STATION CIRCULAR 139 JANUARY 1941

Influence of Various Grits on Battery-raised Broilers

WILBUR T. COONEY

Oregon State System of Higher Education
Agricultural Experiment Station
Oregon State College
Corvallis

FOREWORD

THIS circular provides basic information regarding the need and value of various classes of grits in the broad field of poultry feeding. It is generally accepted by those in the poultry industry that grit is an important supplement to the basic rations fed to the different classes of poultry.

The advances in artificial methods of mass production and in close-confinement practices have crystallized a greater need for information regarding the use of grits. The feeding of various grits to poultry is within itself probably of minor importance, but when considered from the standpoints of conflicting opinions and the complex problems of poultry nutrition as a whole it is important that information be obtained on the value of various grits throughout the life of the fowl.

The information presented in this publication covers only one growth phase of the chicken, and additional work is planned to obtain further information on the value of grits in poultry rations.

WM. A. SCHOENFELD
Dean and Director

SUMMARY

1. There was some indication that broilers deprived of grit would consume a larger proportion of mash to grain than those that had access to grit of one type or another.

2. Greater quantities of siliceous grits were consumed than of calcium grits.

3. The amount of calcium grits consumed varied in inverse proportion to the amount of calcium each grit contained.

4. The lesser consumption of calcium versus siliceous grits when fed in conjunction with a ration previously balanced for calcium, supports the belief that birds are reasonably capable of detecting diets unbalanced for minerals and will tend to eat accordingly.

5. The results obtained in these feeding trials with respect to average weight at marketing time do not show that grit played more than a minor role when fed as a supplement to a balanced basic ration in the rearing of broilers in batteries to the age of 8 weeks.

6. There is little evidence from the work completed to date with battery broilers that grit materially increases the efficiency of food utilization when measured by pounds of feed required to produce a pound of gain.

7. Grades received on broilers fed various types of grits indicate that grit is a desirable constituent of a normal ration and that hard, siliceous grits in general yield best results.

8. The slightly less favorable results obtained with groups fed calcium-carbonate and calcium-sulphate grits may be explained by an interference with metabolism when these grits supplement a basic ration previously balanced for known requirements.

Influence of Various Grits on Battery-raised Broilers

(A progress report on certain experimental projects)

By

W. T. Cooney, Research Assistant
Department of Poultry Husbandry

INTRODUCTION

SEVERAL different kinds of grit are on the market, and considerable misunderstanding exists regarding their relative need and merits.

Grits may be classified into three general groups. Into one group may be placed such insoluble materials as granite, silica, and river gravel. This group consists primarily of silica. Another important group consists primarily of calcium carbonate. To this group belong limestone, calcite, and shells from clams or oysters. A miscellaneous group includes such materials as proprietary gypsum products.

The rapid expansion in the use of batteries for broiler production has resulted in increasing demands for information regarding the value and necessity of grit in broiler rations.

EXPERIMENTAL PROCEDURE (SPRING 1939)

During the spring of 1939 an experiment was set up in conjunction with battery-broiler work then in progress to check the relative value of various types of grit for this phase of poultry production. The following grits were used: (1) limestone, (2) a commercial calcium sulphate grit, (3) gray granite, and (4) white silica.

One hundred and forty day-old S.C. White Leghorn males were divided according to body weight into five equal lots and placed in battery equipment for the duration of the experiment. All lots were weighed at weekly intervals; feed intakes were recorded; and all birds in each of the five lots were marketed at the end of 8 weeks.

STATISTICS AND DISCUSSION

Table 1. Arrangement of the Experiment and Mortality.

Experimental groups	Chicks started	Chicks finished	Mortality
	Number	*Number*	*Per cent*
Limestone	28	26	7.14
Granite	28	28	.....
Gypsum	28	27	3.57
Silica	28	28	.....
None	28	27	3.57

Loss of chicks in any one group could not be attributed to the type of grit fed.

