

# **A History of Poultry Husbandry/Science at Iowa State Universtiy, 1907-2000**

by Jerry L. Sell

## *About the Author*

Jerry L. Sell received his bachelor's degree in animal husbandry and master's and doctorate degrees in poultry nutrition, all at Iowa State University. He was hired as a poultry nutrition specialist in the Iowa State animal science department in 1976, where he conducted nutrition research on laying hens, growing turkeys and broiler chickens. Sell received the American Feed Manufacturers Association Nutrition Research Award in 1978, the National Turkey Federation Research Award in 1990, and the Merck Award for Achievement in Poultry Research in 1996. He was named Fellow of the Poultry Science Association in 1989.

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# Introduction

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My interest in the history of Poultry Husbandry/Science was stimulated several years ago when I searched for historic information about the Poultry Science Association (PSA). Some PSA information had been deposited in the archives of the Iowa State University Library. A review of these archival materials showed many gaps in the PSA information. With the hope that some of these gaps could be filled, a review of information about Poultry Husbandry/Science at Iowa State College (ISC)/Iowa State University (ISU) was done.

The information in the ISC/ISU file was scanty, although Richard H. Forsythe, former Head of Poultry Science at ISU, had prepared a brief summary about poultry at ISC/ISU for inclusion in the ISU Poultry Club Yearbook in 1962. In 1995, Richard Willham asked me to provide some information about the history of poultry for use in his book, *A Heritage of Leadership*, on the history of Animal Husbandry/Science at ISU. Thus, my search was extended to the ISC/ISU Catalogs, the Iowa State Agriculture Experiment Station Reports, Iowa State University Extension Bulletins and Reports, scientific and trade journals, and information on individual faculty members.

The narratives and appendices that follow are intended to provide an overview of the history of poultry at ISC/ISU. There is a lack of details in many instances due to unavailability of information or unintentional omission on my part. I hope that readers will recognize the important contributions that poultry faculty and staff made to poultry science and the poultry industry. These contributions came from the teaching, extension, and research programs which have been inextricably intertwined, although often viewed separately.

There were times when the poultry programs at ISC/ISU were among the best in the nation, i.e., from the 1920s to the late 1960s. Even in later years after course offerings and support for extension programs in poultry became minimal, research programs in immunogenetics, nutrition, and poultry products were outstanding and supported excellent opportunities for advanced degree studies. As of today (2001), outstanding research/graduate programs continue in immunogenetics and poultry products. But, with the virtual absence of a poul-

try extension program within the Department of Animal Science,  
working relationships between ISU and Iowa's poultry industry have  
become meager.

Jerry L. Sell

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# **Chapter 1**

## **Poultry Teaching at Iowa State, 1907-2000**

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In 1858, the Iowa Legislature passed an act providing for the establishment of a State Agricultural College and Farm. Ten thousand dollars was appropriated for the purchase of a farm on which to locate an Agricultural College. A farm was purchased in 1859 in Story County, located between Nevada and Boone about 30 miles north of Des Moines. Part of the Report of the Office Secretary and Superintendent of the Iowa State Agricultural College and Farm sent to the Iowa Legislature in January, 1866 is included as Article 1, Appendix A (p.47). The report describes the progress made in establishing the college and states the objectives of the institution.

The first students were accepted and classes began in 1869. The Report of President A. S. Welch filed with the Governor of Iowa in 1870 (a part of which is Article 2, Appendix A, p. 59) listed an enrollment of 136 young men and 37 young women in the first class. Fifty-five of Iowa's counties were represented in the class. President Welch's report also described the courses of study, faculty, and the "days employment" of the students. The latter is most interesting, especially from today's perspective of student life. Over time, the college developed standards for student admissions and conduct. Examples of information on these subjects, as taken from the 1880-84 catalog, are shown in Article 3, Appendix A (p.69). By the catalog of 1906-07, entrance requirements and examples of test questions on entrance examinations were defined (Article 4, Appendix A, p.77).

As enrollment in the college increased, departments that specialized in subject matters related to agriculture, engineering, and science were established. The Department of Animal Husbandry at Iowa State College (ISC) was established in 1896. A senior year option also was established for Animal Husbandry students after they had completed a three-year agriculture curriculum. However, descriptions of courses in Poultry Husbandry and an Instructor in Charge of Poultry did not appear in the ISC catalog until 1907-08. It seems that some attention had been given to poultry before 1907-08, but there was no

indication of that fact given in the catalog. In the narrative accompanying the list of courses in Animal Husbandry published in 1907-08, it was stated, "The Poultry Husbandry Department stands for all lines of work which pertain to the judging, selecting, breeding, feeding, development, care and management of the various breeds, and classes of land and water fowls," and four poultry courses were listed.

Rather than presenting a narrative of the changes in poultry courses and faculty that occurred from 1907-08 to 2000, these changes will be given in outline form, by selected time periods, according to information presented in college/university catalogs. It is difficult to identify faculty according to their primary work assignments (teaching, research or extension). It is safe to assume that up until about 1915 all faculty participated in all areas of work. Starting in 1915, poultry extension responsibilities were assigned to specific faculty members. The first students designated as Poultry Husbandry majors graduated in 1918.

### 1907-08

Four poultry courses were listed: XXX. Poultry Judging, and XXXI. Poultry Houses, Feeding and Management, were required of all Animal Husbandry students. Courses entitled XXXII. Advanced Practice in Feeding and Management, and XXXIII. Incubator Management, were offered as electives for agriculture students, but these courses required the first named courses as prerequisites.

*Faculty:* H. C. Pierce, Instructor in Charge of Poultry

### 1908-09

Five undergraduate courses in Poultry Husbandry and elective courses in poultry research and experimentation were listed. Course numbering changed from Roman numerals to Arabic numerals. A one-year short course in poultry also was offered. Furthermore, postgraduate studies were provided in breeding, feeding, housing, incubation, brooding and rearing, diseases and pests, and comparative anatomy of poultry. The department's narrative stated, "a Poultry Farm of nearly 20 acres upon which buildings have been erected this year offers unexcelled opportunities for practical instruction." Over the years, the Poultry Farm was expanded to 30 acres, with a total of 34 buildings. The following sentence appeared in the narrative preceding the list of poultry courses (an excerpt from the 1908-09 catalog appears as Ar-

ticle 5, Appendix A, p.83). "At the present time, there is an urgent need and increasing demand for college men who possess scientific training in Poultry Husbandry together with practical experience and ability."

*Faculty:* H. C. Pierce  
W. A. Lippincott

### **1909-10**

Course offerings were similar to previous year.

*Faculty:* H. C. Pierce, Assistant Professor, Poultry  
W. A. Lippincott, Student Assistant, Poultry

### **1910-12**

Thirteen courses were offered. The option to specialize in Poultry Husbandry during the senior year was provided. Opportunities for research with poultry also were listed.

*Faculty:* H. C. Pierce (resigned to accept USDA position in 1911)  
W. A. Lippincott, Professor in Charge, 1911-12, but  
resigned in 1913

### **1912-16**

Opportunity for undergraduate specialization in Poultry Husbandry was increased to include junior and senior years. The specialty was termed "Poultry Husbandry Group." Postgraduate courses in poultry were offered in breeding, nutrition, and incubation and brooding. Courses required for the junior and senior years for the Poultry Husbandry option are shown as Article 6, Appendix A (p.87).

*Faculty:* G. M. Turpin, Professor in Charge  
R. M. Sherwood, Instructor (left in 1915)  
H. A. Bittenbender, Extension (joined in 1914-15)  
M. M. Attender, Assistant in Poultry Husbandry  
(1915-16 only)

### **1916-17**

Among the 13 poultry courses listed were: 44. Market Poultry and Poultry Products, and 45. Poultry Management. Both of these

courses were listed as "For Women" (Article 7, Appendix A, p.89).

*Faculty:* G. M. Turpin, Professor in Charge  
H. A. Bittenbender, Extension  
O. C. Uffort, Assistant in Poultry Husbandry

## 1918-19

The number of poultry courses varied from 11 to 14 and graduate program offerings changed slightly. Only one course "For Women" (Poultry Management) was listed in 1918-19 and none was listed in 1919-20. The two-year option in Poultry Husbandry was listed. ISC changed from semester to quarter system with this catalog.

*Faculty:* G. M. Turpin (resigned in 1918)  
H. A. Bittenbender (became Chief of Poultry Husbandry in 1919)  
F. R. Kenney, Extension (military leave in 1918)  
O. C. Uffort (resigned in 1919)  
H. M. Lackie (listed for only 1918-19)  
R. M. Miller (listed for only 1918-19)  
W. H. Lapp (joined in 1918-19)  
J. H. Bardsley, Extension (joined in 1919-20)  
A. G. Peters, Extension (joined in 1919-20)

The first two Poultry Husbandry majors graduated with a B.S. degree in 1918.

## 1920-24

Course offerings remained about the same, with the two-year option in the Poultry Husbandry Group. The courses 434. Special Poultry Problems, and 515. Research in Poultry Husbandry, encouraged graduate study.

*Faculty:* H. A. Bittenbender (Chief of Poultry Husbandry)  
W. H. Lapp  
R. T. Parkhurst (left in 1921-22)  
J. D. Redditt (listed for only 1920-21)  
A. H. Ward (listed for only 1920-21)  
C. W. Knox (joined in 1921)  
C. P. Earle (listed for only 1921-22)  
J. L. Gordon (listed for 1922-24)

J. J. Warren (listed for 1922–24)

S. W. Henn (listed for only 1922–23)

Three Poultry Husbandry students graduated with B.S. degrees and seven with M.S. degrees during this time.

### **1925–29**

The number of Poultry Husbandry courses increased to a peak of 18 in 1928–29. The two-year poultry option was still available.

*Faculty:* H. A. Bittenbender, Chief of Poultry Husbandry  
(resigned in 1930)  
R. L. Cochran, Assistant Chief  
C. W. Knox  
W. M. Vernon, Instructor (joined in 1925–26)  
J. H. Bardsley, Extension  
L. E. Heifner, Extension (listed for 1924–26)  
W. H. Lapp, Extension  
E. J. Rood, Extension (joined in 1925–26)  
J. G. Niles, Extension (listed for 1926–27)  
R. L. Watkins, Extension (listed for 1926–27)  
W. R. Whitfield, Extension (joined in 1928–29)

Sixteen B.S. students (eight in 1925), 10 M.S. students and 1 Ph.D. student listed for Poultry Husbandry graduated during this six-year period.

The Poultry Club became more visible and had the first place float in the Agriculture Division of the 1925 VEISHEA parade. The horse-drawn float showed a large egg basket and a banner which read "Iowa—Egg Basket of the Nation."

### **1930–34**

Thirteen to 15 poultry courses were listed, including three General Poultry Husbandry courses designated for Poultry/Animal Husbandry majors, for Dairy Industry and Farm Crops and Soils students, or for Teachers of General Agriculture. A two-year Poultry Husbandry option was available.

*Faculty:* R. L. Cochran, Acting Chief of Poultry Husbandry,  
1930–31  
C. W. Knox, Assistant Chief (resigned in 1931)

E. W. Henderson, Head of Poultry Husbandry  
Subsection, starting 1931  
D. Brazie (listed for only 1929–30)  
W. G. Hoyman (listed for only 1931–32)  
T. T. Milby (listed for only 1932–33)  
H. L. Wilcke (joined in 1931)  
N. F. Waters (joined in 1931)  
W. M. Vernon, Extension  
W. R. Whitfield, Extension

Eleven Poultry Husbandry B.S. degrees, 11 M.S. degrees, and two Ph.D. degrees were awarded during these five years.

### **1935–39**

There was a complete renumbering of courses, and listings of poultry husbandry and animal husbandry courses were intermingled. Ten undergraduate and three graduate poultry courses plus seminars were listed. A four-year option in Poultry Husbandry was offered for the first time. A description of the curriculum for a Poultry Husbandry degree is shown as Article 8, Appendix A (p.93).

*Faculty:* E. W. Henderson, Head of Poultry Husbandry  
(resigned in 1938)  
R. L. Cochran (resigned in 1935)  
H. L. Wilcke, Head of Poultry Husbandry starting in 1938  
N. F. Waters (resigned in 1939)  
T. T. Milby (listed for 1936–38)  
D. W. McLaury (joined in 1938–39)  
W. M. Vernon, Extension  
W. R. Whitfield, Extension

Fifteen Poultry Husbandry majors graduated with B.S. degrees and 11 with M.S. degrees. Two Ph.D. poultry majors also graduated.

### **1940–45**

During this time, the number of undergraduate poultry courses decreased to eight. The graduate programs in Poultry Nutrition, Poultry Breeding, and Poultry Products were well established.

*Faculty:* H. L. Wilcke, Head of Poultry Husbandry (military  
leave in 1943)  
G. F. Stewart (joined in 1939–40)

R. E. Phillips (joined in 1939–40)  
D. W. McLaury  
P. R. Riddle (listed for only 1939–40)  
J. N. Thompson (listed for only 1939–40)  
A. J. Maw (joined in 1940–41, acting Head 1943-1945)  
P. E. Sanford (joined in 1943–44)  
J. W. Kelly  
Mary J. Ward (listed for only 1944–45)  
W. M. Vernon, Extension (resigned in 1944)  
W. R. Whitfield, Extension

Eleven Poultry Husbandry students with B.S. degrees, 16 with M.S. degrees, and nine with Ph.D. degrees graduated during this time.

### **1946–47**

The four-year Poultry Husbandry program was dropped and the two-year program restored in 1945–46. In 1947, ISC acquired land near Ankeny. The poultry department received 264 acres of this land and used two large buildings to conduct research with chickens and turkeys.

Faculty: R. E. Phillips, Acting Head  
G. F. Stewart  
Julia S. Lee (listed for only 1945–46)  
J. W. Kelly (listed for only 1945–46)  
Betty Kloth  
Margaret L. McKeen (listed for only 1945–46)  
Wilbor O. Wilson  
Helen L. Hanson (listed for only 1945–46)  
A. W. Nordskog (joined in 1945)  
Robert Penquite (joined in 1946)  
W. R. Whitfield, Extension

Seven students graduated with B.S. degrees, five with M.S. degrees, and one with a Ph.D. degree.

### **1948–52**

Poultry Husbandry was established as a separate department, offering a four-year degree. The graduate program increased considerably.

Faculty: R. E. Phillips, Head of Department  
G. F. Stewart (resigned in 1951)

A. W. Nordskog  
 R. Penquite  
 E. L. Johnson (joined in 1948)  
 R. H. Forsythe (joined in 1948, resigned in 1951)  
 S. L. Balloun (joined in 1949)  
 P. E. Stanford (listed for 1947–50)  
 A. B. Stephenson (listed for 1947–50)  
 A. W. Brant (listed for 1948–50)  
 C. H. Bollenbach (listed for only 1948–49)  
 R. B. Chapin (listed for 1948–50)  
 H. F. Hurry (listed for only 1948–49)  
 W. Kornfield (listed for only 1948–49)  
 W. R. Whitfield, Extension  
 C. C. Bayles, Extension (listed for 1948–50)  
 S. E. Davis, Extension (listed for only 1949–50)  
 L. Z. Eggleton, Extension (joined in 1948)

Forty-one B.S., 12 M.S., and eight Ph.D. degrees in Poultry Husbandry were awarded during this five-year period. The four-year curriculum and course offerings in Poultry Husbandry (1947–48) are shown in Article 9, Appendix A (p.95).

### 1953–59

A four-year Poultry Husbandry major was offered. Strong graduate programs continued.

*Faculty:* R. E. Phillips, Head of Department (passed away in 1959)

A. W. Nordskog  
 R. Penquite (retired in 1958)  
 E. L. Johnson (resigned in 1954)  
 O. J. Cotterill (joined in 1951)  
 F. G. Wollney (listed for only 1952–53)  
 S. L. Balloun (rejoined in 1953)  
 G. A. Donovan (listed for 1953–55)  
 R. J. McVicker (listed for 1953–56)  
 H. M. Ward (listed for 1953–55)  
 L. T. Smith (listed for 1956–59)  
 W. W. Marion (joined in 1958)  
 C. E. Richardson (joined in 1958)  
 P. R. Walther, Extension

L. Z. Eggleton, Extension

W. R. Whitfield, Extension (retired in 1957-58)

Twenty-two B.S., seven M.S., and six Ph.D. degrees in Poultry Husbandry were awarded during this seven-year period.

### 1960-73

Name of the department was changed to Poultry Science in 1961. In 1963, a new Poultry Science Center was constructed on 11 acres of land located on South State Street approximately 4 miles from campus. The farm consisted of nine buildings designed to facilitate teaching and research in the areas of nutrition, breeding, and immunogenetics. Throughout the 1960s, the graduate program gained strength and numbers. The undergraduate program thrived until the late 1960s and then enrollees decreased. Undergraduate degrees in Poultry Science were awarded through 1973. However, the Poultry Science Department was eliminated in 1971 and former poultry faculty became members of the Department of Animal Science. Undergraduate courses in poultry were decreased to four, and a graduate course in Poultry Nutrition and a one-half course in Poultry Breeding were retained.

*Faculty:* R. H. Forsythe, Head (resigned in 1967)

L. Z. Eggleton, Acting Head, 1967-68

W. W. Marion, Chairman of Poultry Science (1968-73)

A. W. Nordskog

S. L. Balloun

C. E. Richardson (resigned in 1962)

M. H. Gehle (listed for only 1965-67)

D. L. Miller (listed for only 1967-71)

R. Hanson (listed for only 1963-65)

George Brant (joined in 1971)

R. D. Carter (listed for only 1959-61)

L. Z. Eggleton, Extension

W. J. Ross, Extension (joined in 1962)

P. R. Walther, Extension

C. D. Lee, Extension Veterinarian (joined in 1965)

W. J. Owings, Extension (joined in 1965)

R. J. Hasiak, Extension (joined in 1972)

During this 10-year period, 37 B.S., 27 M.S., and 29 Ph.D. degrees were awarded in Poultry Science.

## 1974-80

The number of undergraduate courses in poultry was decreased to two, Poultry Production and Poultry Nutrition, and both were taught as electives. The graduate programs in Poultry Breeding, Poultry Nutrition, and Poultry Products were continued at an accelerated pace. However, the graduate course in Poultry Nutrition was dropped and poultry nutrition was taught as a shared course with swine nutrition. Poultry research at the Ankeny Farm was terminated in 1975.

*Faculty:* A. W. Nordskog, Section Leader of Poultry Science, 1974-78  
S. L. Balloun (retired in 1976)  
G. Brant  
L. Z. Eggleton, Extension (retired in 1980)  
W. J. Owings, Extension  
R. J. Hasiak, Extension  
J. L. Sell, Section Leader starting 1978 (joined in 1976)  
C. L. Nelson, Extension Veterinarian (joined in 1974, moved to Vet. Med in 1978)

Twelve M.S. and eight Ph.D. degrees were awarded during this time.

## 1981-2000

The undergraduate course in Poultry Nutrition was eliminated in 1996. George Brant continued to teach an elective course in Poultry Production and concurrently was responsible for teaching other courses in animal science. Poultry Breeding and Poultry Nutrition continued to be components of shared graduate courses. Advanced degrees in Poultry Nutrition and Poultry Products were eliminated and the degrees were incorporated into Animal Nutrition and Meat Science.

*Faculty:* J. L. Sell, Section Leader (retired in 2000)  
A. W. Nordskog (retired in 1983)  
Susan J. Lamont (joined in 1983)  
G. Brant  
W. J. Owings, Extension (retired in 1995)  
R. J. Hasiak, Extension (resigned in 1992)  
D. U. Ahn (joined in 1994)

During this period, 24 M.S. and 34 Ph.D. degrees were awarded. Some students, all of whom worked with poultry and under supervi-

sion of poultry faculty, obtained degrees in Animal Breeding, Animal Nutrition, or Immunology.



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## *Chapter 2*

# **The Poultry Science Club**

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*The following description of the Poultry Science Club was published by Richard Willham in "The Legacy of Leadership," 1996, page 174.*

The Iowa State University Poultry Science Club, defunct since the Poultry Science Department incorporated with the Animal Science Department in 1973, has a long, yet obscure history. The club was almost certainly originally formed as a branch of the old Agriculture Club, though at what date it became a separate entity is unknown. The first references to the Poultry Club date back to 1925, when the club sponsored its first annual Egg Show. This show was designed to promote the Iowa poultry industry, then in its heyday and one of the largest in the nation. In 1925, the club also won the VEISHEA parade float competition with a horse-drawn float that held a large egg basket and a banner reading "Iowa—Egg Basket of the Nation."

The Poultry Science Club continued its involvement with VEISHEA for many years, holding the Egg Show in conjunction with the event until 1958. The show grew over the years, adding classes for both chicks and poults. This show was the only one of its kind in the nation and drew considerable nationwide interest. A sale was held after the show, and the revenue was used to support the Poultry Judging Team's trip to the Collegiate Poultry Judging Contest in Chicago. After 1958, the club prepared a display highlighting the poultry industry during VEISHEA.

The major fund-raiser of the club in later years was the processing and distribution of turkeys. Turkeys were bought live from area producers, and the students dressed the birds at the ISU Poultry Farm. The turkeys were marketed to the faculty and residence halls. The project was successful, with upwards of 100 turkeys sold a year.

In 1962, the club produced its first yearbook—the "Cock's Crow." Copies of parts of this yearbook are presented in Article 10, Appendix A (p.99). This yearbook, in addition to highlighting the activities of the club and its membership, contained numerous articles on the current state of research into poultry production and the Poultry Science Department at ISU. The venture was well supported by the Iowa poultry

industry through advertising. More than five thousand copies of the yearbook were distributed throughout the nation, being sent to every agriculture college, as well as all the high schools and hatcheries in Iowa.

Though the club was always small in numbers, it enjoyed a wide variety of social activities and could boast near 100 percent attendance at meetings. Picnics, home visits to faculty, and tours were enjoyed by the members. The club, in conjunction with the department, also held a very popular Alumni Day event. This undertaking drew in excess of 100 people. For many years, club membership exceeded enrollment in the poultry department, giving testimony that these events and others were well received. By the time of amalgamation with the Animal Science Department, membership had dwindled, and the club was absorbed into the Block and Bridle.

*A list of poultry graduates through 2000 is available in the Special Collections Department, ISU Library.*

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## *Chapter 3*

# **Poultry Extension Begins in 1914**

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Although faculty within the Animal Husbandry Department were involved primarily in teaching poultry husbandry in 1907–08, they were undoubtedly carrying out some extension activities before a formal appointment of a poultry extension specialist was made. Records show that two extension-type articles were published before H. A. Bittenbender was formally appointed in 1914 as poultry extension specialist. These articles were entitled “Trussing and Boning Chickens for Fancy Trade” by W. A. Lippincott (Oct., 1911, Bul. No. 125) and “Farm Poultry Houses” by J. B. Davidson and W. A. Lippincott (June, 1912, Bul. No. 132), both of which appeared as reports of the Animal Husbandry and Agricultural Engineering Sections, Agriculture Experiment Station, Iowa State College (ISC).

The first extension publication was “The Farm Breeding Flock” written by H. A. Bittenbender and published as Extension Bulletin 19, March, 1914. Additional records of extension activities and publications in poultry husbandry are not available for review for the period of 1915 through 1925. However, according to the number of poultry extension faculty listed in ISC catalogs, extension efforts must have increased during this time. Two to five extension faculty were listed each year. Also, beginning in 1921, one extension person was assigned to Club Work, which probably was focused on youth involvement in poultry activities.

According to information provided in Lesson No. I of a Radio Poultry Short Course prepared by H. A. Bittenbender and W. D. Termohlen (Agriculture Marketing Specialist) in about 1926 (see Article 1, Appendix B, p.113), some poultry production in Iowa was evident by 1839. The value of that production was given as \$16,000 as compared with \$250,000 for the entire United States. Other data in the Short Course material showed that poultry production in Iowa, starting in 1880, increased more rapidly than the state population.

Year	Number of	
	Chickens on Farms	Population
1880	7,550,508	1,624,615
1900	18,907,673	2,231,853
1925	30,275,338	2,419,927

Nearly every farm in Iowa during this time had a poultry flock to produce eggs and meat for the family, with any excess production marketed directly to consumers or through local market outlets. By 1925, there was a great need for information about management of these farm flocks and ISC poultry extension specialists were very active in transmitting this information to farmers.

An overview of poultry extension work in Iowa in 1926 is given in Article 2, Appendix B (p.121). Establishment of Cooperative Poultry Record Farms in every township was a goal. This program was intended as a means of spreading information about proper management of poultry through demonstration at the local level. It was noted in this report that in the winter, 1926, extension specialists visited "record flocks" in 57 counties and on 644 farms, and conducted 757 interviews. Other areas of extension work included Poultry House Construction, Remodeling and Equipment Demonstrations, Caponizing Surplus Cockerels, Poultry Culling and Marketing, and Cooperative Egg Grading and Marketing.

Poultry extension specialists also began publishing "Bulletins for Cooperators," which at first was sent to Record Farm Cooperators. These bulletins contained information updates on poultry management, comparative data obtained from Record Farms, and announcements of educational opportunities. An example of a bulletin as authored by E. J. Rood in 1926 appears as Article 3, Appendix B (p.125). Bulletins for Cooperators was the forerunner of the Poultry Newsletter published later. Other extension activities in the late 1920s included Poultry Management Schools conducted in area meetings around the state (Article 4, Appendix B, p.127) and Poultry Programs as part of Farm and Home Week (Article 5, Appendix B, p.129).

An industry organization, the Iowa Poultry Improvement Association (IPIA), was founded in 1927. Members were mainly hatcherymen and poultry breeders. The main objective of the IPIA was to improve communications among components of the industry and to

promote improved production and marketing practices. The IPIA published its first newsletter in March 1929. In 1958, the association became the Iowa Poultry Hatchery Association, which contained a Producers Division, started in 1957. The organization's name was changed to the Iowa Poultry Association (IPA) in 1960.

The name of the association's publication changed, too; Iowa Poultry Improvement Association News (1929-1932), Poultry Year Book (1933-1960), and Iowa Poultry Industry News (1960-1963). A check-off plan was instituted in 1972 to raise funds for use in promotion of egg consumption, and the Iowa Egg Council (IEC) was formed to administer these funds. The Iowa Egg Council currently publishes a newsletter entitled the "Eggsaminer." Extension personnel of ISC/ISU played an active role in the establishment of the IPIA and the IEC, especially from their founding through the 1980s. Poultry extension specialists served as ex-officio or voting members of the boards and helped plan and carry out educational programs sponsored by these organizations. Poultry faculty also published many articles of relevance to the poultry industry in IPIA/IPA reports and newsletters.

Poultry extension specialists interacted with a large number of people in the Iowa poultry industry during the 1920s and 1930s. Article 6, Appendix B (p.133), provides a summary of poultry extension activities of 1928. The number and scope of activities is impressive, especially in view of only three persons having poultry extension appointments. By 1929, only two poultry extension specialists were listed (W. M. Vernon and W. R. Whitfield) and these two persons carried out poultry extension activities through 1944, at which time Vernon resigned.

In 1929, poultry extension launched a new cooperative program focused on improved disease control. In Warren County alone 106 poultry producers indicated a desire to be cooperators in this program (Article 7, Appendix B, p.135). This program proved to be vital to maintenance of the Iowa poultry industry as farmers weathered the Great Depression. Records of poultry extension activities during the 1930s indicated considerable effort. Demonstration flock programs were continued, although the number of cooperators decreased. Total numbers of poultry, however, did not change greatly. Farm families still depended on their flocks as reliable suppliers of family food and some "grocery money."

Information was published by poultry extension specialists in the Iowa Calendar Report until 1934. From 1934 to 1937, extension published quarterly the Iowa Poultry Review (see example Article 8, Appendix B, p.137). The National Poultry Improvement Plan came into prominence in the mid 1930s. The Iowa Poultry Improvement Board supervised this program in Iowa, which initially focused on testing flocks for pullorum disease and its eradication from the entire state (Article 9, Appendix B, p.139). Dr. C. D. Lee, an extension veterinarian at ISC, together with W. M. Vernon and W. R. Whitfield, conducted pullorum testing schools in all regions of Iowa. Continued pullorum testing and culling of flocks resulted in Iowa achieving pullorum-free status.

The U.S. Branch of the World's Poultry Congress hosted the Congress and Exposition in Cleveland in September 1938. Article 10, Appendix B (p.141) describes some aspects of the Congress. W. A. Bittenbender, who was Chief of Poultry Husbandry at ISC for some time, was cited as a member of the staff of the World's Poultry Congress. Sources of monetary support for the Congress also are listed, including an admissions charge of 50 cents per person per day. There was a campaign to obtain 22,000 memberships in Iowa at \$1 per person to support the Congress and for use in Iowa (Article 11, Appendix B, p.143).

A relatively succinct history of poultry extension work at ISC from 1914 to 1939 was found in the ISU archives. The article was evidently prepared in 1939-40 by W. M. Vernon and W. R. Whitfield, poultry extension specialists at that time. The article is entitled "First Twenty-five Years of Poultry Husbandry Extension Work" (Article 12, Appendix B, p.145). Some demographic information and scope of the efforts in poultry extension are described. It is evident that poultry husbandry specialists worked closely with county agents until the late 1930s, when for a variety of reasons, attention of county agents had to be directed elsewhere. The article also describes the involvement of poultry extension specialists in programs related to World War I and the New Deal and lists predictions of how extension would serve the poultry industry in the future.

