ANIMAL PRODUCTION



JOURNAL OF THE BRITISH SOCIETY OF ANIMAL PRODUCTION

MAY 1969

VOL. 11 PART 2

OLIVER & BOYD LTD EDINBURGH

INFORMATION FOR CONTRIBUTORS TO ANIMAL PRODUCTION

Animal Production publishes papers on original research provided that they have not been and, with the exception of authors' summaries, will not be published elsewhere without the Editors' written permission. Authors' summaries can be reproduced if full acknowledgement of the source is made. Contributions may be in the field of animal production, or in any related scientific field. Reports on techniques will be published only as appendices to scientific papers. Results of research which do not warrant a comprehensive presentation may be submitted for consideration as Notes. Notes are not intended for the publication of interim results. They should not

Manuscripts should be typewritten in double spacing with wide margins. Each page and the lines on each page should be numbered. Two copies of the typescript (one of illustrations) should be sent to

exceed 2000 words or the equivalent inclusive of tables and illustrations.

Dr. Gerald Wiener, Animal Production, A.R.C. Animal Breeding Research Organisation, West Mains Road, Edinburgh 9.

Manuscripts are not returned with proofs; authors should therefore retain copies.

For guidance to the general style which should be adopted in the writing and presentation of papers authors are referred to General Notes on the Presentation of Scientific Papers (2nd revised ed., 1965) published by the Royal Society, London (price 5s.). Points of detail applying particularly to Animal Production are given below.

Units of Measurement. Metric units should be used whenever possible and exclusively for papers published from 1971 onward. (Exception may be made for papers in series started prior to 1970.)

Illustrations. The same material should not normally be presented in tables and figures. Legends should be typed on a separate sheet.

- (a) Diagrams should be drawn in Indian ink, about twice the size of the finished block, on Bristol board or stout tracing paper. Photographed diagrams are also accepted. Lettering inside the framework of the diagram should be inserted in Indian ink. Marginal lettering may, if preferred, be inserted lightly in pencil.
- (b) Photographs intended for half-tone reproduction should be on glossy paper. They will be accepted only if found necessary by the Editors.
- (c) Colour plates are unlikely to be accepted unless authors bear the cost. [Continued on inside back cover

Single number, 25s. or \$4.00 net.

Annual subscription, 90s. or \$14.00

Front cover centrepiece: Egyptian illustration (about 600 B.C.) of a domesticated plg guarded by monkeys on a boat (after Keller). Zeuner (1963) stated that the fat but bristly pig with its slender snout resembles the medieval

The British Veterinary Journal

A monthly review of veterinary science

Editor: J. A. Laing

The September 1968 issue includes:

- J. S. Boyd: Radiographic Appearance of the Centres of Ossification of the Limb Bones in the Feline Foetus.
- R. G. Dalton: Renal Function in Neonatal Calves-Diureses.
- E. A. Wells, W. H. R. Lumsden and Gillian J. C. McNeillage: Isolation of Trypanosomes of the Section Stercoraria from Cattle in Nigeria and the United Kingdom.
- M. W. Wright and Penelope E. Pelham: Prevention of Post-dipping Lameness in Sheep: A Laboratory Method for the Evaluation of Dip Bacteriostats.
- N. E. Downey: Re-infestation Experiments with Ostertagia circumcincta in Lambs.
- W. D. Tavernor, L. C. Vaughan, H. L. L. Williams and R. Hill: Partial Thyroidectomy and Its Effects on the Breeding Ewe.

Annual Subscription 120s

Available from

Bailliere, Tindall & Cassell 7 & 8 Henrietta Street, London W.C.2

The Indian Journal of Veterinary Science and Animal Husbandry

This quarterly, now in its 38th year of publication, presents articles reporting the original research work on diseases of animals, their husbandry and related subjects conducted primarily in India and in other countries

Single Copy 3s. 6d. \$0.45

Annual Subscription 14s. \$1.75

Copies Available with

The Business Manager, Indian Council of Agricultural Research, Krishi Bhayan, New Delhi 1.

Do YOU know the developments taking place in the world's dairying centres?

DAIRY SCIENCE ABSTRACTS

compiled from world literature by the

COMMONWEALTH BUREAU OF DAIRY SCIENCE AND TECHNOLOGY SHINFIELD · READING · ENGLAND

brings that knowledge to the dairy scientist and technologist. Every month in its review articles and its abstracts will be found information on research and development reported in all branches of dairying throughout the world.

