

THE JOURNAL OF AGRICULTURAL SCIENCE

EDITED BY

G. D. H. BELL, B.SC., PH.D., Plant Breeding Institute, Cambridge

R. E. EVANS, M.SC., PH.D., School of Agriculture, Cambridge

J. HAMMOND, C.B.E., M.A., D.SC., F.R.S., School of Agriculture, Cambridge

SIR BERNARD KEEN, D.SC., F.R.S., 72 Eaton Square, London, S.W. 1

SIR E. JOHN RUSSELL, D.SC., F.R.S., Campsfield Wood, Woodstock, Oxon.

E. W. RUSSELL, M.A., PH.D., F.INST.P., East African Agriculture and Forestry
Research Organisation, P.O. Box 21, Kikuyu, Kenya

R. K. SCHOFIELD, D.SC., F.INST.P., Department of Agriculture, Oxford

F. YATES, SC.D., F.R.S., Rothamsted Experimental Station, Harpenden

VOLUME LIII 1959

CAMBRIDGE
AT THE UNIVERSITY PRESS
1959

*Printed in Great Britain at the University Press, Cambridge
(Brooke Crutchley, University Printer)
and published by the Cambridge University Press
Bentley House, 200 Euston Road, London, N.W. 1
American Branch: 32 East 57th Street, New York 22, N.Y.
Agent in Canada: The Macmillan Company of Canada Limited*

CONTENTS

PART I (AUGUST 1959)

	PAGE
FREE, J. B. The effect of moving colonies of honeybees to new sites on their subsequent foraging behaviour (With Four Text-figures)	1
WIDDOWSON, F. V., PENNY, A., WILLIAMS, R. J. B. and COOKE, G. W. Comparisons between combine-drilling and broadcasting muriate of potash for spring barley	10
WIDDOWSON, F. V. The effects of nitrogen upon three stiff-strawed wheat varieties. (With One Text-figure)	17
OYENUGA, V. A. Effect of frequency of cutting on the yield and composition of some fodder grasses in Nigeria (<i>Pennisetum purpureum</i> Schum.) (With Six Text-figures)	25
ANNISON, E. F., LEWIS, D. and LINDSAY, D. B. The metabolic changes which occur in sheep transferred to lush spring grass. I. Changes in blood and rumen constituents. (With Nine Text-figures)	34
ANNISON, E. F., LEWIS, D. and LINDSAY, D. B. The metabolic changes which occur in sheep transferred to lush spring pastures. II. Changes in the acid-base balance of the whole animal. (With Five Text-figures)	42
COOKE, G. W. and WIDDOWSON, F. V. Field experiments on phosphate fertilizers. A joint investigation	46
HARRINGTON, G. and POMEROY, R. W. The yields of wholesale cuts from carcasses of Aberdeen-Angus crosses fattened on grass and in yards. (With Four Text-figures) . .	64
BROOKES, A. J. and HODGES, JOHN. Studies in beef production. I. The effects of level of feeding and of breed on the growth and fattening of spring born cattle. (With Plates 1 and 2)	78
LARGE, R. V., ALDER, F. E. and SPEDDING, C. R. W. Winter feeding of the in-lamb ewe. (With Seven Text-figures)	102
MOUNIB, M. S. and EVANS, J. V. The effect of potassium type and breed on the dry-matter percentage and specific gravity of the red blood cells and plasma of sheep. (With Four Text-figures)	118
LUCAS, I. A. M., CALDER, A. F. C. and SMITH, H. The early weaning of pigs, IV. Comparisons of levels of antibiotic and sources of protein in diets for pigs weaned at 9 lb. live weight	125
CALDER, A. F. C., LODGE, G. A. and BLAIR, R. The early weaning of pigs. V. The inclusion of digestive enzymes and antibiotics in diets for pigs weaned at 6-7 lb. live weight. (With One Text-figure)	130
LUCAS, I. A. M., CALDER, A. F. C. and SMITH, H. The early weaning of pigs. VI. The effects of early weaning and of various growths curves before 50 lb. live weight upon subsequent performance and carcass quality. (With Five Text-figures)	136