Feed-consumption records and feed efficiency as measured by the pounds of feed required to produce a pound of gain for the 8-week feeding period are presented in Tables 2 and 3.

Table 2. FEED CONSUMPTION.

Experimental groups	Mash consumed	Scratch consumed	Mash and scratch consumed
	Pounds	*Pounds*	*Pounds*
Limestone	80.87	41.75	122.62
Granite	80.94	42.25	123.19
Gypsum	76.07	39.00	115.07
Silica	72.07	43.63	116.19
None	74.81	47.06	121.87

Table 3. EFFICIENCY OF RATION.

Experimental groups	Meat sold	Feed per pound of meat sold	Feed per pound of gain
	Pounds	*Pounds*	*Pounds*
Limestone	43.50	2.82	2.72
Granite	50.25	2.45	2.45
Gypsum	46.75	2.46	2.46
Silica	48.00	2.42	2.42
None	46.25	2.64	2.62

From the data presented in Table 3 one must conclude that there is no significant difference in pounds of feed required to produce a pound of gain.

Table 4 shows the computed protein intake for the different groups and the average weight of individual birds at the time of marketing (8 weeks).

Table 4. PROTEIN INTAKE AND GROWTH.

Experimental groups	Protein consumed			Protein in total ration	Average weight per bird
	Mash	Grain	Total		
	Pounds	*Pounds*	*Pounds*	*Per cent*	*Pounds*
Limestone	15.5	4.0	19.5	15.9	1.67
Granite	15.5	4.0	19.5	15.8	1.79
Gypsum	14.6	3.7	18.3	15.9	1.73
Silica	13.9	4.2	18.1	15.6	1.72
None	14.4	4.5	18.9	15.5	1.72

No significance can be attached to the small difference in body weights shown in Table 4.

Table 5 gives the grit consumption for the various groups and the average grit intake per bird in each lot during the 8-week feeding period.

Table 5. GRIT CONSUMPTION.*

Experimental groups	Grit consumed	Grit per bird	Feed per pound of gain
	Pounds	*Pounds*	*Pounds*
Limestone	2.00	0.08	2.72
Granite	5.50	.20	2.45
Gypsum	2.56	.09	2.46
Silica	5.00	.18	2.42
None	.....	.....	2.62

* Includes wastage.

Contrary to popular opinion, the birds consumed larger quantities of the hard, siliceous grits than of the other grits.

The data gathered during this experiment indicated that there was no particular advantage in feeding grit to broilers and certainly no advantage in one type of grit over another. It was the belief, however, that further work should be conducted before attempting to draw any definite conclusions.

EXPERIMENTAL PROCEDURE (FALL 1939)

During the fall of 1939 another grit experiment was set up to check further on the relative value of various types of grit for battery-raised broilers. The grits fed in this work were identical with those used during the first test; namely, (1) limestone, (2) a commercial calcium sulphate grit, (3) gray granite, and (4) white silica.

Two hundred and fifty day-old S.C. White Leghorn males were divided according to body weight into 10 equal lots and placed in battery equipment for the duration of the experiment. All lots were weighed at weekly intervals; feed intakes were recorded; and all birds in each of the 10 lots were marketed at the end of 8 weeks.

The 10 lots of chicks were arranged into five groups, with both lots in each group receiving the same ration. The five groups were managed and fed alike with the exception of the grit. The birds were allowed free access to mash, grain, and grit fed in separate hoppers. Group 1 received a limestone grit; group 2 received a gray granite grit; group 3 received a calcium sulphate grit; group 4 received a white silica grit; group 5 served as a control group with no grit available at any time.

Chicks that died during the first 4 days were replaced with birds of the same age and weight. There was no loss of chicks after the fourth day.

STATISTICS AND DISCUSSION

Table 6 shows the arrangement of the experiment.

Table 6. ARRANGEMENT OF THE EXPERIMENT.