Annual subscriptton: 110s, to subscribers in the Commonwealth and the Republic of Ireland whose governments contribute to the Commonwealth Agricultural Bureaux.

210s, to subscribers in non-contributing countries.

Order it through your bookseller or direct from

COMMONWEALTH AGRICULTURAL BUREAUX CENTRAL SALES BRANCH FARNHAM ROYAL · SLOUGH · ENGLAND

Index Veterinarius

A COMPLETE BIBLIOGRAPHY OF VETERINARY LITERATURE

This subject and author index of current literature on veterinary and related sciences is produced by the Commonwealth Bureau of Animal Health and was first published in 1933. It is issued quarterly and each year about 15,000 references are listed.

For compilation of the *Index* 700 periodicals in 22 languages are searched and coverage embraces the whole world.

Annual subscription is 300s. (\$39) (reduced rate to residents in British Commonwealth or Republic of Ireland—140s.). Orders may be sent to the Central Sales Branch, Commonwealth Agricultural Bureaux, Farnham Royal, Slough, Bucks.

ANIMAL BREEDING ABSTRACTS

is such an invaluable guide to the latest literature on livestock breeding and production that we can hardly believe you have not heard of it (110s. annually, or 210s. if you live outside the British Commonwealth or the Republic of Ireland) BUT do you know about our

ANNOTATED BIBLIOGRAPHIES

Nui	mber Subject	Period covered	Number of References	Price
81	The Limousin breed of cattle	1958-67	17	6s.
82	Meat and milk production in the goat	1938-66	72	21s.
83	Game ranching	1961-68	50	15s.
84	The performance of Africander cattle	1950-66	32	9s.
85	Guinea fowl. Breeding and management	1947-68	23	6s.
86	Reproduction in Bos indicus	1948-68	115	30s.
87	The effect of castration on growth rate of lambs	1959-68	37	9s.
88	The relation between gestation length of sows and size and viability of the litter	1942-68	11	6s.
89	Freezing of ram semen	1958-68	39	9s.
90	The effects of nutrition on semen quality	1952-67	46	12s.
91	Synchronisation of œstrus in cattle, sheep and goats	1953-68	236	42s.
92	Blood groups of cattle	1949-68	135	35s.
93	Body measurements in dairy cattle	1951-68	173	40s.
94	Population size and inbreeding	1954-67	23	6s.
95	Fertility in beef cattle (excluding papers on synchronised oestrus)	1957-68	94	27s.
96	Twinning in cattle, natural and induced (replacing No. 49)	1939-68	74	21s.
97	The performance and productivity of 20 European breeds of sheep	1954-68	150	45s.
98	The performance of 10 breeds of cattle for beef production	1958-68	203	45s.
99	Polymorphic proteins in the blood of domestic ruminants	1961-68	65	18s.

These are duplicates of bibliographies prepared on request at the Commonwealth Bureau of Animal Breeding and Genetics, Edinburgh. In addition to the full title reference, the abstract published in *Animal Breeding Abstracts* is reproduced. They can be obtained on application to the Director of the Bureau, The King's Buildings, West Mains Road, Edinburgh, 9. The prices quoted include postage by ordinary mail, and the remittance should be sent with the order *unless you want it posted by air mail*. If the material is to be sent by air mail, do not send money with your request. You will receive an invoice which includes air mail postage.

Experimental Agriculture

Volume 5, Number 2, April 1969

- P. C. OWEN The growth of four rice varieties as affected by temperature and photoperiod with uniform daily periods of daylight
- A. R. BROMFIELD Uptake of phosphorus and other nutrients by maize in Western Nigeria
- P. C. OWEN Comparative potential yields of rice varieties in the Australian Tropics
- O. L. OKE Sulphur nutrition of legumes
- K. C. ANANTH Timing and frequency of spraying for control of coffee leaf rust in Southern India
- H. K. PANDE AND PANJAB SINGH Effects of moisture and nitrogen on growth, yield and mineral content of rice
- R. W. SMITH Fertilizer responses by coconuts (Cocos nucifera) on two contrasting Jamaican soils
- ABDALLA AHMED ABDALLA Effects of planting date and spacing on yields of onion seed under hot arid conditions in the Sudan
- D. A. HOLLAND Component analysis: an aid to the interpretation of data BOOK REVIEWS

35s. net (\$5.00). Annual subscription £5 net (\$16.50) for four issues.