PART 2 (OCTOBER 1959)

	PAGE
LANGER, R. M. H. and RYLE, G. J. A. The effect of time of sowing on flowering and fertile tiller production in S. 48 timothy. (With Two Text-figures)	145
JONES, D. J. C. Studies of the chemical composition of kales and rapes. III. The minor elements	151
KING, J. W. B., WATSON, J. H. and YOUNG, G. B. Genotype-environment interactions in the wintering of lambs. (With Two Text-figures)	156
LODGE, G. A. Nitrogen metabolism in the lactating sow (With One Text-figure)	172
LODGE, G. A. The energy requirements of lactating sows and the influence of level of food intake upon milk production and reproductive performance. (With Six Text-figures)	177
WALKER, D. M. The <i>in vitro</i> digestion of roughage dry matter (With One Text-figure)	192
EVANS, G. C. The design of equipment for producing accurate control of artificial aerial environments at low cost (With Three Text-figures)	198
SLEE, JOHN. Fleece shedding, staple length and fleece weight in experimental Wiltshire Horn-Scottish Blackface sheep crosses (With Plate 3 and Three Text-figures).	209
RAVEN, A. M. and THOMPSON A. The availability of iron in certain grass, clover and herb species. II. Alsike, broad red clover, Kent wild white clover, trefoil and lucerne. (With One Text-figure)	224
EVANS, R. E. The minimum amount of white-fish meal required to supplement the proteins in some vegetable-protein concentrates	230
HUGHES, A. P. Plant growth in controlled environments as an adjunct to field studies. Experimental application and results. (With Five Text-figures)	247
ZALESKI, A. Lucerne investigations. IV. Effect of germination and seed rates on establishment, mortality and yield of dry matter and protein per acre. (With Two Text-figures)	260
DAVIES, R. O., JONES, D. I. H. and MILTON, W. E. J. Factors influencing the composition and nutritive value of herbage from fescue and <i>Molinia</i> areas. (With Six Text-figures)	268
MANTON, V. J. A. The relationship between fertility in the bovine and impedance change frequency. (With Three Text-figures)	286

PART 3 (DECEMBER 1959)

WALKER, H. F. The digestibility of oat hay	289
WAHHAB, A. Effect of rate and method of application of ammonium sulphate on irrigated wheat sown on three different dates. (With Two Text-figures)	296
REID, D. Studies on the cutting management of grass-clover swards. I. The effect of varying the closeness of cutting on the yields from an established grass-clover sward. (With Two Text-figures)	299

Contents

v

	PAGE
HANCOCK, J. L. Semen and testis characteristics and sexual behaviour of boars. (With Plates 4 and 5 and Four Text-figures)	313
CORNFIELD, A. H. Metabolism of nitrogen during long-term incubation of soil treated with fresh and rotted organic materials. (With One Text-figure)	327
ROOK, J. A. F. and DAMPLING, R. C. A note on the use of molassed wood pulp as a substitute for farm roughages in experimental rations for dairy cattle. (With Plate 6 and One Text-figure)	330
JAMESON, H. R. Liquid nitrogenous fertilizers. (With Plate 7)	333
HAFEZ, E. S. E., ENSMINGER, M. E. and HAM, W. E. Morphological and physico-chemical studies on dwarf Herefords. (With Plates 8-10 and Three Text-figures)	339
WILLIAMS, WATKIN. The isolation of 'pure lines' from F_1 hybrids of tomato, and the problem of heterosis in inbreeding crop species. (With Three Text-figures)	347
O'CONNOR, L. K. and SMITH, G. F. The comparative fertility of bovine semen of four ages diluted with skim-milk and skim-milk + glycerol. (With One Text-figure)	354
TIBBITS, JANET P. Post-natal growth changes in the fibre cortex and medulla of the New Zealand Romney and <i>N</i> -type sheep. (With Four Text-figures)	358
GODFREY, N. W. and TRIBE, D. E. The effect of thyroxine implantation on wool growth. (With Two Text-figures)	369
WALKER, D. M. The development of the digestive system of the young animal. III. Carbohy-drase enzyme development in the young lamb. (With Five Text-figures)	374
WALKER, D. M. The development of the digestive system of the young animal. IV. Proteo-lytic enzyme development in the young lamb. (With Five Text-figures)	381
DRAYNER, JEAN M. Self- and cross-fertility in field beans (<i>Vicia faba</i> Linn.) (With Plate 11 and Three Text-figures)	387
CALLOW, E. H. and FINNEY, D. J. Some effects of implanted hexoestrol on the growth of steers	404
GLOVER, J. The apparent behaviour of maize and sorghum stomata during and after drought. (With Three Text-figures)	412
CHAMBERS, D. T. Grazing behaviour of calves reared at pasture (With Three Text-figures)	417