Experimental groups	Chicks started		Chicks finished	
	Lot 1	Lot 2	Lot 1	Lot 2
	Number	*Number*	*Number*	*Number*
Limestone	25	25	25	25*
Granite	25	25	25	25
Gypsum	25	25	25	25
Silica	25	25	25†	25†
None	25	25	25	25

* Two pullets removed at marketing = 2.50 pounds.
† One pullet removed at marketing = 1.25 pounds.

Feed consumption records and feed efficiency as measured by the pounds of feed required to produce a pound of gain for the 8-week feeding period are presented in Tables 7 and 8.

Table 8 shows a close relationship between the two lots fed the same grit when comparing the pounds of feed required to produce a pound of gain and the total pounds of meat sold. Differences between the different grit groups are small but, in general, the data agree reasonably well with the data presented in Table 3.

Table 7. FEED CONSUMPTION.

Experimental groups	Mash consumed		Scratch consumed		Mash and scratch consumed	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Limestone ..	68.76	61.85	52.15	59.34	120.91	121.19
Granite	69.16	62.41	55.43	54.94	124.59	117.35
Gypsum ..	60.69	67.43	56.21	53.76	116.90	121.19
Silica	58.14	64.26	58.76	55.84	116.90	120.10
None	69.07	68.28	50.07	50.07	119.14	118.35

Table 8. EFFICIENCY OF RATION.

Experimental groups	Meat sold*		Feed per pound of meat sold		Feed per pounds of gain	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Limestone ..	38.75	35.00	3.14	3.46	3.14	3.18†
Granite	42.25	42.25	2.94	2.78	2.94	2.78
Gypsum	39.50	40.25	2.96	3.01	2.96	3.01
Silica	37.50	37.75	3.12	3.29	3.00†	3.18†
None	39.75	40.00	2.99	2.96	2.99	2.96

* Males only.
† Adjusted for pullet consumption.

In this test there is a difference in pounds of meat sold between the granite group and the silica group that approaches statistical significance (Table 8). There was a trend somewhat the same but not as marked in the first test (Table 3). An explanation for such differences, if they are significant, is lacking in the work completed to date.

Table 9 gives the grit consumption for the various lots and the average grit intake per bird in each lot during the 8-week feeding period.

Table 9. GRIT CONSUMPTION.*

Experimental groups	Grit consumed		Grit per bird		Feed per pound of gain	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Limestone ..	1.11	1.72	0.04	0.07	3.14	3.18†
Granite	6.29	9.88	.25	.39	2.94	2.78
Gypsum	3.16	3.21	.13	.13	2.96	3.01
Silica	7.00	4.37	.28	.17	3.00†	3.18†
None	.00	.00	.00	.00	2.99	2.96

* Includes wastage.
† Adjusted for pullet consumption.

Table 10 shows the computed protein intake for the various lots and the average weight of individual birds at the time of marketing (8 weeks).

The data in Table 10 indicate that the protein level of the ration was not responsible for differences in average weight of individual birds. It is interesting to note that the birds in both check lots of group 5 consumed more mash and less grain than any of the lots receiving grit. The uniformity in consumption of mash and grain between the two lots in this group would indicate that young birds at least prefer a larger proportion of their food in ground form when grit is not available. In the first test, however, this tendency for the "no grit" lot to consume a greater proportion of their ration as mash than the "grit" lots did not prevail (Table 2).

Table 10. Protein Intake and Growth.

Experimental groups	Protein consumed						Per cent protein in total ration		Average weight per bird*	
	Mash		Grain		Total					
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Per cent*	*Per cent*	*Pounds*	*Pounds*
Limestone	13.2	11.9	5.0	5.6	18.2	17.5	15.1	14.4	1.55	1.52
Granite	13.3	12.0	5.3	5.2	18.6	17.2	14.9	14.7	1.69	1.69
Gypsum	11.7	12.9	5.3	5.1	17.0	18.0	14.6	14.8	1.58	1.61
Silica	11.1	12.3	5.6	5.3	16.7	17.6	14.3	14.6	1.56	1.52
None	13.2	13.1	4.8	4.8	18.0	17.9	15.1	15.1	1.59	1.60

* Males only.