CAMBRIDGE UNIVERSITY PRESS

The Journal of Agricultural Science

Vol. 72, Part 2, April 1969

Articles include

- J. E. JACKSON Cotton crop environment, growth and yield in the Sudan Gezira. I. The Gezira observation plots: experimental design, cultural methods and yield analysis

 J. E. JACKSON Cotton crop environment, growth and yield in the Sudan Gezira. II. The causes of
- variation in yield from year to year
- MAURICE EDDOWES Physiological studies of competition in Zea mays L. I. Vegetative growth and ear development in maize
- MAURICE EDDOWES Physiological studies of competition in Zea mays L. II. Effect of competition among maize plants

 MAURICE EDDOWES Physiological studies of competition in Zea mays L. III. Competition in maize
- and its practical implications for forage maire production R. H. DAVIS AND D. LEWIS The digestibility of fats differing in glyceride structure and their effects on
- growth performance and carcass composition of bacon pigs
 J. F. D. GREENHALGH AND G. W. REID The effects of grazing intensity on herbage consumption and animal production. III. Dairy cows grazed at two intensities on clean or contaminated pasture
- W. H. BROSTER, VALERIE J. BROSTER AND T. SMITH Experiments on the nutrition of the dairy heifer.
 VIII. Effect on milk production of level of feeding at two stages of the lactation
 HIROKAZU SHIMIZU AND SABURO TAKEUCHI Effect of early weaning at about 30 days after farrowing on
- the reproductive characteristics in gilts and sows

 J. B. COOMBE AND G. K. PRESTON The effect of urea on the utilization of ground, pelleted roughage by penned sheep. I. Food intake, live-weight change and wool grown, pelleted roughage J. B. COOMBE AND K. R. CHRISTIAN The effect of urea on the utilization of ground, pelleted roughage
- by penned sheep. II. Utilization of organic matter, nitrogen and minerals

 C. F. EAGLES AND D. H. WILLIAMS Effect of environment on competitive ability of two natural populations of Dactylis glomerata L.

 P. M. BREMNER Effects of time and rate of nitrogen application on tillering, 'sharp eyespot' (Rhizoc-
- tonia solani) and yield in winter wheat
- P. M. BREMNER Growth and yield of three varieties of wheat, with particular reference to the influence of unproductive tillers

40s. net (\$6.00). Annual subscription L9 net (\$29.00) for six issues

CAMBRIDGE UNIVERSITY PRESS

The British Journal of Nutrition

Volume 23, Number 1, March 1969

- I. H. E. RUTISHAUSER AND R. G. WHITEHEAD Field evaluation of biochemical tests of nutritional status
- M. C. MACRAE AND D. G. ARMSTRONG Studies on intestinal digestion in the sheep
 M. R. LARSHMANAN, W. E. J. PHILLIPS AND R. L. BRIEN Vitamin A status and cholesterol metabolism in
 the rat
- M. IQBAL, J. T. DINGLE, T. MOORE AND I. M. SHARMAN Nutrition and lysosomal activity
- G. A. HALL AND J. MCC. HOWELL Copper deficiency and reproduction in the female rat

 J. MCC. HOWELL AND G. A. HALL Histological observations on foetal resorption in copper-deficient rats
- J. W. CZERKAWSKI AND GRACE BRECKENRIDGE Fermentation of sugar-beet pulp and surcose in an artificial rumen and effect of linseed oil fatty acids

 J. W. CZERKAWSKI AND GRACE BRECKENRIDGE Effect of oxygen on fermentation of sucrode by rumen
- micro-organisms in vitro
- N. F. SUTTLE AND A. C. FIELD Studies on magnesium in ruminant nutrition
 C. J. F. SPRY AND K. G. PIPER Increased retention of orally administered zinc and raised blood cell zinc concentrations in iron-deficient rats
- R. A. WELLER, A. F. PILGRIM AND F. V. GRAY Volatile fatty acid production in rumen of grazing sheep as an indicator of pasture value
- N. J. DROULISCOS AND J. P. ROWLAND Biological value of rapeseed meal, soya-bean meal and casein for weanling and mature rats

