1.

Subscription price in the U.S.A. is \$13.50 per volume; single numbers \$5.50. Enquiries should be addressed to the Cambridge University Press, American Branch, 32 East 57th Street, New York, N.Y. 10022.