Table 11. Composite Table of Averages.

Lot	Chicks started	Chicks finished	Mortality*	Mash consumed	Scratch consumed	Mash and scratch consumed	Ratio of scratch to mash	Meat sold†	Feed per pound of meat†	Feed per pound of gain‡	Protein in total ration	Average weight per chick†	Grit consumed per chick§
	Number	*Number*	*Per cent*	*Pounds*	*Pounds*	*Pounds*		*Pounds*	*Pounds*	*Pounds*	*Per cent*	*Pounds*	*Pounds*
Limestone	50	50	0.0	130.61	111.49	242.10	1:1.2	73.75	3.30	3.16	14.8	1.54	0.06
Granite	50	50	.0	131.57	110.37	241.94	1:1.2	84.50	2.86	2.86	14.8	1.69	.32
Gypsum	50	50	.0	128.12	109.97	238.09	1:1.2	79.75	2.98	2.98	14.7	1.59	.13
Silica	50	50	.0	122.40	114.60	237.00	1:1.1	75.25	3.20	3.09	14.5	1.54	.23
None	50	50	.0	137.35	100.14	237.49	1:1.4	79.75	2.98	2.98	15.1	1.60	.00

* After the fourth day.
† Males only.
‡ Adjusted for pullet consumption.
§ Includes wastage.

Birds that had access to siliceous grits consumed larger quantities of such grits than those that were fed calcium grits. This coincides with results obtained during the first test. Had the basic ration been deficient in calcium the birds unquestionably would have consumed larger quantities of the calcium grits. The amount of limestone and calcium sulphate grits consumed was in inverse proportion to the available calcium present in these products. This is in keeping with prevailing evidence that birds are sensitive to mineral levels in a ration and will exhibit such selective ability when placed on rations requiring it.

Table 11 is a composite table, which presents the averages for the two lots in each of the five groups.

In an effort to determine the part grits might play in grades received for broilers the birds were marketed through a large commercial poultry produce house. The two lots within a group were kept separate as well as the various groups. The grader was unaware of the type of work under consideration and graded each lot as he came to it. A summary of the grader's report is presented in Table 12.

Table 12. SUMMARY OF GRADER'S REPORT.

Experimental group and lot number	Number of birds sold*	Grades			
		No. 1		No. 2	
		Number of birds	Per cent of total	Number of birds	Per cent of total
			Per cent		*Per cent*
Limestone					
1	25	21	84	4	16
2	25	23	92	2	8
Total	50	44	88	6	12
Granite					
1	25	24	96	1	4
2	25	23	92	2	8
Total	50	47	94	3	6
Gypsum					
1	25	18	72	7	28
2	25	19	76	6	24
Total	50	37	74	13	26
Silica					
1	25	23	92	2	8
2	25	22	88	3	12
Total	50	45	90	5	10
†*None*					
1	25	19	76	6	24
2	25	21	84	3	12
Total	50	40	80	9	18

* Includes the four females.
† Rejects: Lot 2 - - - 1 (Per cent of total, 4 per cent. Per cent of total for group, 2 per cent).

From the data in Table 12 one must conclude that grit is a desirable component of a broiler ration. The "no grit" group was graded down to 80 per cent No. 1's as compared to 90 per cent and 94 per cent No. 1's for the two groups fed siliceous grits. Grades received for the limestone group are practically the same as those received for the silica group. The two lots in the group fed a gypsum-type grit were graded down considerably as compared to the other grit groups.