 1. H. Moore Dietary proportions of butterfat and maize oil, and plasma lipids and aortic atherosis in
- rabbits
- D. R. FRASER AND E. KODICEK Metabolism and biological activity of esterified vitamin D in the rat J. H. MOORE, R. C. NOBLE AND W. STEELE Incorporation of linolenic and linoleic acids into plasma lipids of sheep given intra-abomasal infusions of linseed oil, maize oil or linoleic acid
- M. C. NATH AND N. V. SHASTRI Effect of acetoacetate on urinary excretion of tryptophan metabolites in rats
- J. E. STORRY, B. TUCKLEY AND A. J. HALL Effects of intravenous infusions of triglycerides on secretion of milk fat in the cow
- J. E. STORRY, A. J. HALL, B. TUCKLEY AND D. MILLARD Effects of intravenous infusions of cod-liver and soya-bean oils on secretion of milk fat in the cow
- B. S. PLATT, IRENE M. BARRETT AND BARBARA A. CHRISTIE Chronic protein-calorie deficiency and reproduction in rats: respiratory metabolism of ova 70s. net (\$10.50). Annual subscription £10 net (\$32.00) for four issues.

CAMBRIDGE UNIVERSITY PRESS

Journal of Dairy Research

Volume 36, Number 2. June 1969

ARTICLES

SONJA MATTSON, P. SWARTLING AND R. NILSSON Composition of milk fat ELIZABETH A. KERNOHAN AND E. E. LEPHERD Fat globule distribution studies

- J. V. WHEELOCK AND DOROTHY KNIGHT Action of rennet on milk
- J. LABUSSIERE, J. MARTINET AND R. DENAMUR Milk ejection reflex and milking rate
- E. H. RAMSHAW AND E. A. DUNSTONE The flavour of milk protein E. H. RAMSHAW AND E. A. DUNSTONE Off-flavour in stored casein
- A. K. R. MCDOWELL Cream storage and butter quality
- R. VERBEKE, ANNE-MARIE MASSART LEËN AND G. PEETERS Metabolism of fructose in the udder
- N. J. BERRIDGE AND R. ASTON Continuous curd-making
- H. BURTON AND A. N. COCKS Fluctuating temperature in sterilization
- W. D. ANNAN AND W. MANSON Fractionation of αs-casein complex
- J. H. PRENTICE AND HELEN R. CHAPMAN Processing of cream
- C. C. THIEL, CAROL L. THOMAS, D. R. WESTGARTH AND B. REITER A possible mechanism of udder infection
- G. C. CHEESEMAN Effects of protein modifying agents on rennin

R. H. SMITH Nitrogen metabolism and the rumen

30s. net (\$5.00). Annual subscription 80 s. net (1\$3.50) for three issues

CAMBRIDGE UNIVERSITY PRESS

COMMONWEALTH BUREAU OF ANIMAL NUTRITION

The Bureau announces the first eight of a new series of Annotated Bibliographies in which abstracts and titles of papers on specific topics will be brought together. The period covered will usually be from 1950 to the most recent abstracts available in *Nutrition* Abstracts and Reviews.

Annotated Bibliographies now obtainable are:

- AB No. 1. Nutrient requirements of the mouse. 62 references. Price 12s.
- AB No. 2. Metabolism of steam-volatile fatty acids in cattle and sheep. 400 references. Price 80s.
- AB No. 3. Nutritive value of sugar cane by-products for ruminants. 215 references. Price 43s.
- AB No. 4. Use of urea and ammonium compounds for ruminants. 382 references. Price 76s, 6d.
- AB No. 5. Effects of sex hormones on fattening pigs. 45 references. Price 9s.
- AB No. 6. Algae and fungi as food. 205 references. Price 41s.
- AB No. 7. Protein requirements of cattle other than dairy cows. 40 references. Price 8s.
- AB No. 8. The effects of diet on fertility and hatchability of eggs. 375 references.