The Annual Extension Report of 1940 contained many articles focused on improving poultry production, including a description, with pictures, of a "Shelter Porch" designed by ISC poultry faculty. The porch was portable and had raised wire floors. It was designed to reduce poultry diseases and parasites and protect against the weather

and predators. Poultry extension specialists also published the results of a survey that compared the use of electric brooders (newly available) as a source of heat for brooding chicks as compared with use of coal or oil burners.

With the possibility of war looming, national defense programs were initiated. An extension pamphlet was prepared in 1941, which described management procedures recommended to improve efficiency of poultry production. Part of Pamphlet 8 is shown as Article 13, Appendix B (p.151). The Iowa poultry industry was historically focused on egg production, with the state being at or near the top nationally. Production of turkeys became a more prominent part of the state's poultry industry by the late 1930s, and, encouraged by the need for increased food production during World War II, more than 3 million turkeys were produced in Iowa in 1946. Turkey production lagged for a few years then increased to a peak of more than 8 million produced in the mid 1980s.

The Iowa Turkey Growers Association (ITGA) was formed in 1940-41. The organization's first newsletter, published in February 1941, contained an article authored by W. R. Whitfield (ISC Poultry Extension Specialist), which explained the need for such an organization (Article 14, Appendix B, p.153). The ITGA's name was changed to the Iowa Turkey Federation (ITF) in 1949. Information was communicated to Iowa's turkey industry by the publication Iowa Turkey News, which subsequently was renamed Turkey Talk. ITGA and ITF also sponsored two meetings a year for educational and social purposes. A monetary check-off plan was instituted in 1972 to assist the educational and promotional efforts of ITF and the National Turkey Federation. The Iowa Turkey Marketing Council (ITMC) was formed to supervise the use of funds obtained from the check-off. As with the IPA, ISC/ISU poultry extension specialists were involved in the founding of ITGA/ITF and participated actively as board members of ITF and the ITMC. ISC/ISU faculty also contributed numerous articles to the federation's publications.

Entry of the United States into World War II required concerted efforts to increase food production. The extension service at ISC issued numerous publications designed to encourage food production. Articles 15 and 16, Appendix B (p.157) are copies of the front pages of publications issued in 1942 that emphasized increased production. Iowa farmers responded by increasing total chickens to almost 53,500,000 in 1943, including 30,900,000 hens and pullets of egg-laying age. Iowa led

the nation in the number of chickens and in egg production. Turkey production also increased modestly during that time.

Commercial egg breaking and processing of liquid contents for food use were in their infancy at the start of World War II. Demand for dried egg products for the Army and later the Marshall Plan stimulated growth of this industry during the 1940s. Dr. George Stewart, poultry products specialist, worked closely with this segment of the poultry industry, helping adapt milk drying technology to drying of liquid egg products. In the 1950s, egg breaking and processing decreased markedly.

During the post-war period, chicken production began to decrease whereas turkey production continued to slowly increase. Poultry extension activities continued under the direction of W. R. Whitfield, with major efforts similar to those of the World War II era (Article 17, Appendix B, p.161). Poultry Husbandry became a separate department in 1948 and L. Z. Eggleton joined the extension faculty. The trend toward specialization within agriculture was evident and relatively small farm flocks of chickens began to disappear. Consequently, the number of chickens on Iowa farms decreased from a wartime high of more than 53 million to about 23 million by 1959. In contrast, turkey production increased from 2 million in 1943 to 6.1 million in 1959.

In the late 1950s poultry extension specialists devoted much effort to updating Iowa egg producers on new technologies and adaptations required to remain competitive as egg production moved from the Midwest to the southeastern and western areas of the United States. The first page of an extension bulletin dealing with conversion to keeping laying hens in cages is shown as Article 18, Appendix B (p.163). Other educational efforts and emphasis on 4-H activities also were continued (Articles 19 and 20, Appendix B, p.165). Nevertheless, interest by Iowa farmers in the egg production business continued to decrease, as described by an article authored by W. R. Whitfield in 1959 (Article 21, Appendix B, p.169).

As Iowa turkey production increased during the 1950s, extension work also increased in this area. In addition to "how-to" publications (Article 22, Appendix B, p.173), a program entitled "Turkey Days" was offered in 1959 (Article 23, Appendix B, p.175) with emphasis on disease control, nutrition, breeding, and products. Publications also were prepared in the 1960s which focused on specific aspects of turkey manage-

ment (e.g., Article 24, Appendix B, p.177). More general topics were covered by conducting Poultry Evening Schools in various areas of Iowa. Campus extension faculty worked closely with County Extension Directors in carrying out this program (Article 25, Appendix B, p.179).

Dr. R. E. Phillips died in 1959 and Dr. R. H. Forsythe became Head of the Poultry Science Department in 1960. Demonstration Flocks continued as a viable program for improving management and obtaining economic assessments of laying hen flocks. Information and data were sent almost monthly to participants (Article 26, Appendix B, p.181). Field work by extension specialists reflected the interest in larger, more mechanized egg production units. Development of farm quality-controlled egg marketing programs also was emphasized. Extension specialists and researchers collaborated to prepare pamphlets focusing on specific management topics such as feeding programs (Article 27, Appendix B, p.185). Annual Poultry and Egg Conferences were held and extension/research papers were published in Turkey Talk and Turkey World. The annual "Turkey Day" meetings continued.

Dr. C. D. Lee, Poultry Extension Pathologist since 1945, was officed in the Poultry Science Department in the early 1960s and continued to work with the poultry industry, providing guidance on control and treatment of diseases. Dr. W. J. Owings joined poultry extension in 1965. The Poultry Newsletter, area meetings, and special programs were used to assist the egg and turkey industry. Efforts were made to encourage Iowa egg producers to adopt new technologies that would keep them competitive with other production regions. Leonard Z. Eggleton received the Pfizer Extension Teaching Award in 1960 from the Poultry Science Association in recognition of his outstanding, innovative contributions to the poultry industry. Eggleton also was named Iowa Poultry Industry Person of the Year in 1970.

After Dr. Forsythe resigned in 1967, L. Z. Eggleton became Acting Department Head and in 1968, Dr. W. W. Marion was named Chairman of the Poultry Science Department. The Poultry Science Department was merged into the Department of Animal Science in 1971. Extension efforts under the leadership of Eggleton continued through the 1970s. R. J. Hasiak was named Extension Specialist, Poultry Products, in 1972 and became proactive with the turkey processing and egg processing industries. Dr. C. D. Lee retired in 1972, and Dr. C. L. Nelson took the Extension Poultry pathology position in

1974. Laying hen numbers had decreased to about 9 million by 1975. Nevertheless, extension activities continued to focus on improved laying hen management and egg marketing. Newsletters served to communicate relevant information, research updates, and announcements to producers. Information in Article 28, Appendix B (p.187) included dates for Extension Area Poultry meetings and the Iowa Turkey Day.

The annual Egg Marketing Seminar was established and ISU extension faculty continued to collaborate with University of Minnesota personnel to conduct the Annual Turkey Processor Seminar. Surveys were made of Iowa turkey producers to obtain comparative data on turkey growth and feed efficiency. Considerable time also was spent working with Iowa turkey processing plants. In 1979, the format of the Poultry Newsletter was changed and increased emphasis was placed on publishing information generated by the Poultry Science faculty (Article 29, Appendix B, p.191).

L. Z. Eggleton retired in 1980 and W. J. Owings and R. J. Hasiak assumed responsibilities for poultry extension work. Extension efforts in the 1980s included assisting turkey processing plants to adapt to the ever-changing federal regulations, publishing the Poultry Newsletter, planning and participating in annual educational meetings of the Iowa Poultry Association and the Iowa Turkey Federation, and numerous area and regional meetings, e.g., Midwest Poultry Federation. Turkey production in Iowa peaked at about 8.8 million per year, whereas numbers of laying hens plateaued at about 6.6 million from 1980 to 1986. Concurrent with decrease in laying hens was a decrease from 72,000 farmers involved in egg production in 1964 to less than 5,000 by 1987.

A transition that began in the 1960s was completed in the 1980s whereby essentially all poultry extension activities became the responsibility of ISU on-campus faculty, with little, if any, involvement of county extension personnel. Campus poultry faculty worked closely with industry groups in carrying out these responsibilities. Dr. Owings was especially active in working with agricultural economists and industry associations in the preparation of feasibility studies on "Broiler Meat Production" and "Egg Production" in Iowa. His report of egg production was used very effectively by the Iowa Area Development Group to create an awareness among out-of-state industry people of the advantages of egg production in Iowa. Within a year of release of

this report, construction of large egg production units began in Iowa. By 1990, laying hen numbers and egg production increased by nearly 30 percent and by 2000 Iowa was on the brink of again being the national leader in egg production. Dr. Owings conducted an annual survey of turkey disease problems and communicated the results to members of the industry. William J. Owings was named Iowa Poultry Industry Person of the Year in 1983 and received the ISU Meritorious Service Award in 1988. He was one of the first inductees into the Iowa Turkey Federation Hall of Fame in 1999.

In the early 1980s, Owings and C. L. Nelson organized the Iowa Poultry Symposium, which was sponsored by ISU Extension, Iowa Poultry Association, and Iowa Turkey Federation. This symposium was held annually providing information for the chicken and turkey industries. Dr. Darrell Trampel, who became Extension Veterinarian in 1985, also worked with Owings in organizing this symposium and carried on after Owings retired in 1995. Dr. Trampel also has been instrumental in organizing the annual area meetings with the Iowa turkey industry to the present time. J. L. Sell participated in extension programs and provided summaries of research relevant to the poultry industry in the Poultry newsletter, as exemplified by Article 30, Appendix B (p.199). This newsletter also announced the program of a forthcoming Iowa Poultry Symposium of 1989. The Poultry Newsletter was last published in 1991, mainly because of continued decreases in monetary support of extension activities.

Dr. Dong Ahn joined the faculty as Poultry Products Specialist in 1994. He continues to work actively with egg and poultry meat processors and to serve as an ex-officio member of the Iowa Poultry Association and Iowa Turkey Federation. Poultry extension work in the 1990s was conducted substantially on a one-to-one basis with clients, although area group meetings and the Iowa Poultry Symposium continued.



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## *Chapter 4*

# Research Underway in 1907

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Research with poultry undoubtedly began at ISC upon the arrival of H. C. Pierce in 1907 and W. A. Lippincott in 1908. A Poultry Farm was established in 1908 to facilitate research and teaching. Research done on this farm supplied information for the early papers, which were primarily extension in type. As cited in the chapter on Extension, the first paper appeared in the Experiment Station Report, 1911 as Bulletin 125 entitled "Trussing and Boning Chicken for Fancy Trade" and was authored by Lippincott. Poultry faculty at ISC were instrumental in establishing the American Association of Instructors and Investigators in Poultry Husbandry (AAIIPH) in 1908.

The AAIIPH was formed to facilitate information exchange among poultry scientists and to promote teaching and research with poultry. H. C. Pierce was listed as President of the Organizational Meeting and was active as a member of the association's constitution committee and a program participant of the first meeting at Cornell University. It is significant that Pierce was chairman of the first session of the AAIIPH meeting, which took place July 23, 1908. (Article 1, Appendix C, p.207). The third meeting of AAIIPH was held at ISC in 1910 and H. C. Pierce was secretary-treasurer, before leaving ISC to join the U.S. Food Research Laboratory, Philadelphia, Pennsylvania. The name of AAIIPH was changed to Poultry Science Association in 1927 ISU hosted the PSA meetings held in 1959 and 1985.

In 1914, AAIIPH began publishing its own scientific journal, which was the forerunner of the Poultry Science journal. The first paper in this journal originating from Iowa appeared in 1921. The paper was "Some Results of Predicting Records that Pullets Will Make," written by Lloyd L. Stewart. No affiliation of the author was given in the journal. Before this time, other early landmark poultry research papers were published in the ISC Agriculture Experiment Station Reports. Included among these papers were "Nesting Habits of the Hen" by G. M. Turpin in 1918 and "A Simple Linebreeding Program for Poultry Breeders" by C. W. Knox in 1921. Another early paper, "The Case of the Blue Andalusian," written by W. A. Lippincott

was published in *American Naturalist* 52:95, 1918.

It is not possible to describe all the important contributions made by ISC/ISU researchers to poultry husbandry/science. Nevertheless, information available will be used to highlight areas of research and the researchers involved. Selected examples of contributions of the poultry husbandry/science faculty to the scientific literature are presented in Article 2, Appendix C (p.209).

## **Poultry Management**

Much of the research done during the early years was focused on various aspects of poultry management. Papers published in the 1910s and 1920s dealt with topics such as "Farm Poultry Houses," "The Control of Chicken Mites and Lice," and "A Successful Iowa Shed Roof Poultry House." Topics in the 1930s and 1940s included "Care, Candling, and Grading Market Eggs," "Use of Artificial Lights for Turkeys," and "Comparative Growth Rates of Turkeys, Ducks, Geese, and Pheasants." Personnel involved in publishing results of early management research included J. H. Bardsley, H. A. Bittenbender, E. W. Henderson, W. H. Lapp, T. T. Milby, W. M. Vernon, R. L. Watkins, W. R. Whitfield, and H. L. Wilcke. Management research continued during the 1950s through the 1980s under the direction of R. D. Carter, L. Z. Eggleton, R. J. Hasiak, D. L. Miller, W. J. Owings, and P. R. Walther in the areas of egg production, turkey production, and egg marketing.

Along with management-related research, research programs evolved in the disciplines of Poultry Breeding and Immunogenetics, Poultry Nutrition, and Poultry Products.

## **Poultry Breeding and Immunogenetics**

C. W. Knox obtained M.S. and Ph.D. degrees in Genetics at ISC in 1923 and 1926, respectively. Thereafter, he joined the Animal Husbandry Department and pioneered the establishment of an outstanding poultry breeding program, beginning in 1926, whereby several inbred lines were developed. These inbreds served as foundation stock for subsequent breeding and immunogenetics research for the next eight decades. His research at ISC included genetics of growth, broodiness, maturity, and plumage color. He left ISC in 1931 to serve as geneticist with the Bureau of Animal Industry, now the Agricultural Research Service. His research contributed to the development of broiler-type

chickens and a strain of commercial turkeys. He was made a Fellow in the Poultry Science Association in 1958, which is the greatest honor bestowed by the Association.

Nelson F. Waters (Ph.D., Harvard University) joined the Animal Husbandry faculty in 1931 as associate professor in poultry breeding. Waters pursued the inbreeding work of Knox and published a paper in Poultry Science in 1936 which described the results of "A Ten Year Inbreeding Experiment on the Domestic Fowl." Effects of inbreeding White Leghorn chickens on characteristics of economic importance to poultry breeders (egg production and fertility and hatchability of eggs) were reported and discussed. Although Waters left ISC in 1939, he continued to publish papers on his inbreeding studies at ISC till 1941. Waters was Geneticist at Regional Poultry Research Laboratory, USDA, East Lansing, Michigan until his retirement in 1962. He is credited with developing inbred lines of chickens that proved useful in research on the avian lymphomatosis complex and on cancer. Waters was the first scientist to demonstrate the contagious nature of visceral lymphomatosis. The Poultry Science Association recognized his contributions to poultry science by naming Waters a Fellow in 1962.

A. J. Maw, who joined the faculty in 1939, carried on the poultry breeding program. His research focused on the results of crossing some of the existing inbred lines of chickens. Maw moved to a position at Pennsylvania State University in 1944 where he had an outstanding career as a scientist and administrator. Among his accomplishments was the discovery of a mutant gene that prevented the utilization of a specific dietary nutrient. A. J. Maw was named Fellow of the Poultry Science Association in 1965.

Arne W. Nordskog became a member of the Poultry Science Department at ISC in 1945 and guided the poultry breeding program until his retirement in 1983. Nordskog's research program was broad in scope and contributed greatly to poultry science, especially in the areas of quantitative genetics and immunogenetics. His contributions include a better understanding of heterosis, limitations of improvements in poultry performance through genetic selection, and use of selection indices for increasing efficiency of egg production. He was the first to identify genes of the major histocompatibility complex in chickens and then to determine their importance in disease resistance, livability, and production traits. Nordskog published 115 papers in

scientific journals and 63 graduate students obtained advanced degrees under his supervision. Many of his advisees continue to occupy prominent positions in academia and industry. In 1972 Nordskog received the CPC International Award for Distinguished Research and he was named Fellow of the Poultry Science Association in 1976. He was inducted into the Poultry Hall of Fame (American Poultry Historical Society) in 1995.

Susan J. Lamont assumed the position of poultry geneticist/immunogeneticist at ISU in 1983. Lamont's research effectively merged two important disciplines, genetics and immunology, to address major issues of importance to poultry science and industry. She became one of the world's experts on the chicken major histocompatibility complex (MHC). Her research contributed to a better understanding of associations of the MHC with immune response and disease resistance, to the molecular organization and regulation of expression of these genes, and to the characterization of the MHC in turkeys. Lamont not only conducts research at ISU but also is involved in collaborative research with scientists elsewhere within the United States and with international researchers. She has published 73 papers in refereed journals and has served as major professor of 12 students for their advanced degrees. Lamont's research contributions were recognized by the Walnut Grove-ISU Livestock Service Award in 1989 and the Iowa State University Foundation Award for Outstanding Achievement in Research in 1999.

## **Poultry Nutrition**

The versatile C. W. Knox was seemingly the first ISC poultry researcher to publish a nutrition paper. Knox and A. R. Lamb authored a paper entitled "The Effect of Certain Vitamin Carrying Additives in Normal Rations for Growing Chicks" published in 1923. They reported that dried buttermilk or dried yeast improved weight gain and feed efficiency whereas cod liver oil, butterfat, or Kentucky bluegrass did not. During the 1930s, E. W. Henderson authored or coauthored several research papers on subjects such as "Factors Involved in Malformation of Bones in Growing Chickens," "Yolk Color and Rations for Hens," "Effects of Ration Composition on Egg Weight," and "Tolerance of Chicks for Dietary Soybean Oil." During this time T. T. Milby and H. L. Wilcke published research papers on nutritional aspects of "slipped

tendon disease" in chicks. Wilcke also evaluated the use of single grains in rations of chicks and laying hens.

The occurrence of World War II evidently caused an interruption in nutrition research. After the war, E. L. Johnson, who joined ISC in 1948, began publishing his findings on methionine requirements of poultry and the value of unidentified factor sources in poultry diets. Before resigning in 1954, Johnson's research provided information on nutritional relationships between methionine and choline and various aspects of turkey nutrition, including data on dietary vitamin B<sub>12</sub> and choline requirements. He also coauthored papers with S. L. Balloun on the estimation of the nutritional value of soybean meal for poultry.

Stanley L. Balloun succeeded E. L. Johnson as poultry nutritionist in 1955 and established a very strong research program. His research focused on improving the efficiency of egg and poultry meat production. Balloun's research showed that efficiency of dietary protein utilization by chickens and turkeys was increased markedly by creating a proper amino acid balance in diets. Balloun also did pioneer research in the areas of animal byproduct utilization, amino acid requirements of laying hens and turkeys, folic acid requirements of turkeys, cholesterol metabolism in chickens, and calcium and phosphorus requirements of chickens. Balloun authored 86 papers in refereed journals and was frequently invited to participate in national and international conferences. He traveled to 23 countries consulting and lecturing to scientists and members of the poultry industry. He wrote the bulletin entitled "Soy-Preferred Protein for Poultry," which was translated into several languages. Thirty-five students completed advanced degrees under his supervision. Balloun received the National Turkey Federation Research Award in 1965, the American Feed Manufacturers Association Nutrition Research Award in 1974, and was named Fellow of the Poultry Science Association in 1978.

Although W. J. Owings' primary responsibility was extension, he also was active in nutrition research, working on his own projects and with S. L. Balloun and J. L. Sell. Areas of his research included evaluation of byproducts of corn processing industry, influence of dietary microbial preparations on poultry performance, phosphorus requirements of laying hens, and microwave processing of soybeans. Owings authored or coauthored 20 papers in scientific journals and many research reports in extension publications. Owings retired in 1995.

After S. L. Balloun retired in 1976, J. L. Sell was appointed to the poultry nutrition position. Nutrition research was carried forth with laying hens, growing turkeys, and broiler chickens. Major areas of research of Sell and his graduate advisees included demonstration of the extrametabolic effect of dietary fats in laying hens, quantitation of relationships between dieting fat concentration and performance of turkeys, determination of phosphorus requirements of laying hens and vitamin E and vitamin K requirements of turkeys, factors affecting physical and functional development of the gastrointestinal tract of turkeys, and efficiency of transfer of dietary conjugated linoleic acid into chicken eggs. Sell served as major professor of students who obtained 54 advanced degrees and he published more than 160 papers in scientific journals. He participated in conferences and consulted with scientists and poultry industry personnel in 22 foreign countries. Sell received the American Feed Manufacturers Association Nutrition Research Award in 1978, the National Turkey Federation Research Award in 1990, and the Merck Award for Achievement in Poultry Research in 1996. He was named Fellow of the Poultry Science Association in 1989.

## **Poultry Products**

Extension activities were ongoing from the early 1900s within the poultry group to help poultry producers produce and market products of high quality. However, research in poultry products was not initiated formally until the appointment of George F. Stewart in 1939. Stewart established a research laboratory primarily designed to study egg quality and egg processing. His research yielded information on the use of heat treatment and/or oiling shell eggs to improve keeping quality, the effects of pasteurization of liquid egg products on their functional properties, factors affecting leavening power of egg white, and methods for destruction of salmonella and coliforms in liquid whole egg. Richard H. Forsythe, who later became Head of the Department of Poultry Science at ISU, worked with Stewart in the area of poultry products research. In 1948, Stewart became Associate Director of the ISU Agriculture Experiment Station and in 1951 took a position in Food Science and Technology, University of California, Davis. Stewart was named Fellow of the Poultry Science Association in 1949.

O. J. Cotterill joined the faculty in 1951 to work in the poultry products area. Cotterill continued to investigate factors affecting egg

quality and spoilage and studied the effects of pH, thermostabilization, and interactions of egg white proteins on lysozyme activity. Cotterill resigned in 1956 to accept a position at the University of Missouri. W. W. Marion assumed the poultry products position in 1958. R. H. Forsythe, who had an interest in poultry products research, became head of the department in 1960. Marion's research focused on the determination of basic characteristics of meat and eggs. Studies were done to document the rate of cholesterol deposition in eggs and factors affecting cholesterol deposition. Characteristics of eggshells, including calcium and protein contents, were measured to determine their relationships with breaking strength of shells. Changes in nutrient composition of poultry meat during frozen storage were investigated. Pesticide metabolism in laying hens also was studied. When Marion assumed administrative responsibilities in Poultry Science and Food Technology, he had published 46 papers in scientific journals.

R. H. Forsythe contributed substantially to poultry product research during his first tenure at ISC (1947–51) and while serving as head of the department (1960–67). Much of his research was focused on composition and functional properties of egg whites and factors affecting egg quality. He also conducted research on procedures for commercial processing of liquid contents of eggs and on various aspects of microbial contamination of eggs. During his career, he was author of more than 50 papers in refereed journals and numerous articles in symposia and conference proceedings. After leaving ISU in 1967, Forsythe had distinguished careers in industry and at the University of Arkansas. In the latter instance, he played a vital role in the establishment of the Poultry Center of Excellence at the University of Arkansas. Forsythe was named Fellow of the Institute of Food Technologists in 1982, Fellow of the Poultry Science Association in 1995, and was inducted into the American Poultry Historical Society Hall of Fame in 1989.

R. J. Hasiak was appointed to an extension/research position in 1972 and participated in research projects related to microbiological and sensory qualities of turkey meats. Hasiak also did field studies on problems encountered at turkey and egg processing plants. Hasiak resigned in 1992 and took a position in the U.S. Department of Agriculture.

In 1994, D. U. Ahn was hired as poultry products specialist. Ahn has conducted research on mechanisms of lipid oxidation in meat and the determination of oxidation products that cause off-flavors. He also

studied factors affecting the solids content of eggs, formation of cholesterol oxides in meat and egg products during processing and storage, effect of irradiation on lipid oxidation and volatiles production, and sensory characteristics of irradiated meat products. The influence of conjugated linoleic acid on physical and sensory traits of eggs and the metabolism of conjugated linoleic acid in laying hens also have been areas of study. During his relatively brief career he has published more than 60 papers in refereed journals and has mentored numerous graduate students and visiting scientists. Ahn received the American Egg Board Research Award in 2000.

### **Teaching**

Research also is a vital part of teaching, although not so well recognized as are the research disciplines. George Brant's primary responsibilities included teaching poultry and animal science courses and advising undergraduate students. While fulfilling these duties, he developed, on the basis of innovative thinking and research, numerous computer programs for use in teaching. These programs facilitated better instruction by teachers and a greater understanding of the subject matter by students. Some of these programs are used by faculty at other universities. Brant also has been active in the preparation of several texts and syllabi to assist the teaching and learning processes.

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## *Chapter 5*

# Poultry Faculty and Staff Contribute to Success

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The titles assigned to faculty who were in charge of poultry husbandry/science varied over the years, as shown in the list of Leaders/Coordinators that follows. From 1907 to 1948, Poultry Husbandry, and from 1973 to the present, Poultry Science was a part of the Department of Animal Science. An independent Department of Poultry Husbandry/Science existed from 1948 to 1973.

### **Leaders/Coordinators of Poultry Husbandry/Science**

H. C. Pierce	1907–1911	Professor in Charge
W. A. Lippincott	1911–1912	Professor in Charge
G. M. Turpin	1912–1918	Professor in Charge
H. A. Bittenbender	1919–1930	Chief of Poultry Husbandry
R. L. Cochran	1930–1931	Acting Chief of Poultry Husbandry
E. W. Henderson	1931–1938	Head of Poultry Section
H. L. Wilcke	1938–1943	Head of Poultry Husbandry
A. J. Maw	1944–1945	Acting Head of Poultry Husbandry
R. E. Phillips	1945–1959	Head of Poultry Husbandry
R. H. Forsythe	1960–1967	Head of Poultry Husbandry/Science
L. Z. Eggleton	1967–1968	Acting Head of Poultry Science
W. W. Marion	1968–1973	Chairman of Poultry Science
A. W. Nordskog	1974–1978	Section Leader of Poultry Science
J. L. Sell	1978–1999	Section Leader of Poultry Science
Susan L. Lamont	1999–present	Coordinator of Poultry Science

Day-to-day work at the poultry farms, secretarial and clerical assistance, and work of the laboratory technicians and research associates contributed much to the success in teaching, research, and extension activities in poultry at ISC/ISU. Thus, it is appropriate to list persons who occupied those positions. Unfortunately, only records of

persons employed from 1937 onward were available, and the years of employment may not be exactly correct because of "gaps" in the records.

### **Foremen and Superintendents of the Poultry Farms**

Burt Perry	(1937-1947)	Lester Williams	(1976-1986)
Charles Callahan	(1947-1976)	William Larson	(1986-present)

### **Animal Caretakers**

H. F. Foley	(1937-1938)	C. Pugh	(1959-1963)
M. J. Foley	(1937-1941)	R. Jondall	(1961-1986)
E. McKenna	(1937-1945)	W. Strothers	(1961-1979)
H. Willhoit	(1937-1941)	H. Albertson	(1963-1976)
C. Callahan	(1938-1976)	G. Peterson	(1963-1964)
S. Nyguard	(1942-1943)	G. Johnson	(1964-1975)
R. L. Barnes	(1942-1943)	W. Miller	(1969-1990)
C. Swan	(1943-1946)	A. Drake	(1970-1971)
E. Erickson	(1944-1945)	L. Yeoman	(1971-1973)
E. Markley	(1946-1947)	R. Eslick	(1973-1974)
J. Parr	(1946-1947)	H. Harrison	(1974-1975)
G. O'Neil	(1947-1948)	G. Bales	(1975-1977)
A. Jefferson	(1947-1978)	B. Janvrin	(1976-1981)
B. Keltner	(1947-1949)	D. Williams	(1976-1991)
H. Campbell	(1947-1948)	W. Larson	(1977-1986)
G. Grady	(1948-1949)	L. Tjelta	(1978-1983)
D. Morgan	(1948-1952)	J. Tjelta	(1979-present)
M. Mielke	(1949-1950)	B. Funk	(1982-1984)
H. Nichols	(1949-1961)	D. Peterson	(1983-2000)
O. Eggers	(1950-1968)	W. Rogers	(1984-present)
G. Hall	(1950-1958)	Gary Kennedy	(1990-1991)
E. Anderson	(1950-1976)	J. Mackie	(1992-2000)
J. Sams	(1951-1959)	S. Johnston	(2001-present)
R. Chelsvig	(1955-1958)		

### **Secretarial and Clerical Staff**

Designations of these positions varied with time. Thus, the following codes after the person's name are used: C=clerk, St=stenographer, Sy=secretary.