OREGON STATE BOARD OF HIGHER EDUCATION

Beatrice Walton Sackett ..... *Marshfield*
C. A. Brand ..... *Roseburg*
E. C. Sammons ..... *Portland*
Robert W. Ruhl ..... *Medford*
Edgar William Smith ..... *Portland*
Willard L. Marks ..... *Albany*
R. C. Groesbeck ..... *Klamath Falls*
Mac Hoke ..... *Pendleton*
R. E. Kleinsorge ..... *Silverton*
Frederick M. Hunter, Ed.D., LL.D. ..... Chancellor of Higher Education

STAFF OF AGRICULTURAL EXPERIMENT STATION

*Staff members marked * are United States Government investigators stationed in Oregon*

Frank Llewellyn Ballard, B.S. ..... President of the State College
Wm. A. Schoenfeld, B.S.A., M.B.A. ..... Director
R. S. Besse, M.S. ..... Assistant Director
Esther McKinney ..... Accountant
Margaret Hurst, B.S. ..... Secretary

Division of Agricultural Economics

E. L. Potter, M.S. ..... Agricultural Economist; In Charge, Division of Agricultural Economics

Agricultural Economics

W. H. Dreesen, Ph.D. ..... Agricultural Economist
D. B. DeLoach, Ph.D. ..... Associate Economist

Farm Management

D. C. Mumford, M.S. ..... Economist in Charge
G. W. Kuhlman, Ph.D. ..... Associate Economist
W. W. Gorton, M.S. ..... Assistant Economist
H. L. Thomas, M.S. ..... Associate Agricultural Economist, Conservation Economic Division, Soil Conservation.*
J. C. Moore, M.S. ..... State Representative, Division of State and Local Planning, Bureau of Agricultural Economics*
V. W. Baker, B.S. ..... Assistant Agricultural Economist, Division of Land Economics*

Division of Animal Industries

P. M. Brandt, A.M. ..... Dairy Husbandman; In Charge, Division of Animal Industries

Animal Husbandry

R. G. Johnson, B.S. ..... Animal Husbandman
O. M. Nelson, M.S. ..... Animal Husbandman
A. W. Oliver, M.S. ..... Associate Animal Husbandman
B. W. Rodenwold, M.S. ..... Assistant Animal Husbandman

Dairy Husbandry

G. H. Wilster, Ph.D. ..... Dairy Husbandman
I. R. Jones, Ph.D. ..... Dairy Husbandman
H. P. Ewalt, B.S. ..... Research Assistant (Dairy Husbandry)
R. E. Stout, M.S. ..... Research Assistant (Dairy Husbandry)
V. P. Smith, B.S. ..... Research Assistant (Dairy Husbandry)

Fish and Game Management

R. E. Dimick, M.S. ..... Wildlife Conservationist in Charge
F. P. Griffiths, Ph.D. ..... Assistant Conservationist*
A. S. Einarsen, B.S. ..... Associate Biologist, Bureau of Biological Survey*
Jay B Long, B.S. ..... Research Assistant (Fish and Game Management)

Poultry Husbandry

H. E. Cosby ..... Poultry Husbandman in Charge
W. T. Cooney, B.S. ..... Research Assistant (Poultry Husbandry)

Veterinary Medicine

J. N. Shaw, B.S., D.V.M. ..... Veterinarian in Charge
E. M. Dickinson, D.V.M., M.S. ..... Associate Veterinarian
O. H. Muth, D.V.M., M.S. ..... Associate Veterinarian
R. W. Dougherty, B.S., D.V.M. ..... Assistant Veterinarian
A. S. Rosenwald, B.S., D.V.M. ..... Assistant Veterinarian
Roland Scott, D.V.M. ..... Research Assistant (Veterinary Medicine)†
Richard Shuman, D.V.M. ..... Junior Veterinarian, Bureau of Animal Industries*
M. P. Chapman, B.B.M. ..... Research Assistant (Veterinary Medicine)
K. S. Jones, D.V.M. ..... Research Assistant (Veterinary Medicine)

† On leave.