Obtainable from

Commonwealth Bureau of Animal Nutrition. Bucksburn, Aberdeen, AB2 9SB, Scotland

THE JOURNAL OF THE

AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE

CONTENTS-Vol. 34, No. 3. SEPTEMBER 1968 INCLUDE

Medal of Agricultural Science Award 1968--Dr. R. O. SLATYER

A Review of Quantitative Genetics in Plant Breeding with Particular Reference to Sugar Cane, by

D. M. HOGARTH

Probability and Statistics in Agricultural Research and Extension, by R. R. OFFICER and J. L. DILLON

Pasture Research in North-Eastern Australia: the Research Progress of the C.S.I.R.O. Divison of

Tropical Pastures, by J. GRIFFITHS DAVIES and A. G. EYLES

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Fruit Trees, by D. R. LEECE

The Concept of Leaf Analysis for Frui

Problems in the Use of Chemical Analyses for Diagnosis of Plant Nutrient Deficiencies, by C. S. ANDREW Letters

Castration of Adult Rams, by C. H. S. DOLLING Thesis

An Evaluation of Pasture Quality Through the Performance of Grazing Sheep, by J. R. GALLAGHER An Evaluation of Pasture Quality for Growth in Young Grazing Sheep, by R. C. KELLAWAY Technical Notes

The effect of Level of Feeding on the Intake and Digestibility of a Tropical Grass by Sheep, by M. J. PLAYNE

Implications of the Effect of Nitrogen on Daily Pasture Growth Rates in the Semi-arid Sub-tropics by J. S. Russeli

Molybdenum Application in the Lime of Lime-pelleted Subterranean Clover Seed, by R. A. DATE and G. R. HILLIER

A Comparison of Lime and Rock Phosphate for Pelleting Temperate and Tropical Legume Seed, by

R. A. DATE and P. S. CORNISH

Experimental Variation of the Supply of Nitrogen, Phosphorus and Water to Wheat, by J. Lipsett

Suppression of 'Arrowing' of Sugar Cane with Bipyridyl Desiccants, by A. C. ARVIER

Near-surface Soil Moisture Measurement with a Neutron Probe, by J. D. F. BLACK and P. D. MITCHELL

The Use of the Flour Maltose Value as a Measure of Starch Damage, and Alpha Amylase Activity,

""" by W. C. BARNES Talks

Recent International Developments in Pesticides, by A. L. ABEL What is Farm Management?, by I. A. DEAN New Foods: A Look into the Crystal Ball, by F. H. REUTER Irrigation in Israel, by I. LEVIN Lucerne the Plant, by J. R. McWilliam Personation in Academy 10 March 1987.

Perspectives in Australian Pasture Improvement, by L. R. HUMPHREYS Enquiries should be addressed to the

Business Manager, 226 Clarendon Street, East Melbourne, C.2, Victoria, Australia

ANIMAL BEHAVIOUR Volume 16 Part 4

Editors: P. P. G. Bateson and L. R. Aronson

this issue includes:

Orientation of the Sand-Beach Isopod.

Sensory Involvement in the Mating Behaviour of Domestic Sheep.

Sensory Involvement in the Recognition of Lambs by their Dams.

Arboreal Behaviour of the Red-Back Vole.

The Role of Experience in the Development of Food Preferences in Gull Chicks.

Temperature—dependent Maze Learning in the Desert Iguana.

Social Modification of Agonistic Behaviour in Fish.

Catechol Amines and Social Relations in Siamese Fighting Fish.

The effect of Visual Experience upon The Rats Reaction to Near and Far Surfaces.

The Role of Dances in Recruiting Bees to Familiar Sites.

Vaginal Stimulation and Exploratory Behaviour in the Rat,

The Behaviour of Group Companions towards Rhesus Monkey Infants.

Grooming by Adult Baboons in Relation to Reproductive Cycles.

Animal Behaviour is published three times yearly.

Annual Subscription 100s. U.S.A. and Canada \$17.50

Baillière, Tindall & Cassell

7 & 8 Henrietta Street London WC2

METRICATION

From 1971 (Vol. 13 of Animal Production) it is intended to publish Metric Units ONLY unless exceptional circumstances exist (e.g. papers in a numbered series, started in earlier volumes, where non-metric units were used).

To hasten the transition, authors are requested to use metric units henceforth whenever possible. Conversion factors (metric \rightleftharpoons non metric) are not required as a rule, but might be helpful in the case of complicated or unusual combinations or derivatives of units.

If necessary, a table of conversion factors for frequently used units will be published in the Journal.