Lucille Richey, St	(1937-1938)	Illa Ladman, C, St	(1939-1942)
Theda Bowman, C, St	(1938-1939)	Lorane Mellebacker, C	(1941-1942)

Mary Olinger, St	(1942–1944)	Miriam Thomas, St	(1964–1965)
Norma Catlin, C	(1942–1943)	Diane Wright, St	(1965–1966)
June Berkley, C	(1943–1944)	Miriam Stevenson, St	(1966–1967)
Jessie Hostettler, St	(1944–1945)	Diane Motz, Sy	(1967–1970)
Emma Trampel, St	(1945–1946)	Janet Hagaman, St	(1967–1969)
Katheryn Ogden, C	(1948–1949)	Jeanette Kaminiski, St	(1967–1969)
Barbara Brainard, St	(1949–1950)	Mabel Auld, C	(1968–1983)
Leowta Buck, C, St	(1949–1951)	Linda Kennedy, St	(1969–1971)
Edna Azeka, St	(1952–1953)	Sonja Kinney, Sy	(1970–1971)
Vera Wanamaker, C	(1952–1954)	Nancy Holcomb, Sy	(1971–1980)
Phyllis Opperman, St	(1953–1954)	Jean Magnuson, St	(1971–1972)
Barbara Patterson, St	(1954–1955)	Kathleen Crilly, St	(1972–1973)
Jean Kaltenhuser, C	(1954–1956)	Diann Burke, St	(1973–1975)
Margaret Keeseey, St	(1955–1956)	Mirian Brandenburg, C	(1975–1976)
Marjory Button, St	(1956–1957)	Vicky Hensen, C	(1976–1977)
Darlene Smalley, St	(1957–1958)	Laura Robinson, C	(1977–1978)
Alice Barnes, C	(1957–1968)	Mary Kay Litzel, C, Sy	(1979–1984)
Mary Lou Cowgill, St	(1958–1959)	Karen Ellson, C	(1981–1983)
Marlys Waggoner, St	(1959–1960)	Amy Crouch, C	(1983–1984)
Sharon Christensen, Sy	(1960–1961)	Ellen Fairchild, C, Sy	(1983–1985)
Ramona Lingscheit, Sy	(1961–1962)	Doris Anderson, C	(1984–1985)
Barbara Stark, St	(1961–1962)	Jody Danielson, C	(1985–1986)
Judith Erickson, St	(1962–1963)	Andrea Zeff, C	(1986–1990)
Betty Martin, C	(1963–1965)	Mary Cochran, C	(1990–1999)
Norma Trinkle, Sy	(1963–1967)	Ann Shuey, Sy	(1985–1999)
Sharon Schultz, St	(1963–1964)		

### Laboratory Technicians/Assistants

H. Ward	(1947–1951)	N. Holt	(1974–1975)
G. Clevenger	(1957–1968)	J. Jacobs NoNoNo	(1975–1979)
M. Hirsher	(1961–1962)	Y. Dubberke NoNo	(1979–1984)
B. Royer	(1965–1967)	B. Young NoNoNo	(1984–1992)
B. Robinson	(1966–1968)	B. Rahn NoNoNoNo	(1981–1989)
J. Falk	(1967–1969)	M. Jeffrey NoNoNo	(1990–2000)
H. Needleman	(1970–1971)	N. Nelson NoNoNo	(1992–1995)
J. Vergel	(1971–1972)	E. Johnson	(1996–1999)
R. Paulson	(1972–1974)		

## Research Fellows, Associates, Research Associates, and Instructors

J. K. Williams	(1937–1938)	R. M. Hanson	(1962–1963)
D. MacLaury	(1938–1940)	W. J. Ross	(1962–1964)
P. R. Record	(1938)	M. F. Festing	(1962–1963)
C. I. Draper	(1939–1940)	D. L. Miller	(1964–1965)
R. E. Phillips	(1939–1941)	H. Tolman	(1964–1965)
R. W. Kline	(1940–1943)	R. Jungk	(1966–1967)
M. C. Sweet	(1940–1941)	G. M. Speers	(1967)
H. R. Connally	(1941)	D. M. Briggs	(1967–1969)
P. E. Sanford	(1941)	A. C. Cox	(1968)
P. A. Grace	(1943–1944)	J. F. Tierce	(1971–1973)
L. R. Best	(1943–1944)	P. Hayse	(1972–1973)
W. O. Wilson	(1944–1946)	H. S. Greenberg	(1974–1975)
B. K. Stepp	(1944–1947)	I. Y. Pevzner	(1975–1979)
A. B. Stephenson	(1945–1947)	J. W. Hardiman	(1976–1977)
C. Bollenback	(1948)	T. L. Wing	(1979–1980)
H. M. Ward	(1950–1954)	H. Singh	(1981–1982)
R. J. McVicker	(1953–1954)	Y. H. Hou	(1983–1984)
P. R. Walther	(1957–1960)	S. Cheng	(1985–1988)
L. T. Smith	(1959–1961)	M. Richard	(1989)
L. W. Schierman	(1961–1963)	M. Kaiser	(1996–present)

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## **Chapter 6**

# **Poultry Work in Other Parts of ISU**

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### **College of Veterinary Medicine**

Several outstanding faculty in Veterinary Medicine at ISU worked in extension and research, beginning in the early 1930s with the extension and diagnostic work of Chester Lee. Extension personnel who followed Lee's tenure have been Clifford Nelson and Darrell Trampel. Faculty with primary appointments in teaching and research included Melvin Hofstad, Harry Yoder, John Barnes, and Donald Reynolds.

### **Department of Agricultural and Biosystems Engineering**

Extension and research efforts for the benefit of the poultry industry have been done in this department. Examples include collaboration with faculty in the Poultry Husbandry Department in the design of poultry buildings (J. B. Davidson and W. A. Lippincott, 1912). Thamon Hazen was primarily responsible for planning and supervising the building of the present Poultry Science Farm in 1961-62. More recently V. Meyer assisted turkey producers with the design of ventilation systems for turkey barns. H. Xin established an active research program to obtain basic information on heat production by hens and studied practical ways of cooling laying hens during heat stress. Xin also obtained data on heat and moisture production by growing turkeys for use in designing more efficient ventilation systems.

### **Department of Genetics**

Considerable collaborative research on poultry breeding was done by faculty of the Departments of Genetics and Poultry Husbandry, beginning in the 1920s and continuing into the 1970s. W. V. Lambert was an early contributor to poultry research. He worked with C. W. Knox in studies documenting heritable traits of chickens, including heritability of skin color, disease resistance, and blood groups. Between 1926 and 1936, Lambert authored 19 papers on poultry

breeding. Later, J. W. Gowen, J. A. Brumbaugh, and W. A. Hollander used poultry in their genetics research program. Hollander authored several papers on the genetics of feather color in various poultry. Hollander also wrote a brief description about poultry research in the genetics department. This report is entitled "Iowa State Genetic Department Poultry Work," which is filed in the Poultry Science papers, Special Collections Department, ISU Library.

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## **Chapter 7**

# **Awards and Honors**

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The list of awardees and honorees that follows may not be complete. Records of this information dating before 1950 are sketchy at best and missing for the most part. In some instances people who received awards after leaving ISC/ISU are listed because of their relatively strong ties to the university. Where available, a reference is given for the location of citations of specific awards for use by readers who wish to obtain details. Vitae of recent poultry faculty members also are available in the Special Collections Department, ISU Library.

### **Faculty Awards**

- Dong U. Ahn – American Egg Board Research Award, 2000.  
(Poultry Science 80:1872)
- Stanley L. Balloun – National Turkey Federation Research Award, 1965.  
(No citation was published in Poultry Science)  
– American Feed Manufacturers Research Award,  
1974. (Poultry Science 53:2262–2263)  
– Fellow, Poultry Science Association, 1978.  
(Poultry Science 57:1811–1812)
- Leonard Z. Eggleton – The Pfizer Extension Teaching Award, 1960.  
(Poultry Science 39:1588–1589)  
– Iowa Poultryman of the Year, 1970.
- Richard H. Forsythe – Institute of American Poultry Industry Research  
Award, 1952.  
– Fellow, Institute of Food Technologists, 1982.  
– American Poultry Historical Society Hall of  
Fame, 1989.  
– Fellow, Poultry Science Association, 1995.  
(Poultry Science 74:2087)

- Charles W. Knox** – Fellow, Poultry Science Association, 1958.  
(Poultry Science 37:1482–1483)
- Susan J. Lamont** – Walnut Grove-ISU Livestock Service Award, 1989.  
– Iowa State University Foundation Award for  
Outstanding Achievement in Research, 1999.  
– Regents Award for Faculty Excellence (ISU), 2001
- Arne W. Nordskog** – CPC International Award for Distinguished  
Research, 1972. (Poultry Science 51:2135)  
– Fellow, Poultry Science Association, 1976.  
(Poultry Science 55:2529–2530)  
– American Poultry Historical Society Hall of  
Fame, 1995.
- William J. Owings** – Iowa Poultry Industry Person of the Year, 1983.  
– ISU Extension Meritorious Service Award, 1988.  
– Iowa Turkey Federation Hall of Fame, 1999.
- Robert Penquite** – Purina Mills Teaching Award, 1949.  
(No citation was printed in Poultry Science)
- Howard C. Pierce** – Fellow, Poultry Science Association, 1951.  
(Poultry Science 30:937–938)  
– Charter member of Instructors and Investigators  
in Poultry Husbandry, which later became the  
Poultry Science Association.
- Jerry L. Sell** – American Feed Manufacturers Association  
Research Award, 1978. (Poultry Science 57:1807–  
1808)  
– Named C. F. Curtiss Distinguished Professor in  
Agriculture, ISU, 1986.  
– President of the Poultry Science Association,  
1986–1987.  
– Fellow, Poultry Science Association, 1989.  
(Poultry Science 68:1757–1758)

- National Turkey Federation Research Award, 1990.  
Poultry Science 69:2265)
- Merck Award for Achievement in Poultry  
Science, 1996. (Poultry Science 75:1623-1624)

George F. Stewart - Fellow, Poultry Science Association, 1949.  
(No citation was published in Poultry Science)  
- International Award, Institute of Food  
Technologists, 1966.

Nelson F. Waters - Poultry Science Research Award, 1932.  
(Poultry Science 11:318)  
- Fellow, Poultry Science Association, 1962.  
(Poultry Science 41:2002-2003)

Harold L. Wilcke - Fellow, Poultry Science Association, 1978.  
(Poultry Science 57:1814-1815)

### **Graduate Student Awards**

C. Roselina Angel - Graduate Student Research Paper Certificate of  
Excellence, 1989 (Poultry Science:68:1763,  
advisor: J.L. Sell)  
- Graduate Research Award, 1990  
(Poultry Science 69:2260)

Amy Batal Corless - Graduate Student Research Paper Certificate of  
Excellence, 1998 (Poultry Science 77:1941,  
advisor: J.L. Sell)  
- Graduate Research Award, 1999 (no citation was  
published)

Catherine  
Young Davis - Graduate Student Research Paper Certificate of  
Excellence, 1982 (Poultry Science 61:2549,  
advisor: J.L. Sell)  
- Graduate Student Research Paper Certificate of  
Excellence, 1984 (Poultry Science 63:2549,  
advisor: J.L. Sell)

- Fernando Escribano – Graduate student Research Paper Certificate of Excellence, 1988 (Poultry Science 67:1855, advisor: J.L. Sell)
- Peter R. Ferket – Graduate Student Research Paper Certificate of Excellence, 1985 (Poultry Science 64:2534, advisor: J.L. Sell)  
– Graduate Student Research Paper Certificate of Excellence, 1987 (Poultry Science 66:2104, advisor: J.L. Sell)
- Ronald Kean – Graduate Student Research Paper Certificate of Excellence, 1992 (Poultry Science 71:2167, advisor: S.J. Lamont)
- Keith Turner – Graduate Student Research Paper Certificate of Excellence, 1993 (Poultry Science 72:2400, advisor: J.L. Sell)
- Terry Wing – Graduate Student Research Paper Certificate of Excellence, 1979 (Poultry Science 58:1692, advisor: A.W. Nordskog)

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# Appendix A

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Information in this appendix was obtained from the Iowa State College/University Catalogs and the Poultry Science Department file in the Special Collections, ISU Library.

## Article 1

OFFICE SECY AND SUPERINTENDENT  
IOWA STATE AGRICULTURAL COLLEGE AND FARM,  
COLLEGE FARM, JANUARY 1, 1866.

*To the Honorable Senate and  
House of Representatives of the State of Iowa :*

In pursuance of law I have to make the following report of the proceedings of the Board of Trustees of the Iowa Agricultural College and Farm for the year 1865. Also, I herewith transmit a brief history of the Institution from its organization in 1858, up to the present time, together with the reports of the Executive and Building Committee and Architect, as follows, to-wit:

Withdrawn  
IOWA STATE UNIVERSITY  
of Science and Technology  
Library

1858-66

REPORT OF THE SECRETARY

OF THE

IOWA AGRICULTURAL COLLEGE AND FARM.

According to instructions, I beg leave to make a plain and concise statement of the condition, history and wants of the College and Farm, from 1858 to 1866.

At the session of the Legislature of 1858, an act was passed providing for the establishment of a State Agricultural College and Farm, with a Board of Trustees, which shall be connected with the entire agricultural interest of the State. M. W. Robinson, Timothy Day, John Wright, G. W. F. Sherwin, Wm. Duane Wilson, Richard Gaines, Snel Foster, J. W. Henderson, Clement Coffan, E. H. Williamson, and E. G. Day, were appointed the first trustees. Clement Coffan and E. H. Williamson would not serve. Peter Melendy and John Pattee were appointed to fill their seats.

The institution is managed by a Board of Trustees, who are appointed by the Legislature, one being taken from each Judicial District in the State, and embracing the Governor and President of the State Agricultural Society, being in all fourteen members.

The Board serves without pay for their services. Its officers are, a President *pro tem.*, a Secretary and Treasurer, and an Executive Committee of three to act during the interim of the meetings of the Board.

In 1858 the Legislature passed an Act, appropriating ten thousand dollars for the purchase of a Farm on which to locate an Agricultural College. A farm was purchased in 1859 in Story County, situated about midway between Nevada and Boonsboro, and about thirty miles directly north of Des Moines.

The Cedar Rapids and Missouri Railroad is now running directly through the farm, coming into it on the east side about ninety rods north of the south line, and running diagonally through it, bearing

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of Science and Technology  
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north-west, and leaving it on the north line within about twenty rods from the north-west corner, dividing it so as to leave about one hundred and sixty acres on the north side and about four hundred and eighty-eight acres on the south side of the Railroad. The farm contains six hundred and forty-eight acres, and is admirably adapted to the purposes of the institution, embracing all the leading varieties of soil in the State. It is well watered by Squaw and Clear creeks running through the farm, Squaw creek on the east, Clear creek on the west sides, affording an inexhaustible supply of pure stock water.

Near the center of the farm there are several fine springs, affording a good supply of water. The timber is principally black walnut, oak, elm, white maple, linn, cotton-wood, ash, hickory and numerous other valuable varieties.

The farm contains six hundred and forty-eight acres lying in a body, being about four hundred rods long from east to west, and about two hundred and fifty-nine rods wide from north to south. After deducting the one hundred and fifty acres above described, there remain four hundred and ninety-eight acres of prairie land suitable for grass and grain. There is probably not far from one hundred and eighty acres of low bottom land, about one hundred of which is covered with timber; the remainder is equally divided between wet and dry bottom.

The low land in the timber is a rich, deep, black, sandy loam, with clay subsoil, but not inclined to hold water on the surface. Next west adjoining the timber is a fine smooth, level tract of low land, remarkably well adapted for grass, but could, by a judicious system of drainage, be converted into a most productive corn land, not excelled in the West. Beyond this, to the north-west, is a large tract known in this State as second bottom land, being level, dry and very rich, and remarkably productive for almost every crop grown in this latitude. The soil is a mixture of black sand, fine gravel, and rich black alluvium and prairie soil proper, comprising, perhaps the most desirable soil known to the agriculturist. West of this is a large tract of level prairie, the soil being dry, slightly intermixed with fine gravel in places, with clay subsoil, being a fair representative of the prevailing prairie soil of the State. On the north-west corner of the farm is a tract of perhaps forty acres of clay soil, most of which is covered with a heavy growth of oak,

walnut and hickory timber. Though called clay soil, this land is a fair specimen of what is known in this State as "barrens" and "timber land." The soil is a mixture of prairie and clay, with heavy clay subsoil, and is considered the best wheat and fruit land in the Western States. On the south side of the farm is about ninety acres of high rolling prairie, intermixed with gravel, and well adapted for almost any grain crops, being warm and dry, the ravines which intersect it, carrying off all surplus water in the wettest seasons. The gravel contained in the soil is mostly on the surface, and is turned under by the first plowing, nearly disappearing after cultivation. There are five sand and gravel banks on the farm, furnishing an inexhaustible supply for building purposes, and for grading roads, walks and yards.

There is also on the farm good clay for making brick convenient to where the College is now being built.

#### THE IMPROVEMENTS

consist of a good, substantial, brick farm house, with a basement of stone, making a cellar under the whole building. The house is completed except painting, and when finished will cost about four thousand dollars. The brick were manufactured on the farm. There is also a good barn on the place, well finished and painted, of good light, and is forty-two by sixty feet in size, capable of providing storage room for grain, and shelter for the necessary teams and stock connected with the farm. There is a good stone basement under the barn, and a large yard inclosed by a substantial fence. Also a fine smoke and ash house fourteen feet square, built of brick.

A great portion of the work and material used in the erection of these buildings was furnished in payment of voluntary subscription by citizens in the vicinity.

There is about four hundred acres of the farm inclosed by a substantial fence, a part of which is built by boards and posts, five (5) boards high, and the remainder of rails, staked and ridered, eight rails high. The fences are built of good material and are put up in a very substantial manner. Of the land enclosed about one hundred and fifty-one acres are under cultivation.

There is a fine young orchard of about four hundred thrifty trees, near the house, inclosed by a good fence. This experiment has sat-

ified the people in the vicinity that the prevalent opinion that fruit cannot be raised upon our *open prairies* is entirely erroneous. Fine apples have been grown upon many of these trees, which had been planted out but four *years*, on *level, open prairie*. To be successful, it only requires ordinary care, such as one would bestow upon a corn crop, and the farmers are profiting by this demonstration placed before their eyes. The trees on the farm were donated by Mr. Jas. Smith, the well known nurseryman of Des Moines.

About seventy-five grape vines have been planted near the orchard, of several different varieties, among which are the Concord, Clinton, Isabella and Catawba. They are doing well, making a fine growth and producing some fruit.

Building material can be found in abundance on the farm and in the immediate vicinity. The necessary wood to burn the brick can be procured from down timber, which is fast going to waste, and the best kind of clay and sand for the manufacture of the brick is found in abundance on the farm. Stone can be had within three and a half miles, and lime within six miles of the farm.

The farm, which has been fully described, was purchased at a cost of \$5,379.12. In consideration of having the college building located at that place, the citizens of Story and Boone counties made liberal donations of lands, money, labor and material to the amount of about seven thousand dollars, to assist in improving the farm and erecting the necessary farm buildings.

#### DONATIONS.

Story county donated ten thousand dollars in the bonds of the county, bearing seven per cent. interest. There is also appropriated the proceeds of the sale of five sections of land in Jasper county, known as the Capitol lands. The value of the lands is about \$17,000.

It was expected that the Legislature of 1860 would have made an appropriation sufficient to commence the erection of suitable college buildings, but as the financial condition of the State would not justify it, an appropriation was not asked for. At the session of 1862, an appropriation was not expected, as the whole finances of the State were needed to meet the extraordinary expenditures incident to the suppressing of the rebellion. Hence nothing had been done to add to its prospective revenue since the Institution

was organized, until the last session. We have done what we deemed prudent in opening a farm and erecting thereon buildings suitable for a dwelling for a farmer, and also shelter for the crops and animals.

Beyond the expenditures necessary to place the farm under a fair state of cultivation, the Trustees did not feel justified in making appropriations from the limited amount in their hands, but preferred reserving the best of the assets for an endowment to meet the expenses of the Institution when in operation, hoping that when it had the ability the State would make the needed appropriation for college buildings. But, during this time the people of the State generally supposed that the buildings were erected, and that the college would soon be opened to the public; and many applications have been made to receive students. Had it not been for the extraordinary condition of the financial matters of the State, such would doubtless have been the condition of the Institution on the opening of the present year. It is now about seven years since the purchase of the College Farm. If all this could not have been done, a general expectation or hope at least, was felt by its friends generally, that the farm would be open for experimental husbandry. Even this could not be accomplished under the circumstances without involving an expenditure which it was thought would not be justified by the people of the State, unless the college institution was fully provided for.

In July, 1862, Congress appropriated to the several loyal States in the Union, for agricultural colleges, 30,000 acres of land for each Senator and Representative in Congress. The amount under this grant to the State of Iowa was 240,000 acres. Any State accepting this grant is required by the terms of the grant to erect the necessary college buildings without using any of the proceeds of the lands for that purpose, within five years from the time of acceptance of the grant. (The State of Iowa, at the special session in September, 1862, accepted the grant, with this and other conditions imposed therein.) The lands have been selected by an agent every way competent, appointed by the Governor and approved by the Board of Trustees of the College, as required by the acceptance law of the State, and they have been approved and certified to the State.

They embrace some of the best unentered lands in the State,

and when prepared for sale will command the attention of the immigrants. As the interest on the proceeds of the sales of these lands is exclusively devoted to meet the annual expenditures of the Institution, there will be a fund soon created to sustain the Institution. This munificent grant having relieved the Board from any anxiety in regard to the future endowment of the Institution, they felt that a portion of the reserved assets might safely be used to place the farm in a condition to experiment upon crops; the purchase of several of the leading races of improved animals of all kinds, and testing their value by crossing on native breeds; best mode of feeding, shelter, &c., and in beautifying the farm with useful trees and shrubbery, and preparing fully for the work contemplated in the establishment of the Institution.

Such is a brief history of the Institution under the management of the Board of Trustees, which is almost exclusively confined to the farm and the operations thereon. The next point is the college proper, and the course of studies to be pursued therein, which are specified in the organic law as follows, with some other provisions in regard to students, &c.

The course of instruction shall include the following branches, to-wit:

Natural Philosophy, Chemistry, Botany, Horticulture, Fruit Growing, Forestry, Animal and Vegetable Anatomy, Geology, Mineralogy, Meteorology, Entomology, Zoology, the Veterinary Art, Plane Mensuration, Leveling, Surveying, Book-keeping, and such mechanical arts as are directly connected with agriculture. Also such other studies as the trustees may from time to time prescribe not inconsistent with the purposes of this act.

The Board of Trustees shall establish such professorships as they may deem best to carry into effect the provisions of this act.

Tuition in the College herein established shall be forever free to pupils from this State over fourteen years of age, and who have been residents of the State six months previous to their admission. Applicants for admission must be of good moral character, able to read and write the English language with ease and correctness, and also pass a satisfactory examination in the fundamental rules of arithmetic.

The trustees upon consultation with the professors and teachers shall from time to time establish rules regulating the number of

hours, to be not less than two in winter and three in summer which shall be devoted to manual labor and the compensation therefor, and no student shall be exempt from such labor except in case of sickness or other infirmity.

#### OBJECT OF THE INSTITUTION.

The Iowa State Agricultural College has for its object, to associate a high state of intelligence with the practice of Agriculture and the industrial or mechanic arts, and to seek to make use of this intelligence in developing the agricultural resources of the country and protecting its interests. It proposes to do this by several means.

1. As a purely educational institution its course of instruction is to include the entire range of Natural sciences, but will embrace most especially a practical bearing upon the every day duties of life, in order to make the student familiar with the things immediately around him, and with the powers of nature he employs and with the material through the instrumentality of which, under the blessings of Providence, he lives and moves and has his being; and since Agriculture, more than any other of the industrial arts combined, it follows that this should receive by far, the highest degree of attention. The course of instruction is to be thorough so that it will not only afford the student the *facts* of science, but will discipline his mind to habits of thought, and enable him fully to comprehend the abstract principles involved in the practical operations of life. In doing this it is not deemed possible to educate every agriculturalist, artisan, mechanic and business man in the State, but to send out a few students educated in the college course, that they, by the influence of precept and example, may infuse new life and intelligence into the several communities they may enter. A single individual who is thoroughly educated in the principles and practice of an art followed by a community, will often exert a more salutary influence upon the practice of this art by the community, than would result from sending the *whole community* to a school of lower order than that which he attended. A single practical school of the highest order in Paris (the *École Polytechnique*), during the last generation, made France a nation celebrated alike for profound philosophers, great statesmen, able generals and military men, and civil engineers. If one high school of practi-

cal character is established, subordinate schools, affording the elementary education of the latter, will follow in due time.

2. As a practical education the Trustees of the Iowa Agricultural College have adopted the fundamental principle, that whatever is necessary for man to have done, it is honorable for man to do, and that the grades of honor attached to all labor, are dependent upon the talent and fidelity exhibited in performing it. It is further considered essential as a part of the student's education that he be taught the practical application, in the field and laboratory, of the principles of his studies in the class room; and manual labor is also necessary for the preservation of health, and the maintenance of the habits of industry. An incidental but not unimportant result of the operations of these principles is a reduction of the cost of tuition by the value of the labor, so that the College can take students at very low rates of admission.

All students, without regard to pecuniary circumstances, are, therefore, obliged to perform manual labor as an essential part of the College education and discipline and training. In these respects consists a most essential difference between the idea associated with manual labor and that of all other attempts made heretofore to combine manual labor with study. Instead of the idea of poverty and want being associated with those that labor, that of laziness and worthlessness is associated with those who refuse to work efficiently, and the experience of established institutions has already most assuredly shown that no young man of whom there is any hope for future usefulness in life, is insensible to the disgrace which thus attaches to the lazy, who will work only as they are watched, and cheat their fellow-students by refusing to do their share of the labor assigned them, and nothing is more conclusively settled than that those students who are most studious and industrious in class, work the most efficiently, and are the most trustworthy in the performance of their daily work.

3. As an *Experimental Institution* our College has an unbounded field for labor. The principles of Agricultural Science, which shall ultimately constitute the subject of instruction in its class rooms will be a prominent and important branch of it. The development of no other department will yield richer and more lasting results, or confer more substantial benefit upon agricultural practice than this. Much time, however, is required to make thorough

and reliable experiments—they will not pay at once. As well might the farmer expect to reap his crop the day he sows his grain. They will, however, ultimately pay a thousand fold, as have the practical application of the sciences of electricity, heat and optics in the present day, paid for the half century of apparently unpractical, purely scientific investigations that led to the results now obtained through them.

The design of this institution is different from all other educational institutions in the country, excepting one in Pennsylvania, and one in Michigan, now in successful operation. By the union of labor and study, they are both placed in their proper position, and thus only are exhibited in their true dignity. Here they are taught to walk together, and that separation is degrading to both. The student's mind and hands are first prepared to promote skill and success in the important and honorable occupation of cultivating the soil, but he will be almost equally fitted to fill with honor any other position in life. There is thus supplied a practical and equal education so much needed by the great body of our farmers, and cheap enough to be embraced by all. "The farmer who claims such an equal education for his son, feels an *imperative necessity* for an institution such as this. He sees that the son of a farmer who has been a four-years' course at our old Colleges, returns with his eyes and his thoughts, and the best of his mind directed *away from* the objects which worthily and usefully occupy his father and his brothers. He is useless and inferior in the sphere of his home; he cannot labor; he must go from home; he is *driven* from it; he can do nothing but enter a profession, and in any profession he may enter, if he cannot make a conspicuous mark, he is a miserable thing at best, and almost certain to fall into ruinous habits and to become their victim. And the unhappy and disappointed father loses not only the cost of his education, his own struggles and expended energy, but in three cases out of four, *the son himself*. How different the case in circumstances which such an institution as ours is destined to establish. The boy in great part aids to work out his own education. Instead of dragging on his father, he aids him; instead of wasting his physical abilities, through want of exercise, he labors and develops them; while his mind is being stored with both practical and refining knowledge, his hands are educated to expertness in a thousand operations, and his body to grace and

strength. How delightful will be the meeting between the graduate of our *Agricultural* school and his father and brothers. He has stores of information for them, and there is mutual interest, and subjects of conversation in everything around. The proud and gratified father will bless the means by which his highest wishes have been accomplished." So plain is the need of this course of training, even to the dullest mind, and so plain is the method of establishing it, it is wonderful up to this day, that such schools are only commencing in this country.

The inquiry will naturally be made in regard to the cost of educating and sustaining a scholar in the college for one year. In the Farmers' High School of Pennsylvania, the price for board, lodging, washing, fuel and lights, is fixed at \$200 per annum. The cost in our institution would not exceed the sum from which would be deducted the amount credited for labor on the farm. The tuition is made free by law.

#### THE PRESENT BOARD OF TRUSTEES.

*President*—Wm. H. Holmes, Polk county.

*Secretary*—Peter Melendy, Black Hawk county.

*Treasurer*—M. W. Robinson, Des Moines county.

*Members*—Suel Foster, Muscatine county; Thomas Holyoke, Poweshiek county; James A. Bronson, Jones county; John McDonough, Clarke county; Joseph McGowan, Appanoose county; P. Henkly, Fayette county; P. Cadwell, Harrison county; L. Q. Hoggett, Story county.

*Ex-officio Member*—Gov. Wm. M. Stone, Marion county.