STATION STAFF—(*Continued*)

Division of Plant Industries

G. R. Hyslop, B.S.—Agronomist; In Charge, Division of Plant Industries

Farm Crops

H. A. Schoth, M.S.—Agronomist; Division of Forage Crops and Diseases*
D. D. Hill, Ph.D.—Agronomist
R. E. Fore, Ph.D.—Associate Agronomist*
H. H. Rampton, M.S.—Assist. Agronomist (Division of Forage Crops and Diseases)*
L. E. Harris, M.S.—Assistant Agronomist
H. E. Finnell, M.S.—Assistant Agronomist
Elton Nelson, B.S.—Agent, Division of Cotton and Other Fiber Crops and Diseases*
Louisa A. Kanipe, B.S.—Junior Botanist, Division of Seed Investigations*
A. E. Gross, M.S.—Research Assistant (Farm Crops)
L. R. Hansen, M.S.—Research Assistant (Farm Crops)
Henry R. Fortmann, B.S.—Research Graduate Assistant (Farm Crops)

Food Industries

E. H. Wiegand, B.S.A.—Technologist in Charge
T. Onsdorff, M.S.—Associate Technologist
D. R. Mills, B.S.—Assistant Technologist
E. W. Harvey, M.S.—Research Assistant (Food Industries)

Horticulture

W. S. Brown, M.S., D.Sc.—Horticulturist
H. Hartman, M.S.—Horticulturist (Pomology)
A. G. B. Bouquet, M.S.—Horticulturist (Vegetable Crops)
C. E. Schuster, M.S.—Horticulturist (Division of Fruit and Vegetable Crops and Diseases)*
W. P. Duruz, Ph.D.—Horticulturist (Plant Propagation)†
G. F. Waldo, M.S.—Associate Pomologist (Division of Fruit and Vegetable Crops and Diseases)*
E. Hansen, M.S.—Assistant Horticulturist (Pomology)
A. N. Roberts, B.S.—Research Assistant (Horticulture)

Soil Science

W. L. Powers, Ph.D.—Soil Scientist in Charge
C. V. Ruzek, M.S.—Soil Scientist (Fertility)
M. R. Lewis, C.E.—Irrigation and Drainage Engineer, Soil Conservation*
R. E. Stephenson, Ph.D.—Soil Scientist
E. F. Torgerson, B.S.—Associate Soil Scientist (Soil Survey)
J. M. Haley, B.S.—Assistant Irrigation Engineer, Cooperative Agent, Soil Conservation Service*
A. W. Marsh, M.S.—Research Graduate Assistant (Soils)
H. E. Clark, B.S.—Research Graduate Assistant (Soils)
H. E. Dregne, M.S.—Research Graduate Assistant (Soils)

Agricultural Chemistry

J. S. Jones, M.S.A.—Chemist in Charge
R. H. Robinson, M.S.—Chemist (Insecticides and Fungicides)
J. R. Haag, Ph.D.—Chemist (Animal Nutrition)
D. E. Bullis, M.S.—Associate Chemist
M. B. Hatch, M.S.—Assistant Chemist
J. C. Lewis, M.S.—Assistant Chemist

Agricultural Engineering

F. E. Price, B.S.—Agricultural Engineer in Charge
W. M. Hurst, M.A.—Agricultural Engineer, Bureau of Agricultural Chemistry and Engineering*
H. R. Sinnard, M.S.—Associate Agricultural Engineer (Farm Structures)
C. I. Branton, B.S.—Assistant Agricultural Engineer†
G. R. Stafford—Engineering Aid, Bureau of Agricultural Chemistry and Engineering*
H. F. Carnes, B.S.—Junior Agricultural Engineer, Bureau of Agricultural Chemistry and Engineering*
L. M. Klein, B.S.—Mechanical Engineer, Bureau of Agricultural Chemistry and Engineering*

Bacteriology

G. V. Copson, M.S.—Bacteriologist in Charge
J. E. Simmons, M.S.—Associate Bacteriologist
W. B. Bollen, Ph.D.—Associate Bacteriologist
F. J. Rudert, Ph.D.—Research Assistant (Bacteriology)

Entomology

D. C. Mote, Ph.D.—Entomologist in Charge

† On leave of absence.