CONTENTS

	PAGE
WALKER, H. F. The digestibility of oat hay	289
WAHHAB, A. Effect of rate and method of application of ammonium sulphate on irrigated wheat sown on three different dates. (With Two Text-figures)	296
REID, D. Studies on the cutting management of grass-clover swards. I. The effect of varying the closeness of cutting on the yields from an established grass-clover sward. (With Two Text-figures)	299
HANCOCK, J. L. Semen and testis characteristics and sexual behaviour of boars. (With Plates 4 and 5 and Four Text-figures)	313
CORNFIELD, A. H. Metabolism of nitrogen during long-term incubation of soil treated with fresh and rotted organic materials. (With One Text-figure)	327
ROOK, J. A. F. and DAMPLING, R. C. A note on the use of molassed wood pulp as a substitute for farm roughages in experimental rations for dairy cattle. (With Plate 6 and One Text-figure)	330
JAMESON, H. R. Liquid nitrogenous fertilizers. (With Plate 7)	333
HAFEZ, E. S. E., ENSMINGER, M. E. and HAM, W. E. Morphological and physico-chemical studies on dwarf Herefords. (With Plates 8-10 and Three Text-figures)	339
WILLIAMS, WATKIN. The isolation of 'pure lines' from F_1 hybrids of tomato, and the problem of heterosis in inbreeding crop species. (With Three Text-figures)	347
O'CONNOR, L. K. and SMITH, G. F. The comparative fertility of bovine semen of four ages diluted with skim-milk and skim-milk + glycerol. (With One Text-figure)	354
TIBBITS, JANET P. Post-natal growth changes in the fibre cortex and medulla of the New Zealand Romney and <i>N</i> -type sheep. (With Four Text-figures)	358
GODFREY, N. W. and TRIBE, D. E. The effect of thyroxine implantation on wool growth. (With Two Text-figures)	369
WALKER, D. M. The development of the digestive system of the young animal. III. Carbohydrase enzyme development in the young lamb. (With Five Text-figures)	374
WALKER, D. M. The development of the digestive system of the young animal. IV. Proteolytic enzyme development in the young lamb. (With Five Text-figures)	381
DRAYNER, JEAN M. Self- and cross-fertility in field beans (<i>Vicia faba</i> Linn.) (With Plate 11 and Three Text-figures)	387
CALLOW, E. H. and FINNEY, D. J. Some effects of implanted hexoestrol on the growth of steers	404
GLOVER, J. The apparent behaviour of maize and sorghum stomata during and after drought. (With Three Text-figures)	412
CHAMBERS, D. T. Grazing behaviour of calves reared at pasture (With Three Text-figures)	417

The Journal of Agricultural Science is issued every other month in parts of about 136 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 J. HAMMOND, School of Agriculture, 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.

Bibliography should be given under the heading 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 should be in italics.

Contributors will receive twenty-five copies of their papers free.

The subscription price, payable in advance, is 60s. net per volume (post free); single numbers 25s. 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 \$10.00 per volume; single number \$4.25. Enquiries should be addressed to the Cambridge University Press, American Branch, 32 East 57th Street, New York 22, N.Y.

*Printed in Great Britain at the University Press, Cambridge
(Brooke Crutchley, University Printer)*