*Executive and Building Committee*.—Wm. H. Holmes, Peter Melendy, James A. Bronson.

I herewith submit a statement, exhibits and receipts, and expenditures of the farm and college building from the commencement in the winter of 1858, to the first day of January, 1866:

#### RECEIPTS.

Appropriation by the State in 1858.....	\$ 10,000 00
Bonds of Story county.....	10,000 00
Notes of individuals.....	4,420 00
Subscriptions.....	920 00



Article 2

THIRD BIENNIAL REPORT

1868/69

OF THE

BOARD OF TRUSTEES

OF THE

STATE AGRICULTURAL

COLLEGE AND FARM,

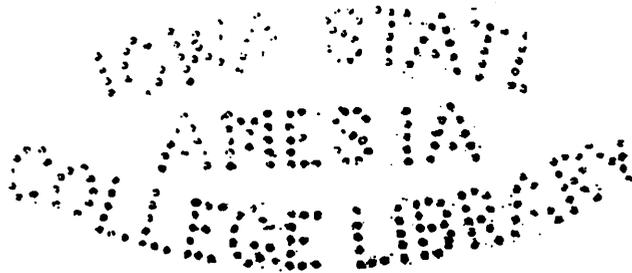
TO THE

GOVERNOR OF IOWA

AND THE

THIRTEENTH GENERAL ASSEMBLY

January 1870



## FACULTY.

---

HON. A. S. WELCH, M. A.,  
PRESIDENT.

GEORGE W. JONES, M. A.,  
PROFESSOR OF MATHEMATICS.

HON. NORTON S. TOWNSHEND, M. D.,  
PROFESSOR OF PRACTICAL AGRICULTURE.

ALBERT E. FOOTE, M. D.,  
ASSISTANT PROFESSOR OF CHEMISTRY

O. H. ST. JOHN, B. S.,  
ASSISTANT PROFESSOR OF GEOLOGY. (NOT ON DUTY.)

MRS. CATHERINE S. POTTER,  
MATRON.

MISS AUGUSTA MATHEWS,  
TEACHER OF PIANO MUSIC.

MISS LILLIE BEAUMONT,  
TEACHER OF THE FRENCH AND GERMAN LANGUAGES.

HON. HUGH M. THOMSON,  
SUPERINTENDENT OF THE FARM.

[No. 16.]

## PRESIDENT'S REPORT.

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IOWA STATE AGRICULTURAL COLLEGE,  
AMES, STORY COUNTY, IOWA, January 10, 1870. }

TO THE BOARD OF TRUSTEES.

**GENTLEMEN:** In the plan of organization of the Iowa State Agricultural College, adopted November 21, 1868, you require that the President shall make an annual report to the Trustees on the condition and progress of the college, together with his views as to the additional facilities needful for its further development, and embodying the reports of other officers in their various departments.

The first regular year of the College was opened March 17th, 1869. On the same day the college building was dedicated and the officers inaugurated with appropriate exercises. Addresses by Hon. John Scott, Hon. B. F. Gue, Hon. John Russell, Prof. Parker, Dr. Townshend and the President, were given before a crowded audience gathered from all parts of the State. A copy of these addresses, published by order of the Board, is hereby transmitted for preservation in the archives of the College.

On the two following days, March 18th and 19th, applicants for admission were classified by written examinations in local geography, arithmetic, English grammar, reading and spelling, and those who were found proficient in these branches were enrolled in the college class. Others whose progress in the above studies fell below the required standard, but was still sufficient to enable them in all probability to enter college after a year's study, were classified in the preparatory department. A few who had never studied English grammar and had made little advancement in geography and arithmetic were rejected.

The two departments thus organized rapidly increased in number

until in less than a month after the opening every available room in, the college building was filled. From this date to the end of the term which closed on the 3d of July, eight students were admitted to fill vacancies caused by the departure of a similar number on account of sickness and other serious reasons. During the same period twenty-two applicants were refused for want of room.

Of the students enrolled in the Freshmen Class of college, the first term, there were—

Young men.....	77
Young ladies.....	16
<b>Total in Freshmen Class.....</b>	<b>93</b>
<b>Number admitted to the Preparatory Department—</b>	
Young men ..	59
Young ladies ..	21
<b>Total in Preparatory Department.....</b>	<b>80</b>
<b>Total number.....</b>	<b>173</b>
Students rooming out of College building.....	15
Students rooming in College building.....	158
<b>Total students in attendance.....</b>	<b>173</b>
Whole number of young men first term.....	136
Whole number of young ladies first term.....	37
<b>Total in attendance, first term .....</b>	<b>173</b>
<b>Number enrolled in Freshmen Class second term—</b>	
Young men...	63
Young ladies.....	15
<b>Total in Freshman Class .....</b>	<b>78</b>
<b>Number in Preparatory Department, second term—</b>	
Young men.....	63

Young ladies.....	27
Total in Preparatory Department.....	90
Total number.....	168
Number rooming out of College building.....	9
Number rooming in College building.....	159
Total students in attendance.....	168
Whole number young men, second term.....	126
Whole number young ladies, second term.....	42
Total in attendance, second term.....	168
Whole number of different students during the year.	192

Fifty-five counties were represented in the College during the year, as follows :

Benton.....	11	Hamilton.....	2
Black Hawk.....	4	Henry.....	2
Boone.....	16	Harrison.....	7
Buchanan.....	3	Hardin.....	2
Butler.....	3	Hancock.....	2
Carroll.....	2	Humboldt.....	2
Cass.....	2	Iowa.....	2
Cedar.....	2	Jasper.....	2
Chickasaw.....	1	Jefferson.....	1
Clayton.....	3	Johnson.....	4
Clinton.....	5	Jones.....	5
Dallas.....	4	Keokuk.....	1
Davis.....	1	Linn.....	2
Delaware.....	2	Louisa.....	2
Des Moines.....	2	Lucas.....	2
Dubuque.....	5	Mahaska.....	2
Fayette.....	2	Marion.....	2
Floyd.....	2	Marshall.....	1
Green.....	2	Monona.....	2
Grundy.....	1	Muscatine.....	3

Polk.....	4	Wapello .....	15
Pottawattamie.....	1	Warren .....	2
Poweshiek .....	1	Webster.....	2
Scott .....	4	Winneshiek .....	2
Story *.....	29	Winnebago.....	3
Tama .....	2	Woodbury .....	2
Van Buren.....	3	Wright.....	1
Total .....			192

\*Of the twenty-nine students from Story county, fifteen had rooms in the college building, and fourteen were day scholars.

### COURSE OF STUDY.

#### DEPARTMENT OF AGRICULTURE.

#### DEPARTMENT OF MECHANIC ARTS.

#### FIRST YEAR.

##### FIRST TERM.

Algebra.  
Physical Geography.  
Rhetoric.  
Book-keeping.

##### SECOND TERM.

Geometry.  
Physiology and Hygiene.  
English Language and Literature.

#### SECOND YEAR.

##### FIRST TERM.

Trigonometry, Mensuration and Surveying.  
General Chemistry.  
Botany and Vegetable Physiology.

##### SECOND TERM.

Analytical Chemistry.  
Zoology, Practical Agriculture.

##### Mechanics.

Analytical Geometry.  
Descriptive Geometry.

#### THIRD YEAR.

##### FIRST TERM.

Analysis of Soils.  
Entomology, Practical Agriculture.  
Botany, Horticulture and Forestry.

Mechanics of Engineering.  
Shades, Shadows and Perspective.  
Differential and Integral Calculus.



them, tried him if the offence was serious and if found guilty inflicted a suitable punishment.

The effect of this experiment in self-government on the improvement in the order of the rooms and halls was immediate, striking, and permanent. General confidence in the council continued without abatement throughout the term. Only one appeal was made to the faculty, and that was withdrawn. Indeed such was the steady success of the whole scheme that that most perplexing question which has been discussed everywhere and settled nowhere, viz: how best to govern college dormitories, seemed at last to have found its solution. If so, it ought to revolutionize college government. At all events it has done so here. I have dwelt with some minuteness on this new movement, both because of its interesting character and because of its important bearing on the welfare of the college hereafter.

#### DAY'S EMPLOYMENT.

The following is the division of the day's employments. The students rose promptly on a signal from the bell at half past five, and put their rooms in order. They then engaged in study till quarter to seven, the hour for breakfast. At quarter before eight the officers and pupils assembled in the chapel, and the daily session for recitations and lectures was opened with devotional exercises. The session occupied five hours, and closed at quarter to one. It was divided into five portions of fifty minutes each for recitations, with short intervals between them for the movement of classes. The exercises of the session were so arranged that every student in either department spent three hours in receiving instruction, and had two hours of uninterrupted study in his room. At quarter to one the captains of the "working squads," thirteen in number, met in the President's office, and received special orders as to work laid out for the afternoon. That no mistakes might be made respecting these orders, they were reduced to writing and read by the officer of the week, at the dinner table. The dinner bell struck at one o'clock. At quarter to two the "work bell" called the students to their allotted labors. The young women repaired in regular order to the laundry, the bakery, or the dining room, to do

the work assigned by the matron, while the young men gathered in squads on the terrace, received the proper tools from their captains, and went to their work cheerfully and promptly, whether it was on the drain, on the ornamental grounds, in the field, the garden or the orchard. Generally at quarter to five, but sometimes half an hour earlier, the work hours closed, and amusements began. These consisted of vigorous games of base ball by the various "clubs," of milder games of croquet by boys and girls together, and of such other plays as are morally and physically healthful. Tea terminated these sports usually at quarter past six; at seven each pupil obeyed the signal bell for study hours, by retiring to his or her room and studying quietly till ten (if needful,) when the retiring bell sounded, the books were closed, the lights extinguished, and the day's work was done. I may add there was an exception to this regularity of the work hours in the ladies' department. The necessities of the kitchen and dining-room required that a squad of girls (six) should be employed there in the evening, and these consequently had their study hours in the afternoon. Moreover, a few young men had duties at different hours, such as the bell-ringer, the keeper of the store room, the superintendent of the dining-room, and the mail carrier.

#### MANUAL LABOR AND ITS RESULTS.

Many looked upon the introduction of regular manual labor into the Iowa Agricultural College with forebodings of evil. It had failed either partially or wholly in many similar institutions of the East. It had been tried by experienced educators and sooner or later abandoned. It had failed under circumstances seemingly as favorable as one could wish. For this reason not a few even of the friends of industrial education predicted that it would prove with us an element of weakness rather than of strength. But never was prophecy of evil farther from its fulfillment. Whatever the results of the introduction of manual labor in other Institutions, here it has been thus far a gratifying success. The afternoon's work was always as cheerfully accepted as the forenoon's recitations, and its influence on the health, progress, and conduct, of our pupils was in the highest

degree salutary. Indeed it is my conviction that we could never carry our number undiminished through the summer term without manual labor. It gives needful exercise and bodily vigor, imparts skill in the use of tools, helps the student to defray a portion of his current expenses, applies science to practice, and promotes respect for honorable toil. From the experience of the past year and the convictions of a lifetime, I have full faith in the wisdom of the law that requires manual labor from every student, and I believe that such a requirement is indispensable to the prosperity of an Industrial School.

#### ORGANIZATION FOR MANUAL LABOR.

The following arrangement for daily labor was found to be most effective. The students were divided into squads of six and each squad elected a captain from its own number. In almost every instance the student most experienced in farm work was chosen. The squads were all reorganized once a month, and the captain held office for that time. Generally, however, the captain was re-elected. This monthly re-organization, while it left most squads unchanged, gave opportunity to correct possible abuses or want of harmony among those who worked together. It was the duty of the captain to see that his men were on hand at the required time, to receive the necessary tools from the foreman of the tool-room, to take care that these tools were cleaned and restored at the close of the work hours, to supervise and instruct his squad in case a foreman was not present, and in such case also to report in writing to the President the time, quality, kind, and value, of the work done that day by each member of his squad.

Besides the captains, it was found necessary, because of the paucity of professors in the college, to appoint a few students of character and experience as foremen to take charge of one or several squads working together as occasion might require. The following young men held this responsible office: Wm. Wells, Jr. P. S. Brown, O. M. Schee, C. P. Wellman.

The foreman's duty was to take charge of two or more squads on any single job; to give instruction and correct bad habits; to see that the work in hand was done thoroughly and well, and

## ENTRANCE REQUIREMENTS

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The requirements for admission are stated in terms of semesters. The term semester as herein used means the equivalent of eighteen weeks, five days a week, on the basis of four studies a day. Thirty semesters are required for unconditioned admission to freshman year. The following are the minimum entrance requirements as adopted by the college section of the Iowa State Teachers' Association in December, 1904:

### SCIENTIFIC COURSE.

Mathematics .....	5 semesters
English .....	6 semesters
Science .....	2 semesters
History .....	2 semesters
Foreign language.....	4 semesters
—	
Total required units.....	19
Elective units.....	11
—	
Total .....	30

### CLASSICAL COURSE.

Mathematics (Alg. 3 and Geom. 2).....	5 semesters
English .....	6 semesters
Science .....	2 semesters
History .....	2 semesters
Latin or Greek.....	8 semesters
—	
Total required units.....	23
Electives .....	7
—	
Total .....	30

Electives to make up the required number of units as above indicated may be selected from the following list of subjects:

In addition to semester credits required as set forth above elective credits may be made up in science, history, foreign

language, Greek, physiography, civil government, political economy, physiology, commercial geography, drawing and manual training.

While the State College does not offer classical courses nor give the classical degrees, Greek and Latin taken in high schools are given full value and recognition towards meeting entrance requirements for any of the College courses counting as elective or foreign language credit.

Students from high schools presenting credits in excess of the number required for admission may receive credit for the same only upon passing a satisfactory examination under the direction of the department concerned, the amount of credit granted to be determined by the head of the department interested.

As previously stated the requirements for all courses include graduation from a high school belonging to the list of accredited schools prepared by the committee on college entrance requirements\* appointed by the State Teachers' Association, approved standings in the studies of the academic year and the studies necessary for entrance to that year, or the passing of a satisfactory examination.

For all the engineering courses students will be required to present one year's work in either French or German.\*

Mathematics, English and history are among the studies most strongly emphasized in preparation for the work of the freshman year, and students from schools with less than twenty-eight semester credits will be expected to pass an examination in them. Credits granted in lieu of these examinations must be upon work approved by the heads of departments.

Students may enter the beginning work of the Freshman year, Second Semester as well as the first, except in German.

The students admitted to freshman standing will take review work in English, history and algebra during the first few days of the term.

In English this work will be a series of written exercises designed to test the student's general preparation in English, including spelling, grammar, punctuation and elementary rhetoric. This test is intended as a practical one, not as a review

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\*Two years' work will be required beginning with September, 1906.

in mere theory; memorized rules and principles will count for little; readiness in applying them is the real test. A student whose sentences are notably incorrect needs further drill in grammar; one whose paragraphing shows no definite plan needs additional practice in elementary composition.

In algebra all subjects up to and including quadratics will be treated, and the ability of the student to demonstrate principles and solve examples and problems will be tested.

Students may enter the beginning work of the freshman year the second semester as well as the first.

For information concerning admission to the veterinary course the student will consult the references cited in the general index.

### SUGGESTIVE LIST OF EXAMINATION QUESTIONS.

#### ALGEBRA.

1. From  $5xy - (m-n)(k+1) - (a+b)(d+c)$  subtract  $(d+c)(a-b) + 5(k+1) - acy - mny$ .

2. Remove the parentheses and simplify

$$7x^2 - \left\{ \frac{a+b}{c-d} - y - 4 - (n-m) \right\} - \left\{ \frac{2(y+4)}{3} \right.$$

$$\left. - 7x^2 - \frac{a+b}{c-d} - m - 8 + n \right\} + 8$$

71

State the rule by which parentheses preceded by the plus or minus sign are removed.

3. Divide  $-45a^{-2x} b^{-3} c^x (m+n)^5 + ab^x c^{1+x} (m^2 + 2mn + n^2)^2$  by  $3a^x b^3 c^x (m+n)^2$ .

4. Write the product of  $(3x-2)(3x+5)$ , of and also of  $(3y+1)(3y-1)$  and give the special rules of multiplication used.

5. Resolve  $a^{12} - a^8 b^4 - a^4 b^8 + b^{12}$  into its prime factors.

6. Find the lowest common multiple of

$$2x^4 + 8x^2 + 8x - 2 \text{ and } 3x^4 + 5x^2 + x^2 + 5x - 2.$$

7. Simplify

$$\frac{a^2 - b}{(a-b)(a-1)} + \frac{b^2 + a}{(b+1)(b-a)} + \frac{1+ab}{(1-a)(1+b)}$$

What is the effect on a fraction of changing:

- Any two of the three following signs: sign of numerator, sign of denominator, or apparent sign of the fraction.
- The signs of an odd number of factors in the numerator.
- The signs of an even number of factors in the numerator.

8. Solve the following equation,

$$\frac{x - \frac{3(x-5)}{4}}{\frac{8}{4}} - \frac{x-3}{4} = x+1 - \frac{2(x+16)}{17} - \frac{8x}{6}$$

9. A man rowing at a certain rate makes the round trip from A up stream to B, 24 miles distant, and return, in 5 hours. Having six hours at his disposal, he starts to make the trip, but when 16 miles from A, the boat springs a leak which causes him to land. In so doing he loses 40 minutes, but by walking at three-fourths the speed the boat would have carried him, he is able to spend an hour in B, and reach home in the required time by a train moving at twice the speed which the boat would have moved down stream. What is the rate in miles per hour of the man rowing in still water and what is the rate of the current?

10. Find the values of a and b in the following:

$$\frac{3}{2a} - \frac{4b}{b-2a+3} = 2\frac{1}{2}$$

$$\frac{1}{a} + \frac{1}{b-2a+3} = -\frac{1}{3}$$

11. Find the value of  $(-5a^{-7}b^{k+1}c^3)^{-2}$  freeing the result of negative exponents.

12. Find the cube root of:

$$8a^{\frac{3}{2}} - 12a^{\frac{1}{2}} + 42a^{-\frac{1}{2}} - 37a^{-\frac{3}{2}} + 63a^{-\frac{5}{2}} - 27a^{-\frac{7}{2}} + 27a^{-\frac{9}{2}}$$

13. Find the sum of:

$$\sqrt[2n]{54x^a - 3y^6}, \sqrt[3]{16x^a + 3y^3} \text{ and } \sqrt[4]{2x^4 + 3}$$

14. Multiply  $\sqrt{x^{\frac{2n}{3}}}$  by  $\sqrt{x^{\frac{n}{3}}}$  by  $\sqrt{x^{\frac{3n}{3}}}$

15. Find the cube root of  $\frac{3}{5} \sqrt{\frac{3}{5}}$

16. Multiply  $\sqrt{2} - 3\sqrt{-5}$  by  $\sqrt{5} + \sqrt{-3}$
17. Find the square root of the binominal surd  $67 + 7\sqrt{72}$
18. Solve  $\sqrt{x^2 - 6x} - 5\sqrt{x^2 - 6x} + 6 = 0$
19. Solve  $9x^2 - 5xy = 21$  and  $xy - y^2 = -4$ , solving for  $x$  and  $y$ .
20. Two trains starting at the same time and going in opposite directions between M and N, upon meeting, have differed in the distance covered by 20 miles. It is found that the train from M will reach N in one and one-half hours from the time of meeting and the train from N will reach M in 40 minutes. How far apart are M and N, and what is the rate of each train?

## FRENCH AND GERMAN.

Students who take Freshman German of the second year in the Engineering course will be required to have a thorough knowledge of the principles of German grammar, such as are given in Vos's Essentials of German, and to have read one simple book like Storm's "Immensee." They must be prepared to read a book as difficult as Hilern's "Hoher Als Die Kirche."

Students taking Freshman French, or the second year in the engineering courses, will be required to have a thorough knowledge of the principles of French grammar as given in the first part of Fraser and Squair's French Grammar. They must have read at least one simple book like Bruno's "Le Tour de la France."

## ENGLISH.

The examinations in English will include questions in grammar and elementary rhetoric and also one or more essays, to test the student's readiness and accuracy of expression. The following list of questions indicates the general nature of the examination:

I. In the following sentence, (a) state the exact grammatical relationship of each phrase and clause; (b) parse the words in black; (c) account for punctuation: "What if their palaces were grand, and their villas beautiful, and their dresses magnificent, and their furniture costly, if their lives were spent in ignoble and enervating pleasures, as is generally admitted?"

II. In the following sentences name the part of speech and state the office of the words in black:

- (a) I believe him to be unprejudiced.
- (b) Alice, did you go boating yesterday?
- (c) It cost me a struggle to give up the trip.
- (d) They let him stay.
- (e) "Ask yourself seriously whether you are fit to read such revelations as are to follow."

III. Discuss fully and carefully four of the following topics:

- (a) The topic sentence and its development.
- (b) The respective advantages of the long sentence, the periodic sentence, the balanced sentence.
- (c) Unity in the paragraph.
- (d) Coherence in the composition.
- (e) Emphasis in the sentence.

IV. Write an essay of from 250 to 350 words on one of the following topics:

- (a) A Reminiscence of My Childhood.
- (b) Why I like—a book, an eminent man, a place.
- (c) Describe a view from \_\_\_\_\_.
- (d) All Students Should be Required to Take Athletics.

NOTE.—These essays are considered an important part of the examination. They will be graded mainly on diction, sentence structure and connection, and paragraphing. Good penmanship, neatness of manuscript, and correct spelling and punctuation are also important.

#### HISTORY.

In addition to American history the requirements cover the entire European field, including the three grand divisions—ancient, mediaeval, and modern. The questions below indicate the general character of the examination in European history:

1. Discuss (a) the significance of the Nile in the history of Egypt, and (b) the arts and industries of ancient Egypt. (c) Outline the work of a famous Egyptian king.
2. Give the date, important facts, and results of the Persian invasion of Greece in the reign of Darius.
3. The Athenian Empire: (a) trace its origin; (b) when was it at its height? (c) State the effect of the Peloponnesian war upon it.
4. Discuss the influence of the geographical features of

Italy upon Roman history. Name the races of people in Italy at the dawn of the Italian history.

5. Outline the chief features of the Roman constitution in the reign of Augustus.

6. Feudalism: (a) its origin; (b) classes in feudal society; (c) fental rights and obligations; (d) value of feudalism.

7. Give date, causes, and results of the Crusades.

8. Discuss the rise and growth of the Italian city republics.

9. Magna Charta: (a) circumstances under which it was secured; (b) chief provisions.

10. Reformation in Germany: (a) leading men; (b) principal steps in the movement.

11. Discuss fully the causes of the French revolution.

12. Something of importance concerning each of the following: Cardinal Wolsey, William the Silent, Cardinal Richelieu, Gustavus Adolphus, Charles Martel, Peter the Great, Oliver Cromwell, Lord Nelson, Bismarck.

#### ADVANTAGES OF ENTERING IN JANUARY.

Students may enter College at the opening of the second semester in January as advantageously as in the fall. For many who need to review the work of the academic year before entering the freshman year this affords an excellent opportunity.

Many students will find it desirable to begin their work in college in this term. Those who have had considerable Algebra in the preparatory school should review its fundamental principles and become acquainted with their application in the wider and more difficult field of college work, and those who have had experience in plane geometry can to advantage supplement such study by a review of some standard text and a thorough drill on the original geometric propositions. The classes in these studies established at the beginning of the spring term furnish an excellent opportunity for students to prepare themselves thoroughly for entering upon collegiate work at the opening of the next school year.

In like manner, students who have completed grammar and have had a high school course in rhetoric, have an opportunity in this term to review the principles of style and correct whatever errors they still make in expressing their thoughts. Without a thorough grounding in the principles of style and a con-



## Article 4

### DIRECTIONS TO CANDIDATES AND STUDENTS.

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#### REQUIREMENTS FOR ENTRANCE.

##### AGE.

1. The age of students seeking admission to the Agricultural College must be sixteen years or over.

##### ENTRANCE EXAMINATIONS AND CERTIFICATES.

2. Candidates for membership in the Freshman class must give evidence of a thorough knowledge of English Grammar, English Analysis, Arithmetic, and (except to enter the Veterinary Course) Algebra through simple equations. Proficiency in these studies may be proved either by actual examinations held at the opening of the term, or by a certificate given on special examinations by either the principal of a high school or a County Superintendent. Teacher's certificates will not be received.

##### SUB-FRESHMAN CLASS.

3. For the purpose of giving a better preparation for the Freshman class to the students who come from sections of the State where the schools are defective, a limited number will receive instruction in English Analysis, Physiology, and the elements of Algebra and Geometry. But students are not advised to come until they are prepared to enter the Freshman class. Students entering this class must, hereafter, show by examination or certificate a thorough knowledge of English Grammar and Arithmetic.

#### HOW TO ENTER THE AGRICULTURAL COLLEGE.

Those who desire to enter the Agricultural College at the opening of the spring term, March, 1881, or for the fall term which commences July 19, 1881, will comply with the following directions:

1. Write the President, if possible, before the first of February, asking for a *card of inquiry*. It will be mailed to you at once.

##### THE CARD OF INQUIRY.

The card of inquiry to be sent on application, contains the following questions to be answered and returned by mail.

##### *Questions Respecting Matters Essential to Admission.*

1. Are you sixteen years old, or older?
2. Are you proficient in the studies required for admission to the Freshman class?
3. Will you, if admitted, remain one entire term, unless prevented by sickness or unforeseen misfortune?

*Questions not Essential to Admission.*

1. Do you intend to complete one of our courses of study?
2. What is your father's occupation?
3. Do you desire to pay a limited portion of your expenses in work?

2. On receiving the inquiry, write an answer opposite each question in the list; then enclose and mail to the President. If the answers you give accord with the "Requirements for Entrance," a card of admission will be sent you.

3. When you arrive at the opening of the term, present this card of admission to the Treasurer; select your room; pay the rent; make your deposit, and, without loss of time, show your receipt therefor to the President at his office. If you have not a certificate of proficiency in the studies required, you will then secure a card of examination.

4. Attend punctually every examination at the time and place indicated on the card. When all the examinations are completed and your standing therein marked on the card, return it to the President. If you have passed the studies required with a standing of 3 or over, 4 being perfect, you will then sign the Student's Record Book and Contract and secure a *card of classification*.

5. Present the card of classification to each of the teachers having charge of the classes to which you are assigned, and attend thereafter every recitation of the term.

The contract signed by every student upon entering the College each year is as follows:

We, the Faculty of the Iowa Agricultural College, hereby agree that we will guarantee to the students of 1881 all the privileges and instruction set forth in the College Catalogue, and that the laws we make shall be simply for their advancement and the good government of the Institution.

A. S. WELCH, President.

We, the Students, hereby agree on entering the College in 1881, that we will respect its laws, and, except in case of illness, unforeseen misfortune, or the necessity of leaving to teach school, remain the entire term (whether first or second) on which we enter.

**STUDENTS' EXPENSES.**

**TUITION.**

1. No charge is made for tuition.

**BOARD, WASHING, ETC.**

2. For board, washing, heating, lighting and cleaning the College building, students pay what the items actually cost the institution. Injury to College property, of whatever sort, will be charged to the author, when known; otherwise to the section or the entire body of students.

Students boarding in the Main College building furnish their

own bedding, and all furniture for their rooms, excepting bedsteads, washstands, tables, and wardrobes. All young men are required to supply themselves with uniforms. (See School of Military Science.)

#### CURRENT EXPENSES.

3. The current expenses of students boarding in the Main College building during the year 1881 will be as follows:

Board, per week,.....	\$2.25
Lighting and heating, per week,.....	.40
Incidentals, per week,.....	.21
Room Rent, per term,.....	\$ .75 to \$1.50
Washing, average per dozen.....	.50
Janitor's Fee, for students not boarding in the building, per term.....	\$3.00

#### DEPOSIT.

4. As security for the payment of his monthly bills, each student, at the opening of the term, deposits with the Treasurer the sum of twenty dollars. This deposit will be returned on final settlement at the close of the term.

#### MONTHLY SETTLEMENT.

5. All bills for each month must, without fail, be settled at the Treasurer's office on the second Saturday of the month following. Those who neglect this settlement cannot be permitted to remain in the College.

#### THE DINING ROOM.

6. The dining room will be opened on the evening preceding the respective days on which the spring and fall terms commence. No allowance on board-bills is made for absences of less than one week's duration. Students and others bringing friends to its tables are required to pay for such twenty-five cents each meal.

#### TEXT BOOKS.

7. Text-books and stationery may be purchased from the College Book-store at ten per cent advance on cost. Our stock is bought at publisher's prices.

#### CARE OF MONEY.

Students are advised to keep their money and other valuables in the College Safe. While doing all in their power to prevent losses and punish theft the officers will not be responsible for money or articles lost or stolen from the persons or rooms of students.

**MANUAL LABOR.**

The following rules regulating manual labor have been made by the Board of Trustees. It will be seen that no student can pay more than from a third to a half of his expenses in work:

1. The manual labor required by law of students in the College, is divided into two kinds: viz., unproductive labor, which shall be compensated by the payment of wages; and instructive labor which shall be compensated by the instruction given and the skill acquired.

2. Unproductive labor shall comprise all the operations in the work-shop, garden, upon the farm and elsewhere, in which the work done accrues to the benefit of the College and not to the benefit of the student. Instructive labor shall embrace all those operations in the work-shop, museum, laboratories, experimental kitchen, upon the farm and garden, in which the sole purpose of the student is the acquisition of skill and practice.