STATION STAFF—(Continued)

B. G. Thompson, Ph.D. — Associate Entomologist
S. C. Jones, M.S. — Assistant Entomologist
K. W. Gray, M.S. — Assistant Entomologist
H. E. Morrison, M.S. — Assistant in Entomology
Joe Schuh, M.S. — Assistant in Entomology

Home Economics

Maud M. Wilson, A.M. — Home Economist
Helen McCullough, M.A. — Assistant Home Economist

Plant Pathology

C. E. Owens, Ph.D. — Plant Pathologist in Charge
S. M. Zeller, Ph.D. — Plant Pathologist
F. P. McWhorter, Ph.D. — Plant Pathologist*
B. F. Dana, M.S. — Plant Pathologist (Division of Fruit and Vegetable Crops and Diseases)*
F. D. Bailey, M.S. — Associate Plant Pathologist (Agricultural Marketing Service)*
P. W. Miller, Ph.D. — Associate Pathologist (Division of Fruit and Vegetable Crops and Diseases)*
G. R. Hoerner, M.S. — Agent (Division of Drug and Related Plants)*
John Milbrath, Ph.D. — Assistant Plant Pathologist

Publications and News Service

C. D. Byrne, Ed.D. — Director of Information
E. T. Reed, B.S., A.B. — Editor of Publications
D. M. Goode, M.A. — Editor of Publications
J. C. Burtner, B.S. — In Charge of News Service

Branch Stations

L. Childs, A.B. — Superintendent, Hood River Branch Experiment Station, Hood River
F. C. Reimer, M.S. — Superintendent, Southern Oregon Branch Experiment Station, Talent
D. E. Richards, B.S. — Superintendent, Eastern Oregon Livestock Branch Experiment Station, Union
H. K. Dean, B.S. — Superintendent, Umatilla Branch Experiment Station (Division of Western Irrigation Agriculture), Hermiston*
Obil Shattuck, M.S. — Superintendent, Harney Branch Experiment Station, Burns
H. B. Howell, B.S. — Superintendent, John Jacob Astor Branch Experiment Station, Astoria
Arch Work, B.S. — Associate Irrigation Engineer (Division of Irrigation), Medford*
G. A. Mitchell, B.S. — Superintendent, Pendleton Branch Station (Dry Land Agriculture), Pendleton*
K. B. Platt, M.S. — Superintendent and Assistant Range Examiner (Division of Grazing), Squaw Butte Range Experiment Station, Burns*
R. G. Johnson, B.S. — Leader of Livestock Research Projects, Squaw Butte Range Experiment Station, Burns
M. M. Oveson, M.S. — Superintendent, Sherman Branch Experiment Station, Moro*
E. S. Degman, Ph.D. — Superintendent and Associate Pomologist, (Division of Fruit and Vegetable Crops and Diseases), Medford*
G. G. Brown, A.B., B.S. — Horticulturist, Hood River Branch Experiment Station, Hood River
L. G. Gentner, M.S. — Associate Entomologist, Southern Oregon Branch Experiment Station, Talent
J. F. Martin, M.S. — Assistant Agronomist (Division of Cereal Crops and Diseases), Pendleton*
R. E. Hutchison, M.S. — Assistant Superintendent, Harney Branch Experiment Station, Burns
Bruce Allyn, B.S. — Junior Irrigation Engineer (Division of Fruit and Vegetable Crops and Diseases), Medford*
J. R. Kienholz, Ph.D. — Assistant Pathologist (Division of Fruit and Vegetable Crops and Diseases), Hood River*
R. D. Frichtel, B.S. — Junior Range Examiner (Division of Grazing), Squaw Butte Range Experiment Station, Burns*
Joseph Belanger, B.S. — Cooperative Research Agent, Conservation Experiment Station (Division of Soil Conservation), Moro*