3. Students shall engage in instructive labor in the presence and under the instruction of the professor in charge according to the statements made in each of the courses of study.

4. The labor furnished by the schools of Agriculture, of Veterinary Science, and of Engineering is given by each exclusively to its own special students.

5. The details supplied by the needs of the Main Building and other departments will be given by the President on nomination by the heads of departments exclusively to the most faithful and meritorious students of the course in the Sciences Related to the Industries.

6. Unproductive labor is paid for rigidly according to value as settled by comparison with regular labor.

**GOVERNMENT.**

The crowded buildings of the Agricultural College and the nature of its exercises, complicated as they are by manual labor, make order, punctuality, and systematic effort indispensable. This institution can therefore offer no inducements to the idler or self-indulgent. Those, moreover, who are too independent to submit to needful authority, or too restless to accept wholesome restraint, are advised to go where the courses of study are milder and the requirements are consequently less. The education attained here is the result of energetic effort made possible by a uniform system of conduct and study. The following regulations give the institu-

tion the highest efficiency and secure to the student the largest possible return for time and expense.

1. The hours from seven to ten o'clock on week-day evenings, and from 7:30 A. M. to 12 M., and from 1 P. M. to 5 P. M. of all week-days except Saturday, are employed in study, recitation and labor.

2. Students must attend punctually all exercises of the classes to which they belong, except in cases of illness or unavoidable detention.

3. When students have for the above reasons been absent from any exercise, they shall, in person, as soon as possible, present their reasons for such absence to the president. If absent from any recitation they shall without delay obtain from the professor in charge a written recommendation for excuse for such absence, which shall be presented to the President for approval. No one is permitted to attend a second recitation after an *unexcused* absence.

4. Students boarding and rooming in any building on the College Farm shall be subject to the same regulations as those boarding and rooming in the College building.

5. Students boarding outside the College grounds shall, so far as possible, keep study hours in their rooms. In the intervals between recitations at the College building they shall remain in the chapel, keeping such order as is essential to uninterrupted study. Access to the rooms and halls of the sections requires special permission.

6. The captains of sections in the dormitories shall report the condition of the order in their respective sections to the President at such times as he may designate.

#### PROHIBITORY LAWS OF THE COLLEGE.

1. Students may not leave the vicinity of the College building at any time without permission from the President. General permission to be absent on Saturday is granted by the President.

2. Loud talking, whistling, scuffling, gathering in halls and staircases, and boisterous and noisy conduct, are *at all times* forbidden.

3. During study hours, when not engaged in work or recitation, students may not leave their rooms except for unavoidable reasons.

4. At 10 o'clock P. M., lights shall be extinguished, and from this time to the rising bell no student may be out of his room, except for serious reasons, nor shall he in any way disturb his neighbors.

5. Students shall not deface by marking, cutting, or otherwise any buildings, walls, or furniture belonging to the College.

6. Students shall not abstract or remove any article, whether clothing, food, furniture, tools, fruit, flowers, or any other property belonging to the College. Damage, destruction, or theft of property, when not more than one dollar in value, will be punished by fine double the amount, but when exceeding that sum the case will be handed over to the civil authorities.

7. Card playing and other games of chance, cooking, and the use of tobacco and intoxicating beverages, in any of the rooms of the College buildings, and smoking on the college grounds are strictly forbidden.

LITERARY SOCIETIES.

No literary, scientific, or other society shall be organized without the approval of the President and Faculty. The existing societies, four in number, meet on Saturday evening and close their sessions at or before 10:15. Students not attending the meetings of these societies shall observe the order and quiet required on other evenings of the week.

PUBLIC WORSHIP AND RELIGIOUS INSTRUCTION.

The Faculty require in and about the College buildings such quiet and decorum as are fitting to the observance of the Sabbath. Officers and students gather daily in the chapel for public worship. A Bible class, led by some older student, has its exercises on Sunday, at 1 P. M. The students' prayer meeting is held on Sunday evening, and on Sunday afternoon at 2:30 a discourse is given in the chapel by the President, one of the Professors or a clergyman invited for the occasion. The object of these sermons is to emphasize and enforce the precepts of the Christian religion, but, in a State institution like this, it would be manifestly improper to teach or to controvert the tenets of sectarianism.

**20 Animal Feeding.** Required first semester of Junior year in Veterinary Course. A study of the composition and digestibility of feeding stuffs; the preparation of coarse fodders; the grinding, steaming and cooking of feeding stuffs; feeding standards and the calculation of rations; feeding for meat; milk, wool, growth and work. Prerequisites, Veterinary 4 and 24, and Chemistry 13. Two hours credit.

**21. Principles of Breeding.** Required first semester of Junior year in Agronomy and Dairy Courses and elective first semester of Junior or Senior year in all other agricultural courses. An elementary course in breeding offered to meet the demands of those students who have not sufficient foundation to take the regular course in Animal Breeding. Embraces a study of the general principles of breeding, selection, variation, heredity, atavism, etc., and a historical study of the results to date. Prerequisites, Animal Husbandry 1 and 2. Two hours credit.

**22. Animal Husbandry Seminar.** Required first and second semesters of Junior year in Animal Husbandry course. One hour credit.

**23. Animal Husbandry Seminar.** Required first and second semesters Senior year in Animal Husbandry Course. One hour credit.

The Animal Husbandry Seminar Courses 22 and 23 meets once each two weeks while college is in session, and has for its members the professors and instructors in Animal Husbandry, and all students in the Junior and Senior classes in the course in Animal Husbandry. At each meeting, four students—two Seniors and two Juniors—present papers on associated Animal Husbandry topics. These subjects are selected a half year in advance and follow, in regular series, Animal Breeding, Relation of Animal Husbandry to other industries, Animal Feeding, and a study of Live Stock organizations, expositions, College and Experiment Station Organization and Equipment.

### POULTRY HUSBANDRY.

The Poultry Husbandry Department affords opportunities for instruction in all lines of poultry work, such as the selection, care and management, incubating, brooding, judging, breeding, feeding, showing, marketing, and diseases of various varieties of fowls, ducks, turkeys and geese.

The Poultry Farm of nearly twenty acres upon which the buildings have been erected this year offers unexcelled opportunities for practical instruction.

### INVESTIGATION AND THE REARING OF YOUNG STOCK.

The buildings consist of a large headquarters building, long poultry house and colony houses for brooders, young stock and breeding stock. The Headquarters Building contains a large feed room, carpenter shop, incubator room, killing and marketing room, egg room, and room for attendants; and is without doubt the best building of its kind in the country. The long poultry house, of the cloth curtain type, consists of seven 12x12 pens which, together with the colony houses, have a capaci-

ty of approximately one thousand head of poultry, which is used in laboratory and investigational work. All pens are equipped with trap nests so that individual egg records may be obtained from each hen. The Incubator room is equipped with machines made by several of the leading incubator firms and affords opportunity for a complete study of the different types of incubators. A thorough study of the latest brooding methods is also made.

#### POSITIONS OPEN TO MEN TRAINED ALONG POULTRY HUSBANDRY LINES.

At the present time there is an urgent and increasing demand for College men who possess scientific training in Poultry Husbandry together with practical experience and ability. Some of the openings for students trained along these lines are college and Experiment Station work, managers of utility and fancy poultry farms, poultry journalism and poultry judging, managers of poultry supply houses and poultry feed departments, superintendents and buyers for poultry fattening establishments, salesmen with the incubator and brooder manufacturers.

#### COURSES IN POULTRY HUSBANDRY.

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30. **Poultry Judging.** Required first semester Junior year in the Animal Husbandry course, elective, first semester Junior or Senior year in all other Agricultural courses. This course includes a study of the origin, history, and classification of the various breeds and varieties, and the scoring, judging and breeding of the most important varieties, in accordance with the American Standard of Perfection. Practice will be given in the study of feather markings, judging and fitting of birds for show. Three hours credit. Lectures, two hours and 1 two-hour laboratory period per week. Fee, \$2.00.

31. **Poultry Management.** Required second semester Junior year in the Animal Husbandry course, elective second semester Junior or Senior year of all other Agricultural courses. This course includes a study of poultry houses, arrangement of buildings and yards, feeds and feeding, judging for market types, incubation, brooding, anatomy of fowl and egg, diseases, sanitation, caponizing, killing, dressing and marketing of poultry products. Three hours credit. Lectures two hours and 1 two-hour laboratory period per week. Fee, \$2.00.

32. **Practice in Feeding and Management.** Elective first semester Junior or Senior year in all Agricultural courses and must be accompanied or preceded by course 30. The student will be given charge of a pen of fowls and will be required to keep a record of the amounts and cost of food consumed, gains made, eggs produced and calculate the profit or loss. This work will cover a period of three weeks, and the student must be present morning, noon and afternoon, time to be arranged by appointment with the instructor. One hour credit. Fee, \$2.00.

**33. Incubator Practice.** Elective second semester of the Junior or Senior year in all Agricultural courses and must be accompanied or preceded by Course 31. Each student will be given charge of one or more incubators for the period of one hatch and required to keep records of fuel consumed, temperatures, infertile eggs, dead germs, dead in shell, chicks hatched and reckon the cost of incubation. This course will cover a period of four weeks and the student must be present morning, noon and afternoon; time to be arranged by appointment with the instructor in charge. One hour credit. Fee, \$2.00.

**34. Brooder Practice.** Elective second semester Junior and Senior year in all Agricultural courses and must be accompanied or preceded by course 31 and preceded by course 33. Each student will be given charge of chicks in a brooder for four weeks from time of hatching and must keep records of temperatures, fuel and foods consumed, gains made, mortality, and calculate the cost of brooding. The student will be required to be present morning, noon and afternoon; time to be arranged by appointment with instructor. One hour credit. Fee, \$2.00.

**35 and 36. Poultry Research and Experimentation.** Elective Senior year in all Agricultural courses. Open only to those who have taken courses 30 to 34. This course is intended for those students who wish to fit themselves especially for college and experiment station work in Poultry Husbandry. This course will include a report of special research on some poultry topic, a study of the Poultry Husbandry work now being carried on in the experiment stations throughout the country, methods and technique of breeding from egg production and meat types, arrangement of experimental records and data in feeding, breeding, incubation and brooding. This course extends throughout the year. Time by appointment. One hour credit each semester. Students electing this course should also take their thesis in Poultry Husbandry. Fee, \$2.00

### **ONE YEAR POULTRY HUSBANDRY COURSE.**

This course is intended for those students who wish to prepare themselves for practical poultry work and have but one year to devote to study and practice. The course will consist of courses 30 to 34 inclusive, practical work on the Poultry Farm, and reports on especially assigned topics. The practical work will consist of five to eight hours work per day in the caring for poultry, building of colony houses, running of incubators and brooders, killing and dressing, mixing of feeds, and such other work as is ordinarily done on a poultry farm. This gives the student a chance to acquire that skill which comes only from practice.

### **POST GRADUATE WORK IN POULTRY HUSBANDRY.**

Because of the newness and great scope of the field, Poultry Husbandry offers many opportunities for doing valuable research work. Unexcelled opportunities are offered for the common application of

training the student may have received in embryology, bacteriology, physics, zoology, entomology, farm architecture, etc. Some of the lines along which the student may work are:

1. **Breeding.** Because of the shortness of generations and widely varying characteristics in color and shapes of varieties, poultry offers unexcelled opportunities for study of unit characters in crossing and the laws of heredity. Work may be also done along the lines of breeding for meat type and increased egg production.

2. **Feeding.** Comparative studies of different rations for laying and breeding stock, rearing and fattening or finishing. Comparison of breeds in regard to gains made on certain rations. Effect of feeding on color of feathers or composition of flesh and eggs.

3. **Housing.** Comparison of glass front, curtain front or combination glass and curtain front houses. Comparison of large and small flocks. Study of colony houses, Poultry House Sanitation.

4. **Incubation.** This branch of the industry is in great need of investigation because of its vast importance and the little knowledge we now have of its laws. Such lines of work could be taken up as: Effect of moisture or non-moisture methods on the hatchability of eggs and vitality of chicks; value of carbon dioxide in incubation; study of natural methods; loss in weight in incubation; change in the structure and density of the shell; selection of chicks as they hatch for constitutional vitality; difference in incubation management for eggs of different classes of poultry.

5. **Brooding and Rearing.** Brooding in large versus small flocks; natural versus artificial brooding; study of brooder diseases; effects of temperature on health and growth of chicks.

6. **Poultry Diseases and Pests.** Study of Cholera, sorehead, black head, roup and other poultry diseases with a view to prevention and cure. Study of lice, mites, rats and other pests with a view to their extermination.

7. **Comparative Anatomy.** To determine the comparative market values, distribution of edible meat, textures of flesh and different types of various breeds.

The many varieties of stock, buildings, incubators, brooders and other equipment on the poultry farm, together with birds shipped in from all parts of the state, are available for this work.

#### **Graduate Work in Animal Husbandry.**

Post graduate work in Animal Husbandry may be taken along any of the following lines:

1. **Animal Nutrition.** Because of the large number of horses, cattle, sheep, and swine feeding experiments being conducted on the College Farm, the opportunities for doing research work in this line are unequalled.

2. **Animal Breeding,** including special work along new and original lines pertaining to principles underlying Animal Breeding.

## Article 6

### DIVISION OF AGRICULTURE 99

Animal Husbandry 15,	Milk Production	1	
Animal Husbandry 16,	Advanced Work in Mutton and Wool Production	1	
Animal Husbandry 17,	Advanced Work in Horse Feed- ing .	1	
*Animal Husbandry 23,	Seminar	1	
Veterinary 17,	Soundness and Shoeing	2	
Zoology 6,	Evolution of Animals	1	
		<hr/>	
		13	
Electives will be selected from the list on page 144,		3	to 7
		<hr/>	
	Total semester hours	16	to 20

\* A continuation of work in the seventh semester. Standing will be for seventh and eighth semesters. One hour credit for both semesters' work will be recorded at close of eighth semester.

### POULTRY HUSBANDRY GROUP

For Sophomore year, see Animal Husbandry Course.

#### Junior Year

##### FIFTH SEMESTER

		Required Semester Hours	
Animal Husbandry 11,	Feeding and Management of Live Stock	2	
Animal Husbandry 32,	Practice in Poultry Feeding	1	
*Animal Husbandry 40,	Poultry Seminar		
Animal Husbandry 43,	Market Types of Poultry	2	
Bacteriology 15,	General Bacteriology	2½	
Horticulture 8,	Landscape Gardening	2	
Soils 1,	Soil Physics	4	
Zoology 19,	Embryology	2½	
		<hr/>	
		16½	
Electives will be selected from list on page 144		0	to 3½
		<hr/>	
	Total semester hours	16½	to 20

\* Course 40 continues throughout the year. Credit is given at the close of the sixth semester.

##### SIXTH SEMESTER

		Required Semester Hours	
Animal Husbandry 8,	Animal Breeding	2	
Animal Husbandry 33,	Incubator Practice	1	
Animal Husbandry 34,	Brooder Practice	1	

Animal Husbandry 40,	Poultry Seminar	1
Animal Husbandry 42,	Marketing Poultry Products	2
Animal Husbandry 44,	Practice in Packing and Judging Poultry Products	1
Soils 2,	Soil Fertility	4
Veterinary 23,	Comparative Physiology	2
Zoology 8,	Animal Parasites	2
		—
		16
Electives will be selected from list on page 144,	0	to 4
	—	—
	Total semester hours	16 to 20

## Senior Year

## SEVENTH SEMESTER

		Required Semester Hours
Animal Husbandry 9,	Animal Nutrition	2
Animal Husbandry 20,	Animal Feeding	2
Animal Husbandry 30,	Breed Types of Poultry	2½
Animal Husbandry 35,	Experiment Station Work	1
Animal Husbandry 38,	Practice in Poultry Fattening	1
*Animal Husbandry 45,	Poultry Seminar	
Agricultural Journalism 1,	Beginning Journalism	1
Agricultural Journalism 5,	Live Stock Advertising	1
Veterinary 44,	Sanitary Science	2
Veterinary 770,	Anatomy and Physiology of Poultry	2
Economics 9,	Outlines of Economics	3
		—
		17½
Electives will be selected from list on page 144,	0	to 2½
	—	—
	Total semester hours	17½ to 20

\* Course 45 continues throughout the year. Credit is given at the close of the eighth semester.

## EIGHTH SEMESTER

		Required Semester Hours
Animal Husbandry 10,	Thesis	2
Animal Husbandry 15,	Milk Production	1
Animal Husbandry 17,	Advanced Horse Feeding	1
Animal Husbandry 36,	Poultry Research	1
Animal Husbandry 39,	Advanced Poultry Judging	2
Animal Husbandry 45,	Poultry Seminar	1
Agricultural Journalism 2,		1
Bacteriology 16,	Poultry Bacteriology	3½
Veterinary 871,	Poultry Parasites, Diseases and Hygiene	2

33. **Advanced Studies of the Breeds of Swine.** Origin, development, and characteristics of the breeds of swine.

5th or 7th Sem. Prerequisites 4 and Vet. Anat. 355; lectures 2; credit 2; fee \$1.00.

34. **Advanced Studies of the Breeds of Sheep.** Origin, development, and characteristics of the breeds of sheep.

6th or 8th Sem. Prerequisites 3 and Vet. Anat. 355; lectures 2; credit 2; fee \$1.00.

35. **Market Classes and Grades of Live Stock.** Laboratory work in classifying, grading, and valuing horses, cattle, sheep, and swine from the standpoint of the open market.

5th or 7th Sem. Prerequisites 1, 2, and Vet. Anat. 355; recitation  $\frac{1}{2}$ ; lab. 1,  $1\frac{1}{2}$ ; credit 1; fee \$1.00.

44. **Market Poultry and Poultry Products. For Women.** Special consideration is given to a study of the characteristics, classification, selection, and care of poultry products from the standpoint of the consumer.

Fall Sem. Prerequisites Chem. 109 and 110; lecture and lab. 1, 2 hr.; credit 1.

45. **Poultry Management. For Women.** General care and management of poultry from the standpoint of home economic students.

Spring Sem. Prerequisites Chem. 109 and 110; recitation and lab. 1, 2 hr.; credit 1.

46. **General Poultry Husbandry.** Various kinds of poultry products ordinarily produced for sale, with reference to their relative importance and opportunities for their production; characteristics of important classes and breeds of poultry; judging, breeding, housing, and marketing.

3rd Sem. Recitations  $1\frac{1}{2}$ ; lab. 1,  $1\frac{1}{2}$  hr.; credit 2; fee \$2.00.

47. **General Poultry Husbandry.** Continues the work in 46 and includes feeding, incubation, brooding, diseases, and sanitation.

4th Sem. Prerequisite 46; recitations  $1\frac{1}{2}$ ; lab. 1,  $1\frac{1}{2}$  hr.; credit 2; fee \$2.00.

48. **Breed Types of Poultry.** Origin, history, and characteristics of the more important breeds and varieties of poultry; also practice in judging by score card and by comparison.

5th Sem. Prerequisite 47; recitation 1; lab. 2, 2 hr.; credit  $2\frac{1}{2}$ ; fee \$2.00.

49. **Poultry Feeding.** Practical and experimental work; series of lectures on the important factors involved in the making up of poultry rations for various classes of poultry and in feeding for various purposes, particularly that of egg production, development of young stock, and meat production.

8th Sem. Prerequisite 47; lecture 1; lab. 1, 3 hr.; credit 2.

50. **Poultry Seminar.**

7th Sem. Credit 1.

51. **Incubation.** Successful hatching of eggs, including those factors which influence the hatching quality before as well as during the incubation period. A consideration of general methods in vogue in the management of central or mammoth hatcheries and the distribution of

baby chicks. Laboratory includes practical and experimental work in incubation.

6th Sem. Prerequisite 47; recitations 2 for first 12 weeks; lab. 4 weeks, 1 hr. daily divided into 3 periods; credit 2; fee \$2.00.

52. **Brooding.** The principles and practice of brooding.

6th or 8th Sem. Prerequisite 51; recitations 2 for last 3 weeks of semester; lab. 4 weeks, 1 hr. daily divided into 3 periods; credit 1½; fee \$2.00.

53. **Market Types of Poultry.** Judging and breeding of the most suitable types of poultry for meat and egg production.

7th Sem. Prerequisite 47; recitations 1½; lab. 1, 1½ hr.; credit 2; fee \$2.00.

54. **Poultry Seminar.**

8th Sem. Credit 1.

55. **Marketing and Judging Poultry Products.** Market classification of dressed poultry, eggs, and feathers. Judging, dressing, packing, shipping, and storing poultry products.

8th Sem. Prerequisite 53; recitations 1½; lab. 1, 1½ hr.; credit 2; fee \$2.00.

56. **Poultry Research.** Experimentation and study of special poultry problems. Approved methods and technique as well as practical research work.

8th Sem. Prerequisite 47; labs. 3, 3 hr.; credit 2; fee \$2.00.

58. **Dairy Husbandry Seminar.** Papers on selected subjects and recent investigations.

7th Sem. Credit 1.

59. **Milk Production and Herd Management.** Efficient and economical production of milk and the practical care, feeding, housing, and management of dairy cattle.

8th Sem. Prerequisite 9 or 20; recitations 2; credit 2.

60. **Advanced Study of the Dairy Breeds.** Origin, history, and characteristics of the important strains and families of each of the dairy breeds.

6th Sem. Prerequisite 4; recitation 2; lab. 1, 2 hr., and 1, 1 hr.; credit 3; fee \$1.00.

61. **Seminar. Problems in Milk Production and Herd Management.** Weekly conferences in which current events and recent experimental work and special problems will be discussed. Special problems will be assigned for research work also. For Dairy Husbandry students.

8th Sem. Credit 1 hr.

65. **Research in Animal Breeding.** Heredity and its related problems offer a large field for experimental research. ASSOCIATE PROFESSOR LLOYD-JONES.

Credit 3 to 10 hours per semester.

66. **Advanced Animal Nutrition.** Feeding, care, and management of live stock; especial emphasis being placed on the study of experimental methods and of research work previously done. Practical and fundamental problems will be worked out. Practical laboratories and lectures are given.

PROFESSOR PEW; ASSOCIATE PROFESSORS IKELER AND SHEARER;  
ASSISTANT-CHIEF EVVARD

Credit 3 to 10 hours per semester.

67. **Research in Dairy Husbandry.** Advanced study of the dairy breeds; milk production and herd management. PROFESSOR KILDEE  
Credit 3 to 10 hours per semester.

68. **Research in Poultry Husbandry.** Incubation, brooding, feeding, breeding, marketing and study of the principles and practices of successful management of flocks. PROFESSOR TURPIN  
Credit 3 to 10 hours per semester.

69. **Advanced Genetics.** Scientific study of experimental breeding and the newer theories concerning the mechanism of heredity.

ASSOCIATE PROFESSOR LLOYD-JONES

9th Sem. Prerequisite 8, or its equivalent in Hort., Bot., or Zool.; recitations 2; credit 2.

70. **Problems of Heredity and Breeding.** Seminar. Weekly conferences in which current work in the experimental study of heredity and special topics are discussed. Consent of instructor required before election. ASSOCIATE PROFESSOR LLOYD-JONES  
Credit 1 hr. per semester.

### BACTERIOLOGY AND HYGIENE

PROFESSOR BUCHANAN, Room 320, Central Building: after Sept. 1, 1916, Room 1, Science Building

Professor Brown; Associate Professors Hammer and Murray; Assistant Professor Levine; Instructor Burling; Teaching Fellows, De Bord, Johnson

With the opening of the school year 1915-1916 the department will be housed on the first and second floors of the new science hall. This building has been planned to furnish the best possible accommodations to bacteriological laboratories. The large general student laboratories, accommodating sixty and forty students respectively at one time, are well equipped with standard laboratory tables, lockers, sterilizers, autoclaves, thermostats and microscopes. The general laboratory on the first floor is intended for those students, both elementary and advanced, who should secure special instruction in the pathogenic bacteria of importance in the live stock industry. A room for small animals, a small autopsy room, and a room designed primarily for work in immunity and serum therapy are provided, together with dispensing room, offices, research, and class rooms. On the second floor the general laboratory is designed for the needs of students in general bacteriology in such courses as Agronomy, Dairying, Forestry, Horticulture, Home Economics, and Sanitary Engineering. Rooms are also planned for diagnostic work, for research work, and for investigations in both engineering and agricultural experiment stations.

The laboratories in soil bacteriology are housed with the Department of Soils on the first floor of Agricultural Hall. Student laboratories, accommodating thirty-six students, with laboratory furniture and apparatus, a dispensing room, and a room for thermostats and for storage purposes



COLLEGIATE INSTRUCTION

Curriculum in Dairy Husbandry

Leading to the degree of Bachelor of Science.  
For freshman and sophomore years, see Animal Husbandry Curriculum page 141.

Fall Quarter		JUNIOR YEAR Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
General Bact. Bact. 304A	5	Animal Nutrition A. H. 318	3	Adv. Study Dy. Breeds A. H. 335A	4
Comparative Physiology Vet. Phys. 364	3	Feed. & Mktg. Horses A. H. 424	2	Rural Sociology Ec. 386	3
Embryology Zool. 534	3	Dairy Bacteriology D. I. 350	4	Fertility & Fertilizers Soils 354	5
Gen. Agr. Economics Ec. 233	3	General Genetics Gen. 300	3	Economic History Hist. 324	3
Electives	3	Electives	5	Electives	2
	17		17		17
SENIOR YEAR					
Milk Secretion A. H. 535	2	Dairy Farm Problems A. H. 436	5	Pork Prod. & Mktg. A. H. 425	3
Commercial Dairy. D. I. 406	4	Animal Breeding A. H. 350	3	Market Milk D. I. 305	3
Soil Management Soils 454	3	Seminars A. H. 439	1	Pasture & Hay Crops F. C. 404	3
American Govt. Govt. 315	3	Electives	8	Electives	8
Extempore Speaking P. S. 311	2				
Electives	3				
	17		17		17

Curriculum in Poultry Husbandry

Leading to the degree of Bachelor of Science.  
Six months of practical work in agriculture, under the direction of the department is required before graduation. See page 139.  
For entrance requirements, see page 73.

Fall Quarter		FRESHMAN YEAR Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Poultry Husbandry A. H. 144 <sup>1</sup>	3	Management of Poultry A. H. 145	2	Packing Plant Prob. A. H. 146	3
Livestock Problems A. H. 101	2	Livestock Problems A. H. 102	2	Livestock Problems A. H. 103	2
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
Farm Shop A. E. 254	2	General Chemistry Chem. 101	4	General Chemistry Chem. 102	4
General Farm Crops F. C. 124	4	General Botany Bot. 101C	3	General Horticulture Hort. 114	3
Military 121	1	Military 122	1	Military 123	1
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys. Ed. 101, 102, 103; Tech. Lect., A. H. 121, 122, 123; Orientation, Ag. 101, 102; Ag. 104, see page 139.

several electives in some other line of agriculture or allied science and thus prepare himself for special work in a chosen field, or for work for an advanced degree in that field. Electives are to be chosen in conference with the senior college counselors and the head of the department. The Department has prepared groups of elective sequences leading to definite objectives: as for example, a group of courses in Vocational Education and Psychology, Chemistry and Physiology, Agricultural Economics, English, Technical Journalism, Entomology, etc. Where such sequence requires as much as 30 credits, the student with the consent of his counselor and classifying officer, and the approval of the Substitutions Committee may substitute for enough credits to make the sequence possible.

For information concerning the Reserve Officers' Training Corps, see page 261.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 127.

## ANIMAL HUSBANDRY

143

Fall Quarter		SOPHOMORE YEAR				Spring Quarter	
	Credits	Winter Quarter		Credits		Credits	
Poultry Judging		Hatchery Operation		Brooding			
A. H. 244	3	A. H. 245	2	A. H. 248	3		
General Chemistry		Organic & Quant.		Organic & Quant.			
Chem. 103	4	Chem. 255	3	Chem. 266	3		
Anat. Dom. Animals		General Zoology		General Zoology			
Vet. Anat. 217	3	Zool. 114	3	Zool. 115	3		
Farm Meats		Mathematics		Physics			
A. H. 270	3	Math. 205	4	Phys. 204	3		
Gen. Agr. Economics		Gen. Agr. Economics		Farm Dairying			
Ec. 231	3	Ec. 232	3	D. I. 114	4		
Military 221	1	Military 222	1	Military 223	1		
	17		16		17		

In addition to the courses listed above, each student will be required to include in his schedule: Phys. Ed. 201, 202, 203.

JUNIOR YEAR					
Spl. Poultry Problems		Incubation		Poultry Nutrition	
A. H. 344	3	A. H. 345	3	A. H. 546	3
Comp. Physiology		General Bacteriology		Spl. Poultry Bacteriology	
Vet. Phys. 364	3	Bact. 304A	5	Bact. 574	3
Embryology		General Genetics		Soils	
Zool. 534	3	Gen. 300	3	Soils 254A	3
Animal Nutrition		Rural Sociology		Gen. Agr. Economics	
A. H. 318	3	Ec. 366	3	Ec. 233	3
Extempore Speaking					
P. S. 311	2				
Electives	3	Electives	3	Electives	6
	17		17		17

SENIOR YEAR					
Mkt. Poultry		Poultry Breeding		Commercial Poultry Prod.	
A. H. 440	4	A. H. 548	3	A. H. 449	3
Poultry Seminar		Poultry Seminar		Poultry Seminar	
A. H. 541	1	A. H. 542	1	A. H. 543	1
American Govt.		Fertility & Fertilizers		Poultry Sanitation	
Govt. 316	3	Soils 354	5	Vet. Hyg. 428	2
Fish & Game		Economic History		Tech. Advertising	
Zool. 405	3	Hist. 324	3	T. JI. 325	2
Electives	6	Electives	5	Electives	9
	17		17		17

### Combined Curriculum in Animal Husbandry and Veterinary Medicine

See the Dean of Veterinary Medicine and the Head of Animal Husbandry.

#### Description of Courses

For description of non-collegiate courses, see page 300.

101. **Livestock Problems.** Beef and dual-purpose cattle. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. (A) For students who have not had one year of vocational or 4-H Club training. Fall. (B) For students who have had at least one year of 4-H Club or vocational training. Fall. Rec. and lab. 2, 2 hr. Credit 2.

102. **Livestock Problems.** Sheep and horses. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. (A) For students who have not had one year of vocational or 4-H Club training. (B.) For students who have had at least one year of 4-H Club or vocational training. Winter. Rec. and lab. 2, 2 hr. Credit 2.

103. **Livestock Problems.** Dairy cattle and hogs. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. Spring. Rec. and lab. 2, 2 hr. Credit 2.

104. **Livestock Problems.** Beef, dairy and dual-purpose cattle, sheep, horses, and hogs. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. Summer. Rec. and lab. 6, 2 hr. Credit 3.

107. **Market and Breed Types of Beef, Dairy and Dual-Purpose Cattle, Sheep, Horses and Hogs.** For Veterinary Medicine students. Judging. Fall. Rec. and lab. 6, 2 hr. Credit 6.

For information concerning the Reserve Officers' Training Corps, see page 261.

## Article 9

### POULTRY HUSBANDRY

ROBERT E. PHILLIPS, Ph.D., Head of Department

Professors Robert Penquite, Ph.D.; George F. Stewart, Ph.D.

Associate Professor Arne W. Nordskog, Ph.D.

Fellows Hurry, Sanford, Slosberg, Stephenson

Extension Worker Whitfield

#### OPPORTUNITIES FOR UNDERGRADUATE STUDY

For undergraduate curriculum in poultry husbandry leading to the degree of Bachelor of Science, see pages 90 and 91.

The curriculum in poultry husbandry provides for a general education in agriculture with specialized training in subjects relating to the production, processing, storage and distribution of poultry and egg products. Considerable emphasis is also placed on providing the student with a general background in the sciences and humanities. The curriculum provides a liberal allowance of elective courses to be selected by the student in consultation with the departmental staff.

Students graduating in Poultry Husbandry find employment in many lines of work: commercial poultry farm managers and owners, poultry breeding farm managers and owners, hatchery managers and owners, technologists in produce plants and poultry specialists for service work in agricultural journalism, government service, as well as in the biologic, feed and equipment industries.

#### OPPORTUNITIES FOR GRADUATE STUDY

The department offers major work for the degrees Master of Science and Doctor of Philosophy in poultry nutrition, poultry breeding, avian physiology, and poultry products technology; minor work for students taking a major in other departments.

The completion of a suitable undergraduate curriculum including course work substantially equivalent to that given at this institution is required. This will include undergraduate courses prerequisite to the specialization chosen for graduate study. A strong undergraduate background in science (biology, chemistry, and mathematics) is highly desirable for those who wish to pursue graduate study in these fields.

Open to graduate students for minor only: 490.

#### DESCRIPTION OF COURSES

##### COURSE PRIMARILY FOR NONCOLLEGIATE STUDENTS

1. Poultry Management. (0-1-3) Cr. 2. W.  
Culling and selecting, housing, feeding, brooding, fattening, marketing of poultry and grading of eggs.

##### COURSES PRIMARILY FOR UNDERGRADUATE STUDENTS

101. General Poultry Husbandry. (0-2-3) Cr. 3. F. W. S.  
Principles and practices of poultry production. Classification of breeds, culling, judging, housing and feeding. Introductory course for those who expect to specialize in poultry; arranged also for those who wish a single course in poultry.
102. Poultry Farm Management. (0-2-3) Cr. 3. W.  
*Prerequisite:* 101.  
Development and organization of the commercial poultry farm enterprise. Principles and practices related to the feeding, housing and selection of laying stock (chickens and turkeys).
103. Advanced Poultry Farm Management. (0-2-3) Cr. 3. S.  
*Prerequisite:* 102.  
Principles and practices related to the incubation of eggs and the brooding, feeding and housing of young stock (chickens and turkeys).
201. Poultry Nutrition. (0-2-3) Cr. 3. F.  
*Prerequisite:* 101.  
Principles and practices of poultry nutrition; selection and use of ration ingredients; feeding standards and ration formulation.
301. Poultry Judging. (0-1-0) Cr. 3. F.  
*Prerequisite:* 101.  
History and development of breeds and varieties, production judging methods, standard judging methods, individual bird evaluation and stock appraisal.
302. Incubation and Brooding. (0-2-3) Cr. 3. W.  
*Prerequisites:* 101, Zool. 334.  
Problems in hatchery management including the incubation of eggs and the brooding of chicks and poults.
303. Poultry Show Organization and Administration. (0-1-0) Cr. 3. W.  
*Prerequisite:* 101.  
Organizing and managing poultry shows and exhibitions.

401. Marketing and Processing Poultry Products. (0-3-3) Cr. 4. F.  
*Prerequisite:* 101, Chem. 103.  
 Procurement, processing, storage, and distribution of poultry and egg products; commercial produce plant operations.
402. Poultry Breeding. (0-3-0) Cr. 3. S.  
*Prerequisite:* 101, Gen. 300.  
 Principles of genetics as applied to poultry. Inheritance of economically important traits including egg production, egg size, hatchability, body size and viability; methods of poultry breeding.
490. Special Problems. Cr. 1 to 3. Yr.  
 Open to senior college students showing satisfactory preparation for problem chosen and quality point average of 3.5 or above for two preceding quarters. Conferences and preparation of report on individual problems.
- COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS
- 501, 502, 503. Poultry Seminar. (0-1-0) Cr. 1 each. Yr. Staff
504. Advanced Poultry Nutrition. (0-2-3) Cr. 3. Alt. S.  
*Prerequisite:* 201, Chem. 103, Vet.Phys. 364. Mr. Panquite  
 Vitamin, mineral, and protein requirements of poultry, poultry rations, development and study of nutritional deficiencies.
550. Physiology of Avian Reproduction. (0-2-3) Cr. 3. Alt. F.  
*Prerequisite:* Vet.Phys. 366 or equivalent. Mr. Phillips  
 Special emphasis on the physiology of reproduction of poultry and the relationship of the endocrine glands to this process.
- COURSES FOR GRADUATE STUDENTS
601. Advanced Poultry Breeding. (0-3-0) Cr. 3. Alt. W.  
*Prerequisite:* 402. Gen. 655. Mr. Nordskog  
 Application of systems of breeding to poultry, including inbreeding, outbreeding, hybridization and methods of selection.
602. Advanced Poultry Products Technology. (0-3-0) Cr. 3. Alt. S.  
*Prerequisite:* Bact. 304, Chem. 474. Mr. Stewart  
 Research problems in poultry products; literature study; planning for and execution of research projects related to the processing, storage, distribution, and utilization of poultry and egg products.
- 606A. Institution Purchasing. (I.Mgt. 006 A, A.II. 606A) (0-1-6) Cr. 3. W.  
*Prerequisite:* A.M. 374, I.Mgt. 484. Mr. Stewart  
 Procurement and storage of poultry and egg products for institutions.
690. Research.  
 A. Poultry Breeding. Mr. Nordskog  
 B. Poultry Nutrition. Mr. Panquite  
 C. Avian Physiology. Mr. Phillips  
 D. Poultry Products Technology. Mr. Stewart

## CURRICULUM IN POULTRY HUSBANDRY

Leading to the degree of Bachelor of Science.

Six months of practical work, approved by the department, in the branch of the industry of particular interest to the student is required before graduation.

### FRESHMAN YEAR

Prin. of Composition Engr. 101	3	Prin. of Composition Engr. 102	3	Prin. of Composition Engr. 103	3
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	General Chemistry Chem. 103	4
General Poultry Husbandry P.H. 101	3	Poultry Farm Mgt. P.H. 102	3	Adv. Poultry Farm Mgt. P.H. 103	3
Crop Production & Mgt. Agron. 114	4	Animal Biology Zool. 114B	4	Soils & Soils Mgt. Agron. 154	4
Military 111	1	Military 112	1	Military 113	1
	15		15		15

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Lib. 106A (Fall); Ag. 101, 102; Ag. 104.

### SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Prin. of Economics Econ. 231	3	Prin. of Economics Econ. 232	3	Prin. of Economics Econ. 233	3
Poultry Nutrition P.H. 201	3	Speech-Making Speech 311	3	Public Address Speech 312	3
Anat. Domestic Animals Vet. Anat. 217	3	General Horticulture Hort. 114	3	Prop. Analysis Engr. 205	3
*Mathematics Math. 205	4	**Physics Phys. 204	3	Military 213	1
Military 211	1	Military 212	1	***Electives	7
***Electives	4	***Electives	4		
	18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

\*Students may substitute Math. 101.

\*\*Students may substitute Physics 211.

### JUNIOR YEAR

Physiol. of Domes. Animals Vet. Phys. 364	3	Incubation & Brooding P.H. 302	3	General Bacteriology Bact. 304A or D	3 or 5
Embryology Zool. 334	3	General Genetics Gen. 300	3	Hist. of American Agric. Hist. 324	3
Poultry Judging P.H. 301	3	Accounting I Econ. 334	4	***Electives	9 or 11
***Electives	8	***Electives	7		
	17		17		17

### SENIOR YEAR

Poultry Seminar P.H. 501	1	Poultry Seminar P.H. 502	1	Poultry Seminar P.H. 503	1
Mktg. & Processing Poultry Products P.H. 401	4	Business Correspondence Engr. 404	2	Adv. Poultry Nutrition P.H. 504	3
Physiology of Avian Reproduction. P.H. 550	3	American Government Govt. 315A	3	Poultry Breeding P.H. 402	3
***Electives	9	***Electives	11	Poultry Sanitation Vet. Hyg. 428	2
	17		17	***Electives	8
					17

\*\*\*Specialized Training

The following courses are suggested as electives for students who wish to prepare for these special fields:

Commercial Poultry Farm and Hatchery Operations. Chemistry 255 and 256 are required. Animal Husbandry: 111, 112, 135, 318, 337, 350, 374, 434; Chemistry: 474; Agricultural Engineering: 254, 255, 256, 289; Horticulture: 164, 224, 366, 414, 415; Landscape Architecture: 208; Technical Journalism: 325; Economics: 130, 335; Zoology: 374, 375, 384, 504.

Produce Plant Operations. Chemistry 211 and 212 are required. Mathematics: 101, 102, 103, 211, 212, 213; Physics: 211, 212, 213; Chemistry: 431, 432, 433, 474; Animal Husbandry: 374; Dairy Industry: 114, 258, 350.

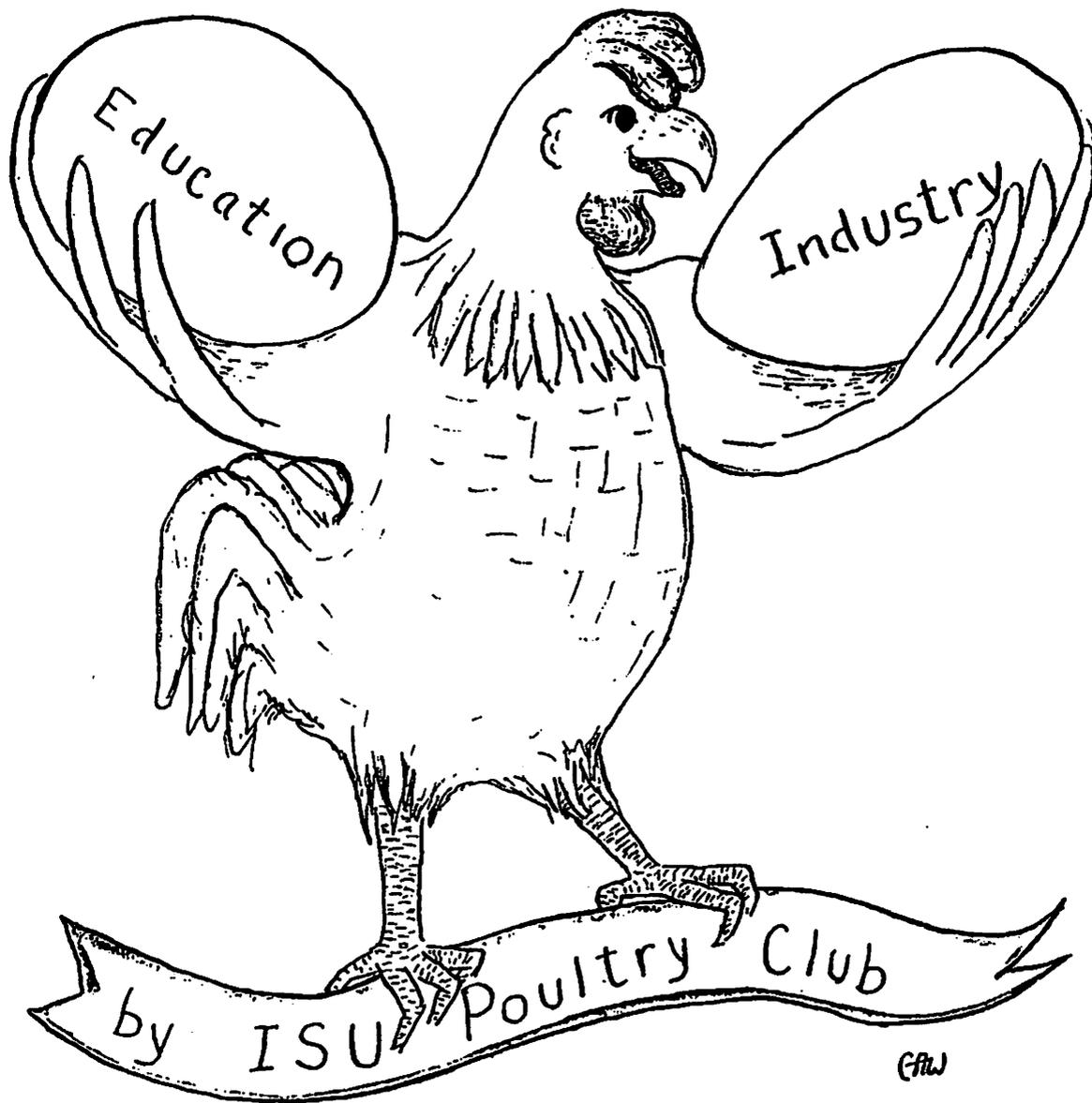
Feed and Equipment Manufacturing, Advertising, and Sales. Chemistry 255 and 256 are required. Animal Husbandry: 111, 112, 318; Chemistry: 474; Technical Journalism: 325, 335; Economics: 335, 365, 385, 430, 435, 480; Psychology: 204.

Pregraduate Training. Chemistry 211 and 212 are required. Mathematics: 101, 102, 103, 211, 212, 213, 441, 442; Chemistry: 431, 432, 433, 474; Vocational Education: 304, 361; Physics: 211, 212, 213; Modern Language: 201, 202, 203, 231, 232, 233.



Article 10

# The Cock's Crow



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## History Of The Poultry Club

Although the Poultry Club is a very active organization, there is a very sketchy historical record of the club's activities. The sources of information used were old yearbooks, magazines, and student directories. No place could we find the date that the Poultry Club became a separate division of the old Ag Club.

Over the years the purpose of the club has been to promote a closer relationship between the student and the poultry businessmen. Through this organization prominent out-of-town speakers are brought to the campus. The speakers are not necessarily poultrymen, but men who have a broad scope on the affairs of the world.

During Veishea the Poultry Club has been one of the most active clubs on campus. As far back as 1925, they have been winning honors. In that year they won the Agriculture Division with a horse-drawn float, which held a large egg basket and a banner which read, "Iowa--Egg Basket of the Nation".

On May 14, 15, and 16, 1925, the First Annual Egg Show was held. The purpose of the show was to encourage production and marketing of quality eggs and increase the consumption of eggs. In latter years a Baby Chick and a Cake and Cookie Show were added. The purpose of these annual shows was to create a greater interest among the poultry breeders of Iowa, and to give them a chance to compare their chicks and produce with that of other poultrymen in the country.

Somewhere along the line the Cake and Cookie Show was dropped and a Poultry Show was added. This gave a remaining Egg, Chick, and Poultry Show which was the only one of its kind in the United States. The entire show was held in conjunction with Veishea. The show attracted the interest of prominent poultrymen throughout the United States. After the shows, a sale was held and all of the proceeds went to the Club. However, due to loss of interest the show was dropped in 1958. Since 1958, the Club has sponsored a display with which they have received high rankings from the judging committee. A third place was gained in 1960, and a second in 1961.

Proceeds from the Egg, Chick, and Poultry Show were used to send four boys to the Collegiate Poultry Judging Contest in Chicago and for other poultry functions on campus. Iowa State attended the judging contest thirty times without missing. They compiled an excellent record by winning first, four times; second, five times; third, one time; fourth, three times; and fifth, four times. They never placed last. The last judging team went in 1959.

Like most organizations the club was disbanded during the war.

If any reader knows of any historical information not included, we welcome his writing to us at Iowa State.

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**Compliments of Abe Schankerman  
with Schankerman Bros.**

## Activities Of The Poultry Club

The Iowa State Poultry Science Club may be considered as a David among many Goliaths. Throughout the years it has been one of the smallest departmental clubs on campus. This year the Poultry Club boasts more members than are enrolled in the poultry curricula with nearly 100 per cent attendance at meetings. The size of the club has not limited its activities and over the years a treasury has been built which is the envy of many of the larger clubs. All of the money has been earned by student planned and operated projects.

The largest work project of the club has been that of processing and selling turkeys to the faculty and residence groups. The turkeys are bought from local producers and dressed, using student labor, at the poultry farm. Two years ago over 100 turkeys were dressed and sold. The project was not carried out this year because of the turkey market.

The editing and publication of this magazine is a recent project of the club. Our main purpose is to acquaint people around the state with our poultry facilities here at Iowa State University. As you know the college life of a student is approximately four years, so we must be constantly in search of new material to keep our club strong.

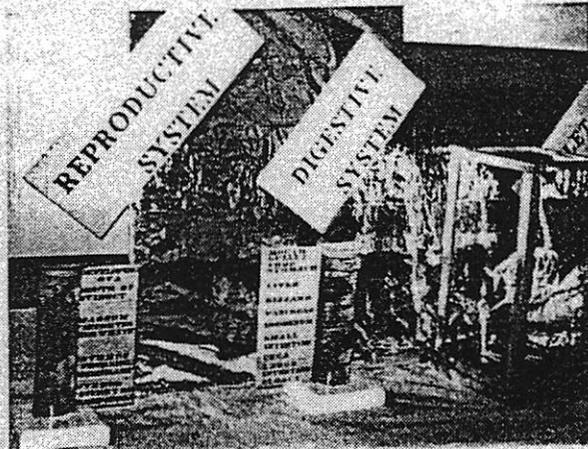
A copy of the magazine will be sent to every college and university which has an Agricultural Division, every high school in the state, turkey growers, and hatcheries. This will give a total distribution of approximately 5000 copies.



Because the Poultry Club is small, it is important that all members participate wholeheartedly. We feel that participation is directly related to interest. And interest can be held by activities of either working or relaxing together.

Each fall quarter the club holds a get acquainted breakfast picnic at a local park. This is usually the first social gathering for the club and it allows the members to meet the new freshmen, and acquaints the freshmen with the club's activities.

During the winter quarter the club members journey to the home of a faculty member for an evening of dining and fellowship. The informal atmosphere gives both the student and faculty members the opportunity to get better acquainted.



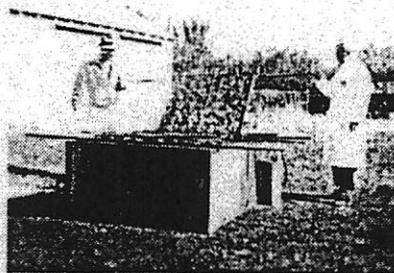
Each spring Veisha is an event that comes to the Iowa State campus. One of the features of Veisha is the colorful displays set up by the departmental clubs. Last year our club chose the theme, "Research, Building Block for the Future" for its display. Visitors to the display were greeted with a sign made of small building blocks and a large four foot square red block which was mounted on one corner to a revolving table. A sign on each side of the block represented the different areas of the display: nutrition, genetics, products, and physiology. The guided tours through the display were climaxed with a free sample of egg nog for each visitor. The club made and served approximately 4000 cups of egg nog. This display received a second place in the Ag. Division.

Following the monthly meetings, various types of programs are usually planned. These programs vary from pictures of trips, to visits with poultry industry representatives. Because of the small number of members, individual problems may also be discussed.

Each year the Poultry Club provides funds to send two seniors to the Fact Finding Conference in Kansas City. This is an attempt to narrow the gap between our school and the industry.

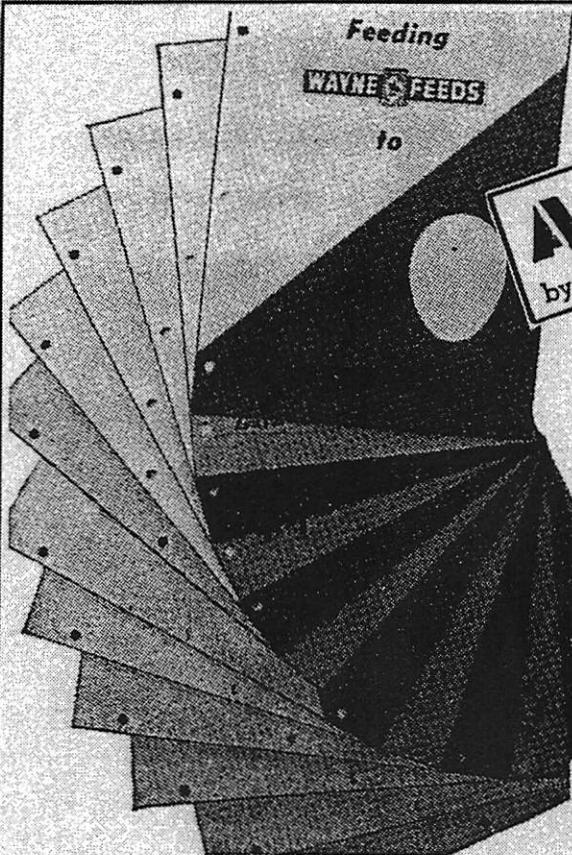
### *Alumni Days*

This year the Poultry Science Department Staff with the help of the Poultry Science Club members sponsored an Alumni Days on October 21. This picnic was held on Saturday morning at the Poultry Farm at Ames and replaced our usual Fall Quarter Club picnic. About 120 attended the dinner including the department staff and their families, past alumni, friends, poultry club students and their parents. The enjoyable dinner of barbecued chicken, with all the trimmings, served by the staff and club members, was prepared by the Chicken Barbecue Service of the Iowa Poultry Association.



After the brief get-acquainted period following the dinner many of the guests attended the ISU-Missouri football game, sitting together in a block of reserved seats.

Following the game coffee was served at Dr. Forsythe's home.



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\*Average results from comparison tests at the Wayne Research Farm.

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## RESEARCH FARM, continued

In early 1947, the University acquired 1,400 acres of land near Ankeny, Iowa. This has been developed into what is now known as the Ankeny Experimental Station. The poultry department received 264 acres of this land.

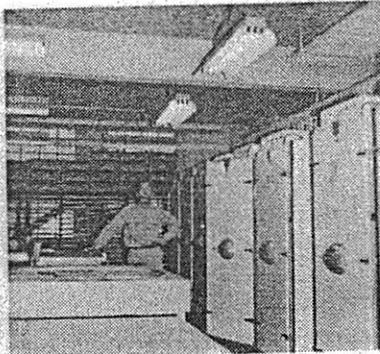
At the present there are only two buildings on this land. One is a large mating house for chickens. These birds are used in genetics work. The other building is a mating house for turkeys. These birds are the parent stock for all the turkeys used in nutrition research. Orland

Eggers is farm foreman and there are three full-time employees.

In 1926, Iowa State began basic research in the inbreeding of chickens. At the present time, some of the oldest inbred lines of chickens in the United States are to be found here at Iowa State. Also, work on Leucosis in chickens was started in 1930. Both of these projects have been of definite value to the poultry industry. These are the types of basic research that the Iowa State Poultry Science Department expects to continue with in the future.



Earl Anderson  
Wendell Strother  
Harry Albertsen  
Ron Jondall  
Art Jefferson  
Charlie Callahan - Foreman



Charles Callahan  
Incubator Room



Barbra Stark  
Poultry Farm Secretary

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## POULTRY LABORATORY

Housed in the basement of a long, red brick building behind the Agronomy building is the poultry laboratory. Dr. William Marion, heading the work done here in product technology and nutrition research, considers it a chemistry laboratory.

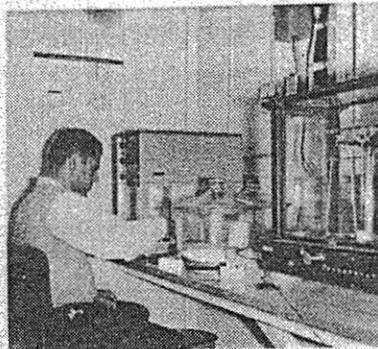
Many facilities are available in this laboratory for use in product, feed, and physiologi-

cal determinations connected with the various research projects.

Jill Rinford is employed as technical assistant and several students are employed part-time for other jobs in the laboratory. Dr. Marion's office and the offices of several graduate students are also located in the laboratory.



Jill Wainford  
Lab Technician



Nuhad Dagher  
Balance Room

# Research in Poultry Breeding and Genetics

Dr. A. W. Nordskog

Currently we are involved in four breeding and genetics projects with poultry. These deal with responses to selection, single gene effects on performance, blood group studies and measurement of performance in field tests.

Our project on selection responses is designed as a long time experiment which was started in 1956. Selection experiments serve in testing the validity of modern quantitative genetics theory as applied to poultry. This is important because it is basic to the development of the most effective breeding systems for each type of chicken - egg producers and broilers.

Present knowledge concerning such questions as the correspondence between expected and realized genetic gains, correlated responses to selection, plateaued populations and selection limits is very sketchy. To answer these questions we have developed lines where each has been selected on the basis of a single trait.

For example, we have a Leghorn line selected strictly on high rate of egg production. We have two other lines selected only for body weight. One is large body size and the other small body size. Likewise, we have two lines where we are selecting in opposite directions on egg size. Furthermore, we are developing such "single trait" lines not only in the Leghorn breed but also in an Egyptian breed known as the Fayoumi.

After four years of selection the large body line now averages 6.2 pounds. The small body line averages 3.2 pounds. Of course, we already knew that selection would be very effective in changing body weight but what we didn't know too well is what would happen to other important traits when body weight is changed by selection. Thus, we found that a one pound increase in body weight increased egg weight almost 2 ounces per dozen and age at sexual maturity by four days. We found also that selecting for small body size tended to improve fertility and hatchability while large body size lowered these traits. On the other hand egg production decreased whether selection was for large body size or small body size.

These effects are what we call correlated responses to selection.

We found somewhat similar results when we selected for large egg size and small egg size. However, in this case we obtained different results from the two breeds. Thus, large egg size was associated with lower fertility in the Leghoms but not in the Fayoumi.

Another interesting result which is coming out of this experiment is that when selection is for body weight we find a high correlated response in egg weight. Yet, surprising, when we select for egg weight we do not have a high correlated response in body weight. This seems to be genetically explainable only if the number of genes influencing one trait is substantially greater than in the other trait.

Our second project is concerned with genes for plumage color and other morphological traits and their influence on performance in the fowl. We are developing lines with high levels of inbreeding but which segregate, for example, for the dominant white plumage color gene. We have other lines which segregate for single comb and rose comb and still other lines segregating for white shanks, barring, naked neck, crest and even blue egg shell color.

Our object is to learn how these genes determining simply inherited traits, influence egg production, maturity, fertility and other important economic traits. By developing inbred lines segregating for single gene effects it is possible for us to control the genetic background and to allow us to be more sure what the influence of these single genes are on performance traits.

We find that the dominant white gene depresses growth rate in one of our lines but not in the other. Hence, the action of this gene is conditioned by the particular genetic background peculiar to a breed or a strain. Also we have discovered that the gene for dominant white (1) is completely dominant in a Leghorn background but incompletely dominant in a Spanish breed background.

The Leghom heterozygote (Ii) is indistinguishable from the Leghom homozygote (II). Both are completely white. However, in a Spanish background we find that Ii birds have a great deal of black flecking while II is completely white as in the case of the Leghom. Thus, we find that I is incompletely dominant in a Spanish genetic background, but completely dominant in a Leghom background.

Our third project deals with blood typing. Several commercial breeders in the country today are using blood typing techniques as a possible tool for the improvement of their strains. We know that in the case of human beings each belong to one of three blood types - A, B and O. We also know that the success of blood transfusions in human medicine is dependent on a knowledge of blood types. In a similar manner, chickens belong to different blood types.

For the past three years we have been developing our blood typing program. Most of the experiments we have underway are basic in nature. Some of the findings may have application not only to poultry but also to human and veterinary medicine. We have been conducting skin grafting experiments in connection with our blood group studies. Ordinarily, when skin from one individual is grafted onto another the skin is rejected or sloughed off.

When individuals are closely related, as in the case of identical twins, then skin from one individual can be grafted quite successfully onto the twin. However, when individuals are not related then skin grafting is not successful. We have found that skin grafts are accepted when they bear similar blood types. If they are dissimilar the grafts are rejected.

It appears that blood antigens and skin antigens have elements in common. This is of significance to workers in human medicine because of the interest today in skin grafting and organ grafting from one human being to another. These findings along with the fact that relatively simple techniques are involved in grafting chickens indicates that chickens may become of real importance in tumor transplantation and other immunity studies in human and veterinary medicine.

Our fourth project deals with field testing

for performance. We want to know what factors enter into the accuracy of comparing chickens of different strains under different management conditions or on different feeding schemes. At the present time our main interest centers on how best to make valid comparisons between strains.

These studies are cooperative with the Iowa Poultry Association in connection with the random sample egg laying test we have in Iowa known as the Iowa Multiple Unit Test. The main purpose of this test is to compare commercial varieties of chickens to serve as information for poultrymen, hatcherymen and breeders but the second purpose is to provide us with research information on testing procedures.

The question is asked by the practical poultry raiser as to just how reliable are random sample poultry tests. Reliability of results increases when we average over many tests and average over a number of years. The question is how many birds need to be tested in how many pens, over how many farms and in how many years.

We have collected four years of data from the Iowa Multiple Unit Poultry Test and are now in the process of summarizing these results to show more precisely what factors are important in conducting a test. This leads to the questions as to which is most important, breeding or management? We know that both are important, but it appears that differences among modern high producing strains of chickens being sold today are frequently not as great as differences in management, feeding and disease existing between different farms.



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Habit**

# Poultry Nutrition - 1962 Style

Dr. S. L. Balloun

In talking about our poultry nutrition research at Iowa State University, we always try to remember that this is only one phase of our poultry research and that, by itself, it would be relatively ineffective. We need to develop top rations to feed our chickens, but if we do not have superior genetic stock, and if the health of the stock is not of the best, the feeding program falls flat on its face! And in the final analysis, if we don't produce food--good food, kept good--our efforts have been wasted.

Just the same--nutrition of poultry is going places! It's come a "fer piece" and it continues to advance. In 1870, The Practical Poultry Keeper gave this advice on poultry nutrition "Potato peelings from the family kitchen should be boiled until soft, mashed with enough bran to make a stiff paste, seasoned with salt and pepper, soaked in boiling water overnight and fed warm as a mash in the morning."

Seriously, though, we are making progress! At Iowa State University, we are constantly trying to find ways to produce better results in terms of more efficient production, and production of higher quality eggs and meat.

Our research in poultry nutrition is organized under three general projects--1) nutrition of young chickens, 2) nutrition of laying hens and 3) turkey nutrition.

1) Chick nutrition. We don't produce many broilers in Iowa, but since we do grow a large number of replacement pullets, we feel that this is an area of research which is quite important. Furthermore, the same nutrients which are needed for fast, efficient growth in broilers are also needed for efficient production of pullets. Usually, the nutritional needs of the replacement pullet are not so critical as those of the broiler, but the broiler chick, being very sensitive to nutritional changes, is an excellent tool for measuring diet differences. This is why we use broiler-type chicks in most of our trials--we can see differences in broiler chicks when they are fed different diets long

before the same feeds would show differences in growth or efficiency in egg-type strain chicks.

Quite naturally, as we investigate possibilities of improving our chick diets, we do work with a number of different kinds of nutrients and feeding stuffs. At the present time, our chick work is concerned for the most part with a) protein and amino acids, b) fats, choline and cholesterol interrelationships, c) fundamental studies aimed at a better understanding of the chick through a study of blood composition, microflora of the intestinal contents and nitrogen excretion.

2) Nutrition of laying hens. Since the object of feeding laying hens is to produce a highly palatable and nutritious food, we have devoted a good share of our facilities and time to the study of factors affecting the quality of eggs produced. During these studies we have studied fats and cholesterol, calcium and phosphates, and protein and energy levels as these affect production and the quality of the eggs produced. We are just starting a project in which we will investigate the effect of body size and other strain differences or nutritive requirements.

3) Turkey nutrition. In the turkey area, we have worked with both market turkeys and breeders. In our breeding flock, we have studied the vitamin E, choline, zinc and energy requirements. With market turkeys, our most significant studies have been concerned with the supplementation of diets with pure amino acids. Of special interest to us has been the finding that lysine supplementation has produced the greatest effects in the "finishing" period after poults are 16-20 weeks of age.

In addition to the work with amino acids, we have also studied the protein and energy needs of turkeys and the effects of such additives as antibiotics, arsonics, etc.

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# Research in Poultry Products

Dr. William Marion

Research in poultry products at Iowa State University employs analytical techniques to find out more about the basic characteristics of eggs and poultry meat.

Under these broad areas are individual and detailed problems presently being considered. An area receiving the most attention up to this time is that of cholesterol metabolism in the laying hen. Much of this work has been done in cooperation with those persons in poultry nutrition.

Of particular concern to those in poultry products has been the total amount of cholesterol in the egg and factors which might influence this amount. Early in this work an impression was formed that it is very difficult to alter egg yolk cholesterol. This idea is still retained.

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After considerable work in which the diet of laying hens has been changed with respect to fat content, fatty acids, etc., the amount of cholesterol remains essentially the same. It can be stated that the level of cholesterol in egg yolk amounts to 2000 to 2200 milligrams per 100 grams of dry yolk. Slight deviations have been experienced but no significant change from this amount has been realized in the experimental work thus far.

Another area of emphasis within the framework of cholesterol research has been that of determining the rate of deposition of cholesterol in the developing ovum. Ova have been "harvested" from anesthetized laying hens through an incision between the sixth and seventh rib. Care is exercised in removal of these ova from the hen to prevent internal bleeding and subsequent damage to ovarian tissue.

The maximum number of ova taken from a hen in this manner has been seven. These vary in weight from approximately 17g down to perhaps 0.1g. Some unique aspects of this study have been that a hen is capable of returning to normal production within the expected 9 to 14 days.

Analysis of each ovum for cholesterol con-

tent has made it possible to arrive at an idea of the rate of cholesterol deposition in the maturing ovum. It is accepted that 9 to 10 days time is required for an individual ovum to mature and be ready for ovulation. It appears from these studies that cholesterol is deposited in a rather linear manner during maturation.

The most recent approach taken in cholesterol research has been the use of an isotope, Carbon-14, attempting to tag the cholesterol molecule in the egg yolk. Progress thus far indicates that it is a rather simple chore to inject the isotope intraperitoneally, and achieve labeled yolk cholesterol. Using acetate - 1 - Carbon-14 results in all parts of the egg, shell, albumin and yolk being labeled with the isotope.

Selection of a labeled intermediate compound closer to cholesterol in the natural synthesis of the latter has resulted in more selective labeling of cholesterol in the yolk. One of the final aims of this area of work is to use yolk containing labeled cholesterol in human feeding studies. This work is done by those persons involved in human nutrition studies.

Another general area of products research deals with the egg shell. The hen does a rather adequate job of packaging her product but in instances there are shells that are apparently weaker in structure than others. These are eggs which perhaps break somewhere between production and consumption. Such eggs represent a monetary loss to the industry and dissatisfaction to the consumer if she finds a broken one in a carton of eggs she buys.

The approach to this problem thus far has consisted of measuring certain chemical constituents of the shell. Calcium in the carbonate form, which comprises 96% of the dry weight of the shell, has been measured on laying hens involved in the Iowa Multiple Unit Test. Calcium was found to be very uniform in amount between strains of hens. It is of considerable interest to note, however, that calcium content of egg shells varied significantly from farm to farm. Such variation may have very important manage-

Continued on next page

Poultry Products, continued

ment considerations as one thinks of reasons why this variation should exist.

Still another measurement taken on shells from this same test is that of protein content. Protein comprises only 2.1 percent of the shell proper but may have considerable importance in the overall structure and perhaps strength of egg shell. Both strain and farm differences were very apparent with respect to shell protein. What significance, if any, shell protein may have with shell strength or overall structure is yet to be determined.

Finally, work with poultry meat is involved with certain chemical changes that occur during frozen storage of such meat. This work is directly related to turkey meat as the latter is commonly involved with frozen storage and, moreover, is purchased by the consumer to a large degree in a frozen state. Early indications are that one constituent, amino nitrogen, increases between slaughter and 60 days storage of the carcass.

Present efforts are directed toward finding the particular time within the storage period at which these changes occur. Therefore, four test periods are being used: (1) pre-rigor, (2) post-rigor, (3) post-freezing, (4) post-storage. Other measurements taken are total soluble nitrogen, moisture content, protein and non-protein nitrogen.

Any significant change in amino nitrogen indicates that certain amino acid breakdown is occurring during storage. A logical step in this sequence of events will be that of determining the amino acid content of turkey meat treated as indicated above. These data will serve in determining which amino acids are undergoing change during the freezing and/or storage.

In brief summary, the research underway in poultry products is aimed toward learning more about the basic constituents of both eggs and meat in an attempt to broaden our knowledge of these products, and to be alert to problems as these arise in the poultry field.

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# IOWA POULTRY ASSOCIATION

LeRoy L. Kruskop

The Iowa Poultry Association was organized in 1927 to provide members of the Iowa poultry industry with the opportunity to pool common interests and combine individual efforts to achieve desired goals.

Throughout the years the Association structure has been changed to adapt it to industry changes. Today the Iowa Poultry Association has 4 divisions. . . Hatchery Division, National Plans Division, Producer Division and Egg Buyer and Processor Division. Each division has a board of directors serving as the governing body for the program of work and activities of the division. Each division has four representatives on an over-all board of directors who coordinate activities of all divisions.

The purposes and objectives of the Iowa Poultry Association are embodied in the trade association movement. Someone has said, "The struggles of the group as a whole produce the possessions of the group as a whole," and in that statement lies the foundation of the trade association movement. Trade associations are but channels through which the members of any group having common interests can direct their struggles in order that each member of the group may benefit through the combined effort.

Disraeli once said, "The more extensive a man's knowledge of what has been done, the greater will be his power of knowing what to do." Trade associations are the source of information as to what has been done--and what is being done--to promote the interests of their members.

The function of a trade association might be briefly stated: to do everything in its power, keeping within the law, to improve the conditions of the business or trade which it represents. Wherever an association does that--and does it well--it benefits everyone coming in contact with the business, including the owner, the wage earner, and the general public. The overall objective justifying the existence of a trade association, is to endeavor to place the industry, trade or service in a better position to conduct its business, in a manner which will achieve the most good for the product or service,

those who provide them, and the consumer. To do this effectively, our major problem is not so much to encourage individual business to compete--even more strenuously--as it is to emphasize the old American principle of planning to work together constructively. This, according to our heritage, means to work in the public interest.

Trade association members in a free American competitive society are business rivals, nevertheless they have learned that much can be gained collectively through cooperative action in the many activities which are conducted by a properly run, non-profit organization.

Of one thing we may be sure: through cooperative effort and with competent leadership we will do as we have been doing for the past hundred and sixty years in this great country of ours--we will come up with the best answer for the largest number of people.

The success of our association program depends primarily on two factors. The members must furnish the manpower--the finances, the leadership--which will make for success. The association offers you the opportunity to Meet--to Greet--to Know your competitors and co-workers that you may come to understand your common problems. It offers you the opportunity to Grow, personally, through contact with others whose problems may be even larger than yours. It permits you to Give--ideas, participation, cooperation--and to Receive all of the values of cooperative effort. It gives you the opportunity to Plan through a better understanding of business conditions, and to Improve your own services. And then, too, it gives you an opportunity to Act and to make yourself heard--and with respect. The Honorable Wright Patman once said, "Just one voice is like a feeble voice in the wilderness. It is not heard. No one pays any attention to you, but if you want to have a voice in the affairs of this great government of ours, it is necessary that you become a member of some association which can speak for you, and in that way your voice will be heard and your voice will be respected."

# IOWA TURKEY FEDERATION

John Planalp

In my travels and contacts with people throughout the state, statements have been made which indicate people either never have given any thought as to how their Iowa Turkey Federation operates or maybe we have not made this information readily available to them. Some people think the Iowa Turkey Federation is something that has been operating a long time and just takes for granted that it goes on. But how does it go on?

I think you should be interested in how your Iowa Turkey Federation operates. Perhaps you can then become more active. Just like the early fathers of our country the founders of Iowa Turkey Federation set up a Constitution in 1948. It is based on principles of Democratic action.

Annually a meeting of the members is held, at this meeting reports are given, members vote on the nominations for the Board of Directors. The revisions in the Constitution and By-laws are considered and action taken to approve or disapprove with action of the Board of Directors. Unfortunately only a small percentage of the total membership attend this meeting. However, the opportunity is there and every member may attend, make his motion and vote.

One of the most important matters of business is to vote on changes in the Constitution and major changes in the By-laws, as two-thirds of a favorable vote of the membership present is required to make changes. Recommended changes must be submitted to the membership. There has been no change since 1948. However, it is foreseeable in the near future there might be some changes that would be of benefit to the membership.

The next step is the Board of Directors, each district is entitled to three directors plus five directors at large. There are also four Ex-Officio Directors as well as members who have been appointed directors on the National Turkey Federation. On this basis we now have twenty-seven members on our Board of Directors.

Board members are nominated by a nominating committee appointed by your President and

elected by the members at the membership meeting. In reality this means the Iowa Turkey Federation members select the persons who make up the Board of Directors of your organization.

From the Board of Directors there is elected an Executive Committee and they are elected by the Board of Directors. The Executive Committee consists of the President, Vice President, and Secretary-Treasurer. By precedent these are elected to represent definite areas of the state on as nearly equitable basis as possible.

The Executive Secretary is employed by the Executive Committee subject to the approval of the Board of Directors. His authority is entirely from the Executive Committee and the Board of Directors and it is his duty to carry on the business of the Federation as nearly as possible within the policies set up by the executive committee and the Board. Your elected President appoints seven or eight operating committees who are responsible for assisting in carrying on certain phases of work. Here is Democracy in action. All powers stem back to the members. Members elect the Board of Directors and approve their actions. Directors elect officers and Executive Committee members. Every one is responsible to the members. As I say it truly is a Democratic organization formed for the good of the Industry as well as each individual member.

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PENB



# Appendix B

Information in this appendix was obtained from Poultry Extension files of the Special Collection Department, ISU Library and from Extension Reports stored at Curtiss Hall. Many articles were retyped because of poor readability of the originals.

## Article 1

Retyped 1926 Publication

Iowa State College of  
Agriculture and Mechanic Arts Extension Service  
R. K. Bliss, Director, Ames, Iowa  
Cooperative Extension Work in Agriculture and Home Economics  
Iowa State College of Agriculture and Mechanic Arts and the  
United States Department of Agriculture Cooperating.  
Distributed in Furtherance of the Acts of Congress of May 8 and June 30, 1924.

Second Radio Poultry Short Course  
Prepared by H. A. Bittenbender and W. D. Termohlen

A-1492  
Lesson No. I

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## Growth and Importance of the Poultry Industry

### Introduction

The importance of an industry should be judged from the standpoint of production and consumption of products. There was a time when many were interested in raising poultry only from the standpoint of a hobby, and it was fed to raise some fancy or unusual breed. Today, however, poultry raising is a business engaging the attention of farmers, laborers, business men, professionals and others, and poultry is at least being given more of the credit and attention which it so justly merits. When we think of the thousands raising poultry; the thousands making feeds, equipment and various other items used in poultry raising; the hatcheries throughout the country; those interested in marketing, transporting and holding of eggs and poultry in storage; the investigators and teachers in government, state and private institutions; the thousands of copies of poultry magazines distributed annually; and the fact that poultry producers are eaten by practically all classes of people, we can realize that the poultry industry is one of the great and vital industries of our great country.

### Historical Development

Before 1825 there was practically no commercial aspect to poultry keeping, practically the only poultry products mentioned frequently in the newspapers being feathers for beds and pillows. From then until 1860 cheap grains and improvement in transportation, especially by boat down the Ohio and Mississippi rivers, encouraged egg production in the Ohio Valley. In 1839 there were sixteen states with poultry valued at over \$250,000. Iowa was listed as having \$16,000 worth of poultry.

By 1860 poultry production for meat was becoming important near cities. Western centers as Cincinnati were shipping barrels of eggs packed in straw. With the increasing commercial aspect in poultry and eggs, poultry keepers saw the

importance of increasing production per hen and in developing cheaper methods of raising chicks and chickens.

The use of incubators exerted a great influence on the growth of the poultry industry. Artificial incubation was by no means new, as early travelers in the Orient mention ovens for hatching eggs. The Egyptians practiced artificial incubation over 2,000 years ago by means of ovens and the use of straw, the secret of which was carefully guarded and transmitted by word of mouth from father to son. Records of the Patent Office prior to 1847 do not contain any account of a machine for hatching purposes, but in that year two patents were issued; however, both were on methods of artificial hatching rather than on machines. From 1847 to 1870, a period of 20 years, there were no patents either for machines or methods of incubation. In 1884 the first advertisement of an incubator appeared, that of James Rankin's "Monarch Incubator." The introduction of the commercially valuable incubator dates from 1887 with the appearance of the "Prairie State," which must be credited with the great stimulus given artificial incubation in the early nineties. In 1896 Charles Cyphers built an incubator of 20,000 capacity, which experiment was the first of those that resulted in the modern mammoth incubators. The Hall Mammoth Incubator, put on the market in 1908, was the first really successful mammoth. We venture these facts about artificial incubation first to point out what really remarkable advances have been made in the comparatively short period of 40 years in the field of small incubators and in mammoth incubation in the past 20 years. There is no question but that artificial incubation has played a very important part in the rapid growth of the poultry industry.

Closely related to artificial incubation is artificial brooding of chicks. As artificial incubation came to be practiced on a larger scale, it became necessary to introduce artificial means of raising chicks. We have appearing in 1885 the advertisement of the "Champion Individual Brooder" by M. A. Strong of Cincinnati, Ohio.

When we think of the hundreds of incubators and brooders now on the market we can realize that they certainly played an important part in the growth of the industry by helping to make possible greater production of chicks.

In the 50's we had the first "hen fever" or in other words, it became a fad or craze to raise pure-bred stock. Asiatic fowl were the most important at this time and were imported in large numbers. In 1849 the New England poultry breeders held their first poultry show.

Interest in the breeding of the various classes of poultry for exhibition purposes increased rapidly and resulted in the organization of the American Poultry Association in 1873. A complete standard was adopted for all the then recognized varieties of domestic and ornamental classes of poultry and in 1874 the first "Standard of Perfection" was printed. Since that time the "Standard" revised periodically, has served as the basis of guidance in breeding operations in developing many breeds and varieties. Thus, we can see that in many respects standard-bred poultry served as a foundation for the subsequent development of the industry.

The growth of the commercial hatchery has greatly aided the development of the poultry industry, by making possible a greater production and distribution of baby chicks. The number of hatcheries has increased materially and the parcel post service in transportation of chicks has enabled them to be distributed to all parts of the country. The International Baby Chick Association was organized in 1916 and has been influential in improving the quality of chicks distributed. Another important step is the establishing of Accredited and Inspected Hatcheries, such as members of our Iowa Accredited Hatchery Association, which means a still greater improvement in the quality of chicks, more standard-bred and production-bred birds, due to the inspection of each flock by a competent, unbiased and skilled man.

There are many other important factors which have entered into and played an important part in the development of the poultry industry from a \$20,000,000 one in 1850 to one of \$1,117,000,000 in 1925. Some of these factors which we might mention

Growth of the Industry in the United States  
— Its Present Status —

Year	Doz.			Popula- tion U.S. 000	Percentage 1880-1900			
	Eggs Produced 000	Chickens Raised 000	Chickens on Farms 000		Eggs Produced	Chickens Raised	Chickens on Farms	Popula- tion U.S.
1880 (June 1)	456,910	125,507	102,272	50,156	100.00	100.00	100.00	100.00
1890 (June 1)	819,722	285,609	258,871	62,948	179.41	227.56	253.18	125.50
1900 (June 1)	1293,662	250,604	233,566	75,995	283.13	199.69	228.38	151.52
1910 (Apr. 15)	1574,979	460,611	280,341	91,972	344.70	367.00	274.11	183.37
1920 (Jan. 1)	1654,044	437,302	359,537	105,711	362.01	377.11	351.55	210.76
1925 (Jan. 1)	1968,276	678,300	427,000	112,786	430.78	540.45	417.50	224.87

\*Production figures are for previous year.

are: educational work by the government and colleges; research work by government; state and private individuals; modern transportation; cold storage; the poultry and agricultural press, etc.

There are some things which have hindered the development, and important among them are: the lack of interest and willingness on the farmer's part in adopting better management methods, one reason probably being that poultry has been a side line rather than a regular farm enterprise; lack of economical marketing by the producers; and a lack of appreciation or knowledge by the consumer as to the real merits of poultry and eggs in the daily diet.

This chart very plainly shows the tremendous growth of the poultry industry in our country during the last 45 years, it having increased over four times in size since 1880, when the first actual poultry census was taken.

In 1925 the gross value of eggs produced was \$618,000,000 and of poultry raised \$499,000,000, making a total of \$1,117,000,000. The gross value of poultry products for 1925 was exceeded that year by the gross value of only five other agricultural products, namely dairy products, corn, cotton, hay and forage, and swine. The gross value of poultry products exceeded the value of cattle, wheat, potatoes, oats, vegetables, tobacco and many other products. Truly our industry is a great one and deserves to receive more attention, as its position, as one of our leading agricultural enterprises merits.

### The Future of the Poultry Industry in the United States

Again let us refer to the chart showing the growth of the poultry industry in the United States. We find that while the last 45 years has seen the poultry industry grow to over 4\_ times its size in 1880, and that the population of the United States in the same time has grown only 2\_ times.

Pessimism is a bad habit which we would certainly not wish upon anyone, but we do believe that this fact of the difference in growth of the poultry industry and the population furnishes much food for thought and is deserving of a rather pessimistic attitude.

Several different surveys of consumption of poultry products have not indicated any outstanding increase in per capita consumption. The Bureau of Agricultural Economics of the United States Department of Agriculture, found in 1923 that for the per capita of the population on farms there was consumed 28.8 dozens of eggs and 11.4 fowls. This means that even on our farms less than one egg is eaten per person each day. Certainly city folks eat even less; in fact late government figures set the per capita

consumption of eggs for the United States at six-tenths of an egg or just a little over a half an egg a day. Problems will certainly arise from the difference in industry growth as compared with population growth and especially since we cannot account for any particularly outstanding increase in per capita consumption. A large part of this increased production over and above that consumed as food is undoubtedly taken care of by the great increase in number of eggs required to produce the greater number of chickens raised annually. Also we must remember that forty years ago, and even a shorter time than that back-yard poultry keeping was very common, while today, with a greater concentration of population in cities and so many living in apartments, it means a disappearing of back-yard flocks; this means a decreasing of the invisible supply of eggs which means that while possibly a few eggs from the farm are going into city consumption the relative per capita consumption has not increased.

We are not trying to point out that we should cut down our production or that the poultry industry will not continue to grow, but we are trying to drive home the fact that, with a much more rapid increase in production than in population there is a possibility of less returns to the producer, and we wish to advise on some points which we feel may aid in prevention of such a condition. We believe that the answer is more attention to the economic phases of the poultry industry, namely that production should be put on a more economic basis to lower costs and that the marketing of poultry products should be given the careful and studious attention which most certainly is needed. Economical production and economical marketing is the need of the present day poultry raiser, along with increased consumption of poultry products.

More economical production might briefly be stated by saying more eggs per hen which means lowering cost per unit produced. However, we cannot have truly economic production unless we keep ultimate disposal in mind, that is producing that which the market desires. It means proper management, balanced rations, proper housing, breeding, etc. All of which will eliminate many present day wastes.

Economical marketing means the maintaining of the quality which exists when the hen lays the egg, to the highest degree possible until it reaches the consumer; eliminating wastes; speeding through the market channels; selling on a quality basis by the producer and such other steps as will be mentioned in subsequent talks which will be given during the short course program.

Increased consumption means getting a higher quality of product which the consumer will more readily appreciate and then educating the consuming public to the real merits of poultry products. We must remember that in attempting to increase consumption of poultry products we are going to run into conflict with other products, such as dairy, meat, cereals, etc. The dairy industry is particularly active in spreading educational propoganda to increase consumption of their products and have much scientific backing aiding them. A battle certainly looms in attempting to increase consumption of poultry products, but we do believe that poultry products stand in a very fair position.

The future certainly holds much for the growth of the poultry industry in the United States; however, there are existing hazards which have been mentioned. Cooperation of the various branches of the industry in giving attention to the economic phases of the poultry industry is needed to overcome those hazards and make the future a bright one.

### **The Poultry Industry in Iowa**

The important poultry section of the United States comprises those states lying in the Mississippi Valley. This area, according to estimates of the United States Department of Agriculture, contained 72.3% of the chicken population of the United States on January 1, 1926.

Iowa is known the world over as the state "where the Tall Corn grows," but we wish to also make it known that it is the state "where the Hen Cackles most," for we find that Iowa is the leading poultry state. The Federal Agricultural Census of 1925 showing 30,275,338 chickens on farms January 1, 1925, and with 38,184,900 chickens raised in 1924, a production of 133,776,386 dozen eggs in 1924. The value of the egg and poultry crop was \$64,290,000, poultry raised being valued at \$30,448,956

and eggs produced at \$34,841,094. The total value of the poultry crop for 1924 and chickens on farms January 1, 1925, was nearly \$100,000,000.

Let us stop a minute and make a comparison of Iowa's poultry industry with some other products. Each year the value is greater than that of all the small fruits produced in the United States; greater than gold and silver from lode mines and gold from placer mines in the United States. The value is greater than the orange crop of California, the tobacco crop of Virginia, or the value of all mined products of Colo-

rado. Some industry we must say.

Growth of the Industry in Iowa

Year	Chickens on Farms	Dozens of Eggs Produced	Population
1880	7,550,508	32,253,933	1,624,615
1900	18,907,673	99,621,920	2,231,853
1925	30,275,338	133,776,386	2,419,927

The above table indicates that in line with the growth of the poultry industry in the United States we have a similar growth in Iowa. We find the last 45 years have seen the industry grow to over four times its size in 1880. However, we must note that

the population has increased but 1.5 times in Iowa, while for the United States it is over 2. This means that in relation to population growth, the poultry industry in Iowa has grown much more than in the United States and that we are confronted with greater problems than they are in many other sections. Our surplus is great and problems of disposal are naturally increased with this greater size of surplus.

We hope to see the poultry industry gain a still more prominent place in Iowa's agriculture and firmly believe it can be made to do so. We do not care to be pessimistic, but facts so far presented certainly give conclusive proof that there is a very urgent need for a program of development in the economic phases of Iowa's poultry industry.

### Future of the Industry in Iowa

Iowa farm business has passed the stage where any enterprise which pays can be neglected, and is now in a stage where attention and proper emphasis and position must be paid to all enterprises which pay. Poultry is and has been one of the money making departments of the farm, yet it has been commonly shoved aside as only a woman's job from which she can make a little pin money. Saving and economy resulting from better management and attention to the economic side of farming is where increased profits will come from.

Economy of production certainly is needed when we consider that the average hen in Iowa produces approximately 60 eggs (five dozen) a year. What would increased consumption per bird mean? Think over the following. If each bird would produce 12 more eggs a year and the present number of hens was maintained it would mean adding to the pocketbook of the Iowa farmers \$3,750,000 a year; a two dozen increase would add \$7,500,000, etc. Or again, an increase of one dozen would mean that to get present total production for the state the number of hens kept could be cut down one-fifth or nearly five million hens. Think of the saving in the annual food bill, in housing space, etc. Is economy of production needed in Iowa? What do you say?

Economy of marketing is a still great need. Let us use the following data as one means of bringing this out. A few years ago Hastings of the United States Department of Agriculture made a survey of the egg trade and found that the preventable

loss in eggs in the United States was as follows:

Preventable Loss from -	
Dirtyies .....	2 %
Breakage .....	2 %
Chick development .....	5 %
Shrunken & held eggs .....	5 %
Rotten eggs .....	2.5%
Moldy or badly flavored eggs .....	5%
Total .....	17 %

Using these figures we find that in 1924 the farmers of Iowa lost through preventable causes from their egg crop the enormous amount of nearly six million dollars which was distributed as follows:

Dirtyies .....	2 %	\$ 700,000
Breakage .....	2 %	700,000
Chick development .....	5 %	1,750,000
Shrunken & held eggs .....	5 %	1,750,000
Rotten eggs .....	2.5%	900,000
Moldy & badly flavored eggs .....	0.5%	175,000
Total .....		\$5,975,000

Besides this loss due to preventable wastes, there is the unmeasurable loss due to curtailed consumption. People do not like bad eggs and if such are served them they are inclined the next time to order something else. There is an enormous annual decrease in value of poultry marketed due to such things as poor flesh condition, poor health condition, marketing of stag birds and not knowing when and what the markets want. The total annual losses due to quality deterioration and poor marketing of Iowa's poultry products can quite safely be estimated as costing the farmers \$10,000,000.

This most certainly shows that a very unhealthy condition exists and that marketing needs to be done in an economical way.

### Conclusion

The last few years have seen the Iowa farmer in a period of depression. Iowa's hens have been a very influential factor in helping him to weather the storm, and the farmer has had brought home to him the fact that the hen deserves a more important place in his farm program. This is bound to result in more poultry and more eggs. A glance into the past shows that in the future more attention should be paid to more economic production, more economical disposal of the products produced, and to increasing the consumption of poultry products. Wastes and inefficiency cut down the profits and hinder the proper development of an industry. All industries must go through certain stages in their development, and evidence conclusively points to the fact that the future development of the poultry industry must be around the economic phases of production, marketing and consumption. May the farmers and poultry raisers of Iowa realize this need and plan their program about the following needs:

1. More economic production, which means cutting down unit cost by greater production per bird under better management conditions and producing those things which their market outlet demands.
2. More economical disposal of the products produced, which means cutting down wastes, speeding through channels, marketing on a quality basis through their best market. This means they must study and find their best market.
3. A higher per capita consumption of eggs and poultry in Iowa and throughout the United States on the farm and in the city.

## PAST, PRESENT AND FUTURE IN THE POULTRY INDUSTRY

YESTERDAY	TODAY	TOMORROW
1. <u>Incubation</u> - Inefficient and little used. Production limited. No commercial hatcheries.	1. <u>Incubation</u> - Efficient, mammoth incubator reducing cost of production. Many commercial hatcheries.	1. <u>Incubation</u> - Every community with an efficient well managed accredited hatchery and breeding farms.
2. <u>Brooding</u> - Chicks raised chiefly with hens. A few crude and dangerous brooders.	2. <u>Brooding</u> - Many efficient brooders with safe sources of heat making possible raising chicks in large numbers.	2. <u>Brooding</u> - Even better brooders. Much commercial brooding.
3. <u>Production</u> - Low and very seasonal. Practically no winter egg production.	3. <u>Production</u> - Increase in average per bird. More winter egg production tending to level out seasonal production.	3. <u>Production</u> - A more even curve of seasonal production due to proper management, breeding methods, etc.
4. <u>Breeding</u> - Breeders selected with little or no knowledge of breeding value.	4. <u>Breeding</u> - More scientific because of trap nests and pedigree breeding.	4. <u>Breeding</u> - Better understanding of poultry genetics will result in great improvement.
5. <u>Feeding</u> - Little or no knowledge of feeding methods.	5. <u>Feeding</u> - Wider use of better feeding methods.	5. <u>Feeding</u> - A general use of better feeding methods.
6. <u>Housing</u> - Poorly designed, inadequately ventilated, uncomfortable, unsanitary.	6. <u>Housing</u> - Better designed; more sanitary. Proper ventilation still a question.	6. <u>Housing</u> - Still better designed, properly ventilated, more uniform temperature.
7. <u>Culling</u> - Little accurate knowledge. Many non-profitable hens in flocks.	7. <u>Culling</u> - Better understanding. Low producers easily eliminated. High producers easily selected.	7. <u>Culling</u> - Increased knowledge making possible selection with a greater degree of accuracy.
8. <u>Disease</u> - Very common. Little knowledge of sources.	8. <u>Disease</u> - Still common. A better knowledge of sources.	8. <u>Disease</u> - Uncommon. Increased knowledge of control and prevention.
9. <u>Education</u> - Little endeavor.	9. <u>Education</u> - Common but not appreciated.	9. <u>Education</u> - Extensive and efficient work scientifically backed.
10. <u>Literature</u> - Poultry literature without scientific backing, of questionable value.	10. <u>Literature</u> - Authoritative books; enterprising poultry journals. Many free bulletins.	10. <u>Literature</u> - Even more authoritative books. Improved journals. More free bulletins.
11. <u>Transportation</u> - Poor roads. Inadequate producers dependent upon local markets.	11. <u>Transportation</u> - Improved roads fairly common. Producers have access to best markets.	11. <u>Transportation</u> - Excellent all-weather road system. More service available. Market access excellent.
12. <u>Prices</u> - Very low for all poultry products.	12. <u>Prices</u> - Average much greater, about 3 times those of 30 years ago.	12. <u>Prices</u> - Questionable, but will hold its own with other commodities.
13. <u>Enterprise Position</u> - A farm sideline. Few commercial farms.	13. <u>Enterprise Position</u> - Farmers becoming interested. Many commercial farms, rather localized.	13. <u>Enterprise Position</u> - A regular farm enterprise. More commercial farms, widely distributed.
14. <u>Poultry Shows</u> - Few held.	14. <u>Poultry Shows</u> - Rather common, but only large ones of good quality.	14. <u>Poultry Shows</u> - Large county shows, divisional and state. High quality.
15. <u>Management</u> - Little given. Uneconomic production.	15. <u>Management</u> - Somewhat improved. Uneconomic production still common.	15. <u>Management</u> - Greatly improved. Economic production in vogue.
16. <u>Marketing</u> - Uneconomic. Chiefly barter with local grocery store. Quality not considered.	16. <u>Marketing</u> - Still rather uneconomic. Selling to store still most common. Some selling to dealers. Starting to practice quality selling.	16. <u>Marketing</u> - Economic. Little or no selling to grocery store. Quality selling the common method.



## Article 2

Retyped 1926 Publication

### POULTRY EXTENSION WORK IN IOWA

During the year of 1926 poultry extension work in Iowa was carried on along the following lines:

- P.1 - Cooperative Poultry Record Farms.
- P.2 - Poultry House Construction, Remodeling and Equipment Demonstrations.
- P.3 - Caponizing Surplus Cockerles.
- P.4 - Poultry Culling and Marketing.
- P.5 - Cooperative Egg Grading and Marketing.

Most of these projects proved quite popular although a part of them were revised before the end of the season. In general it seems that poultry work should be conducted along fewer lines of endeavor, to be most effective.

### Cooperative Poultry Record Farms

A poultry record flock is a demonstrational unit in the community where approved practices of poultry management are to be practiced. It is to be hoped that at least one record flock can be located in every township in Iowa, as a means of spreading useful information concerning the proper care of poultry. Record flock keepers are selected, for the most part, because of their willingness to cooperate and act as a leader in the community. Upon enrolling in this work accurate records must be kept of expenses and receipts of the poultry flock. These records must be sent to the extension service at the end of each month where they are summarized and published showing each breed in a group by itself. These summaries are sent back to the record flock keepers in order that they may compare their flock record with others of the same breed and their breed with other breeds. This acts as a stimulus to each cooperator, because upon finding their record falling below others they have endeavored to find out why their record has not been better which usually results in improvement and correction of poor practices.

A bulletin containing timely suggestions is published and sent out with the summarized reports each month which helps in improving the management of these flocks. In addition, numerous questions concerning poultry problems are asked by the record flock keepers and others which are answered with personal letters.

In years past it has been the policy of the extension service to visit these record flocks twice during each year, but during the past year or two the summer visit, at which time the flock was culled, has been discontinued. At present we try to visit the flocks once during each year to assist in mating up breeding pens. This work should be done between November first and February first but it is not possible to visit all flock keepers during these months, hence the work was carried on only as long as it was timely. It is to be hoped that much of this individual service work be done by the Iowa Poultry Improvement Association, which has charge of the accreditation and certification work and indications seem to be that such is the case. Most of our most progressive record flocks are being accredited or certified.

In 1926, winter visits to the record flocks were made in 57 counties, 644 farm and home visits and 757 interviews were made. Pen mating work was done on these trips as we feel that proper methods of improving breeds are less understood than are proper methods of feeding and housing, and with this in mind we have been carrying on the record flock visits as far as possible.

To illustrate the results of proper care and breeding of poultry we have taken the Single Comb Rhode Island Red flock of Mrs. G. E. Grunewald of Blairstown.

Grunewalds were operating a large tract of land and did not consider poultry as a source of income. They permitted their hired man to keep the poultry but noticed that the chickens were always troubled with disease of some kind or other. Not liking this condition they took over the flock themselves intending to get rid of the disease

trouble. At about the same time Mrs. Grunewald learned of record flock work thru a demonstration given by the home demonstration agent in that county. When beginning the record flock work Mrs. Grunewald was surprised to find that her first month's report was close to the top of the list. This encouraged her and she has put in special effort with her poultry since that time. The poultry proved very profitable, in fact the income from poultry kept the house going during periods of depression.

Mrs. Grunewald has been active in community work and is doing much to improve general condition. During the winter short course at Ames in 1927 she gave a very interesting talk concerning the way she has built up her flock at which time Mrs. Grunewald said, "I have not brought about the improvement in my flock by trying to make the high record each month, but it has been by keeping my flock up in the high producing group constantly.





## Article 3

Retyped 1926 Publication

IOWA STATE COLLEGE EXTENSION SERVICE  
DEPARTMENT OF POULTRY  
R. K. BLISS, DIRECTOR

A-946

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Series II      Bulletin for Cooperators      May 5, 1926      Copy 51

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By - E. J. Rood

### Poultry Short Course

The summer short course in poultry is from June 21<sup>st</sup> to 25<sup>th</sup> inclusive. Culling and disease will be the principal subjects.

We are particularly interested in having at least ten persons from each of the 17 counties accredited on the tuberculosis test. These counties are in need of thorough culling of all flocks so as to reduce the high percentage of hogs going to market with avian tuberculosis.

Invitations have been extended to several specialists from out of the state as well as others within the state.

If interested write to the Poultry Department for a program.

### Broody Hens

Broody hens are making trouble for many of you. Dipping them in the water tank may relieve your feelings but it will not help their condition.

Confine the first night they stay on the nest to a roomy coop in a shady place and feed well. Provide both milk and mash and once a day give moist mash besides. It takes three days to offset every day they are broody. A real test of your feeding ability is to see how quickly you can turn cluckers into layers.

Broody hens make trouble for us too. It is so easy to report hens as setting on eggs and so easy to forget to report them back in the flock. We do not wish to discontinue this credit for hens setting on eggs or broodying chicks, but we may be obliged to.

### Culling

Persistent and thorough culling should be started now and continued until October 1<sup>st</sup>. We find that we cannot give our usual time to culling on account of other projects and more flocks than ever before.

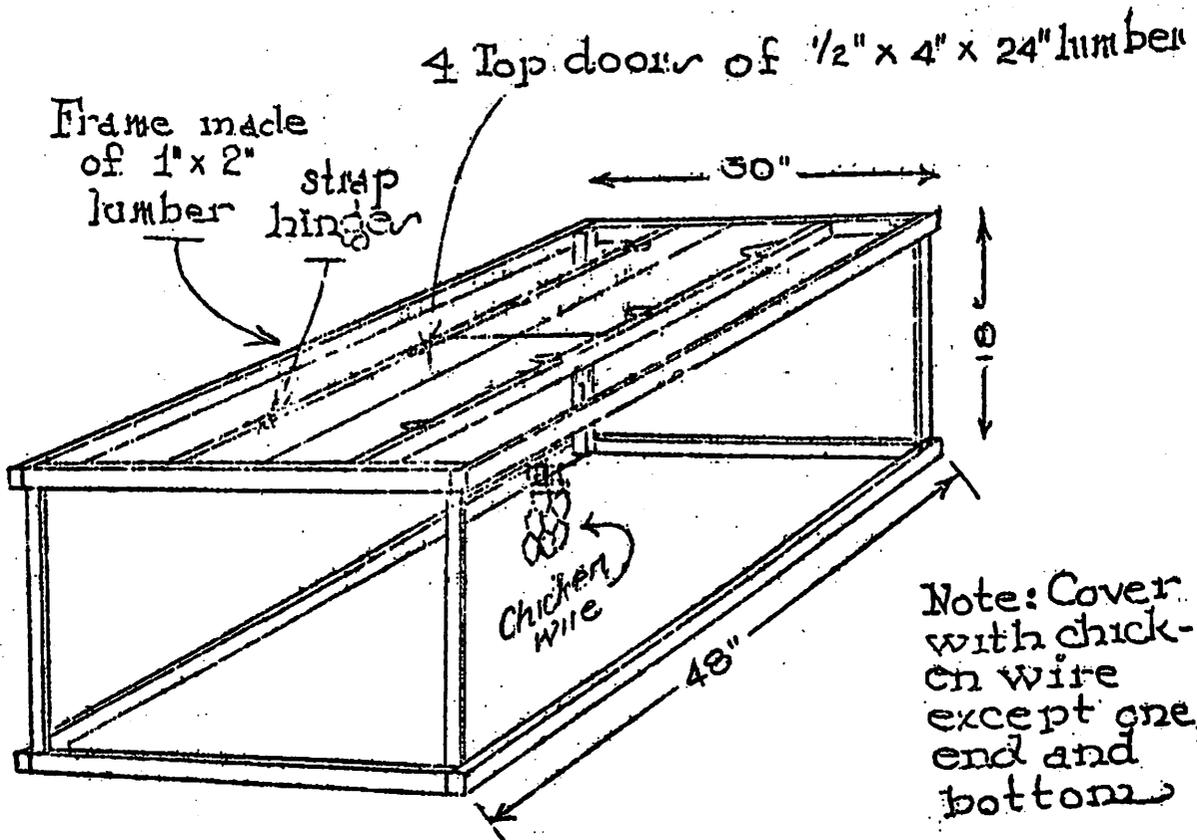
To be a successful poultry keeper, you must learn to cull and now is as good a time as any to start. Culling consists of experience, some knowledge and an abundance of horse sense.

Hens are usually much higher now than later in the year and it is profitable to let the poor as well as the show producers go to market.

The only way we can reach an average of 130 eggs is by hard culling and good feeding.

### Catching Crate

A catching crate will be of great help in culling. The catching crate sketched here is easy to make and handle. You can handle the birds with little or no drop in egg production the next day on account of frightening them.



Every record flock keeper is supposed to have a catching crate. It is money in your pocket to have one.

**Results for April**

491 poultry record flocks reported a total of 83,854 laying hens during the month of April. These birds laid 1,444,614 eggs which is an average production of 57.4% or 17.2 eggs per hen. The receipts from these flocks totaled \$55,095.52. The cost of feed is \$12,473.78. The difference between receipts and cost of feed is \$42,621.74.

## Article 4

Retyped 1926 Publication

### **Poultry Management Schools**

A series of three lessons in poultry management were offered in 1926 for the 1927 program. This series consisted of lessons on (1) Incubation and Brooding, (2) Summer Management and the Prevention of Disease, (3) Housing and Winter Management. At a later date it was deemed advisable to add a fourth lesson on Selection of Breeding Stock to the series.

The Incubation and Brooding lesson was given during the period from late January to early April. This lesson should have been offered at an earlier date because of the increased number of early chicks from hatcheries which influenced the demand for earlier dates for these schools. The slogan used in emphasizing this lesson was "Fewer but better chicks." Practices encouraged in combination with this slogan were:

1. Hatch chicks early.

Experience has taught that early hatched chicks grow into pullets that lay more and larger eggs and do that during the months of early winter when eggs are a good price. Cockerels hatched early that mature quickly make the strongest breeders. Broilers hatched early bring higher prices than those hatched late. Mortality from disease is lower among early hatched chicks than those hatched in warm weather.

A cooperator at Green, Iowa reports that the cockerels out of a brood of chicks hatched during the first week in March were sold in Chicago during the first week of May for 68 cents per pound which would indicate that early hatched broilers bring high prices.



## Article 5

Retyped 1927 Publication

IOWA STATE COLLEGE EXTENSION SERVICE  
DEPARTMENT OF POULTRY  
R. K. BLISS, DIRECTOR  
AMES, IOWA

A-1584

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Series II      Bulletin for Cooperators      Jan. 5, 1927      Copy 59

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By - E. J. Rood

### Poultry Short Course

We are listing below a program for the short course January 31<sup>st</sup> to February 4<sup>th</sup>. Special rates are available on all roads, and there being no tuition or charges, the only expense will be your transportation and living expenses while at Ames. We are hoping for an average attendance of 250 and feel that the best program ever is being offered.

The annual meeting and election of officers of the Record Flock Keepers Association will be held Wednesday evening, February 2<sup>nd</sup>.

### Farm and Home Week

January 31 – February 5, 1927

Poultry Program

#### Monday, January 31

- 1:30 – 2:30      Comparative Records for 1925 and 1926.  
E. J. Rood
- 2:00 – 3:00      Growth and Importance of Poultry Industry.  
W. D. Termohlen, Ag. Economics Dept.
- 3:00 – 4:00      Methods of Marketing Iowa Eggs.  
Dr. Paul L. Miller, Ag. Economics Dept.  
& R. L. Watkins

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#### Marketing Day, Tuesday, February 1

- 9:00 – 10:00      Large Size and Strong Shelled Eggs.  
H. A. Bittenbender
- 10:00 – 10:30      Selecting Eggs for Exhibition.  
Clarence Pearson, Mitchellville
- 10:30 – 12:00      What the Market Demands of the Iowa Poultryman.  
W. F. Priebe, Chicago, Ill.

#### Lunch – Poultry Laboratory.

- 1:15 – 2:15      Problems in Poultry Packing Plant.  
Presented by Poultry Buyers  
Discussion led by Chas. Bowen, Rolfe
- 2:15 – 3:15      Fresh vs. Storage Eggs.  
R. G. Clark, Iowa State Dept. of Ag.
- 3:15 – 4:15      Demonstration of Egg Grades and Market Poultry.  
Wm. Cummings, Boone  
R. L. Watkins & R. L. Cochran
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Poultry Improvement Day, Wednesday, February 2

- 9:00 – 10:00 How I Made My Rhode Island Reds Average 184 Eggs.  
Mrs. G. E. Grunewald, Blairstown
- 10:00 – 11:00 Progress Made in Accredited and Certified Hatcheries and  
Farm Flocks.  
F. W. Wesco, Field Agent of Poultry Improvement Board
- 11:00 – 12:00 Short Talks by Officers of Record Flock Keepers  
& Iowa Inspected and Accredited Hatchery Assn.

Lunch – Poultry Laboratory.

- 1:15 – 2:30 Plan of Michigan Poultry Improvement Association.  
J. A. Hannah, Secy., Lansing, Mich.
- 2:30 – 4:00 Round Table. Anything for Better Poultry in Iowa.  
B. E. Craven, Kellogg, E. H. Ricker, Ottumwa  
R. E. Macy, Iowa Falls, Mrs. Lewis Sietmann, Laurel  
Clarence Pearson, Mitchellville, A. H. Ward, Independence  
A. G. Peters, Newton

EVENING – Record Flock and Hatchery Meetings.

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Feeding and Management Day, Thursday, February 3

- 9:00 – 10:00 Five Years of Trapnesting.  
B. E. Craven, Kellogg
- 10:00 – 11:15 Minerals and Vitamins for Hens and Chicks  
H. A. Bittenbender
- 11:15 – 12:00 Use of Glass Substitutes on Experimental Chicks.  
R. L. Cochran

Lunch – Poultry Laboratory.

- 1:30 – 2:45 Factors Affecting Hatchability.  
R. L. Cochran
- 2:45 – 3:45 Methods of Pedigreeing.  
C. W. Knox
- 3:45 – Tour of Farm.

Friday, February 4

- 9:00 – 10:30 Intestinal Parasites and Their Control.  
Dr. Maurice Hall, U.S. Dept. of Agriculture
- 10:30 – 12:00 Preventing Diseases.  
Dr. Charles Murray, Veterinary Dept.

Lunch – Poultry Laboratory.

- 1:15 – 2:30 More Eggs and Fewer Hens.  
C. W. Knox
- 2:30 – 3:00 Round Table Questions.
- 3:00 – Tour of Farm.

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**Thermostats**

At least two weeks before starting your incubator, provided it is equipped with a wafer or disc thermostate, remove it and shake. If you cannot hear the liquid inside order a new one and be sure that it is in good condition.

### **Incubation**

Start plans now for getting your chicks hatched early enough this next season. From the big surplus of poultry in storage and a shortage of eggs, future conditions would point to fewer but better hens.

### **Ames Poultry Panacea or Fresh Ground**

We firmly believe that if you would limit your production of poultry the coming season only to what you could raise on fresh ground you would be ahead. You will never know what it will do in the way of healthier birds, better layers, more vitality, or freedom from disease until you have tried it.

Fresh ground for growing chicks is the biggest thing in the poultry program.

### **Soy beans**

Will those who are using soy beans either in the grain or in the mash write us as to their opinion as to the results. Do the chicks prefer a matured or slightly immatured seed? Does their addition to the mash increase or lower the palatability of it?

Any information favorable or otherwise will be appreciated.

### **Results for December**

394 poultry record flocks reported a total of 87,436 laying hens during the month of December. These birds laid 368,043 eggs which is an average production of 13.5% or 4.2 eggs per hen. The receipts from these flocks totaled \$24,560.15. The cost of feed is \$10,141.08. The difference between receipts and cost of feed is \$14,419.07.



## Article 6

Retyped 1928 Publication

### Summary of All Work by Poultry Specialists for 1928.

#### General

Days work in field .....	367.6
Days en route .....	34.9
Total days in field by specialists .....	402.5
People reached at meetings held in the field .....	15,202
People reached by letter .....	5,695

#### Office Work

First class letters written .....	1,896
Circular letters written .....	24
Copies of circular letters .....	3,799
Press articles prepared .....	55
Photographs taken .....	51
Bulletin material prepared .....	44
Printed bulletins .....	5
Mimeographed pieces .....	27
Monthly record work bulletins .....	<u>12</u>
	44

Office work includes departmental conferences, office conferences, spring conference, fall conference, Farm and Home Week, help with county tours to poultry farm, help with Iowa Poultry Improvement Association convention or help with annual egg and chick show. This was general work on the campus of which no record was kept.

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### Summary of Specialists' Work in the Field by Kinds of Work

Kinds of Work	Days	Meetings	
		Held	Attendance
Poultry schools	243.7	421	9,538
Club work	34.3	81	1,139
Shows & Institutes	49.2	40	3,847
Other work	40.4	23	678
Totals	367.6	565	15,202



PUBLICITY ARTICLES IN CONNECTION WITH  
POULTRY EXTENSION SERVICE

Poultry Management and Hatchery Schools

INDIANOLA TRIBUNE

March 5, 1929.

**GROWERS SHOW  
ENTHUSIASM IN  
POULTRY PLAN**

**More Than 100 County Grow-  
ers Indicate Desire to Im-  
prove Flocks. Expert  
Gives Instruction**

One hundred and six Warren county poultry growers have signed cards indicating their desire to become cooperators in the poultry sanitation campaign sponsored by the Farm Bureau and which was launched in a series of meetings in the county last week.

Four flocks were entered as demonstration flocks and several more will be entered in that class if the owners find that they can carry out all the recommendations of the specialist in charge.

Cooperators will carry out as many of the features of clean flock growing as possible this year with plans in mind for additional features added in future years. Demonstrators are those who have or can provide the equipment and have clean ground on which this year's chicks may be raised.

The following article on "Safeguarding Against Chick Diseases" was prepared by Prof. W. M. Vernon while in the county last week especially for publication in connection with this campaign.

"There is something about chick raising that strikes us much like spring fever. That is, the average person enjoys working with chicks,

During the last ten years however many chick problems have arisen to take much of that pleasure away. Some of these discouraging troubles may be listed as chilling, over feeding, white diarrhea, over heating, coccidiosis and leg weakness. Later other troubles may enter, as "piling up," worm infestation, cholera or paralysis.

One cannot entirely separate some management problems from diseases. That is because a chick that has been chilled, overheated or over fed will, before posting, appear much the same as ones having some diseases. When trouble arises it is advisable to have a number of the chicks examined by a good veterinarian who is equipped to properly diagnose poultry diseases. To correctly diagnose some of these diseases it is necessary to use a microscope and staining material.

Of the above mentioned troubles there is little one can do to cure the chick if one or more of the troubles arise. Worms may be expelled but the practical thing to do is to do everything possible to prevent the troubles arising. The members of the poultry extension department feel that the growing of healthy young stock is the most important poultry problem we have at the present time. We find that all poultry raisers want to raise healthy birds but not all are willing to do those things which will do much to safeguard them against the troubles mentioned.

**Start With Healthy Chicks**

The greatest precaution should be taken to begin with healthy chicks. The purchaser should be cautious about buying hatching eggs or chicks in order to secure them from properly managed and well bred flocks, also flocks free from white diarrhea, since that is the only disease that may be transmitted from the hen to the chick by the germ being present in the yolk of the egg.

Remove all disease germs from the brooder house before it is used this spring. Thoroughly clean the interior of the house with plenty of hot lye solution using four ounces of lye to ten gallons of boiling hot water. The common strength solution of most disinfectants will not kill some poultry disease germs. The fountains and feeders should also be scalded with boiling hot water each morning for several weeks. This is not as easy as putting some dope or medicine in the drink or feed but will do more good.

**Feed A Balanced Ration**

Much of the slow development and much of the disease and death loss is due to poor rations fed to chicks. Normal growth of the chicks results in a very rapid increase in size and weight. Therefore chicks must have the correct amount of the following things in the ration: yellow corn, oats without hulls, milk and meat meal, mineral, green feed and cod liver oil.

The "all mash ration" used by the college at Ames with splendid results is as follows:

- 70 lbs. ground yellow corn.
- 55 lbs. ground oats without hulls
- 30 lbs. ground wheat
- 19 lbs. wheat bran
- 10 lbs. meat and bone meal
- 10 lbs. dried buttermilk
- 3 lbs. chick size oyster shell
- 2 lbs. charcoal
- 1 lb. fine salt.

If one does not have plenty of green feed from the garden, ten or twelve pounds of high grade ground alfalfa should be added to the above formula. It is profitable to add one pint of a good grade of cod liver oil to each 100 pounds of the above ration for the first four to six weeks. Mix the oil with the mineral and the bran thoroughly and then that may be mixed with the entire bulk of the mash. When feeding the all mash ration, scratch grain is not given till the tenth week.

**Fresh Ground Important**

Since so little can be done for the chicks in case of an outbreak of disease we are forced to follow preventative measures if we hope to avoid the disastrous chick troubles such as worms, diarrhea and coccidiosis. The chicks should never be raised near the old stock because many of the old birds are carriers of disease and are infested with worms.

A freshly cultivated area that has been under cultivation for two years is the place for the young chicks to range. This area should not have had poultry running over it during the

(Continued on page 8)



## Article 8

# THE IOWA POULTRY REVIEW

Published quarterly in the interest of Iowa Poultrymen by the Extension Service of Iowa State College, R. K. Bliss, Director, Ames, Iowa. Issued and distributed under Acts of Congress of May 8 and June 14, 1914.

VOL. 1

AMES, IOWA, APRIL, 1934

No. 1

## Feed Chicks When Placed Under Hover

### Vitamin Deficiencies in Rations Cause Serious Troubles

By H. L. WILGORE

Ten years ago almost anyone would have advised that chicks should not be fed until they were from 48 to 60 or even 72 hours old. Since then it has been found that chicks can be fed as soon as they are put under the hover, and that they actually get off to a more uniform start when fed early.

It is sometimes necessary to help the chicks find their feed and water, even though the hoppers and waterers are placed near the hover. This may be done by feeding on papers, sifting the feed between the fingers so the noise of the feed falling on the papers will attract them.

Rickets in chicks, may be caused by a lack of vitamin D, or of calcium or phosphorus. Vitamin D is supplied by direct sunshine or by fish oils, such as cod-liver oil and sardine oil, fed at the rate of 1 percent of the total feed. Calcium is supplied in bone meal, good oyster shell, or high-grade limestone. The chief source of phosphorus for chicks is steamed bone meal.

When too much mineral is fed, growth is stunted, and abnormal bone development may result. When 10 percent or more of meat and bone meal are included in the ration, it is not necessary to add calcium or phosphorus supplements to the mash, but the chicks should have free access to chick-size oyster shell or limestone in hoppers.

Chicks are very susceptible to a deficiency of vitamin A, usually evidenced at 3 to 5 weeks of age by sticky eyes, a tendency to squat, loss in weight, and death with typical nodules sometimes developing in the mucous membranes of the upper esophagus. Vitamin A is supplied in egg yolks, green grass, yellow corn and fish oils.

Vitamin B is found in practically all of the cereal grains. The practical ration should not be deficient in this respect.

A vitamin G deficiency is often noted in chicks which receive no milk or yeast in their feed. This deficiency is usually observed after the third week, as a paralysis of the legs; it may be avoided by feeding milk, yeast, or pork liver.

When chicks are allowed free range, there is less danger from these deficiencies.

## Poultry Information

This is the first issue of "The Iowa Poultry Review," published by the Extension Service at Iowa State College. The object of this publication is to give some of the constructive poultry information offered by the College to Iowa poultry breeders, leading farm poultrymen, hatcherymen, produce dealers and feed dealers servicing farm poultrymen.

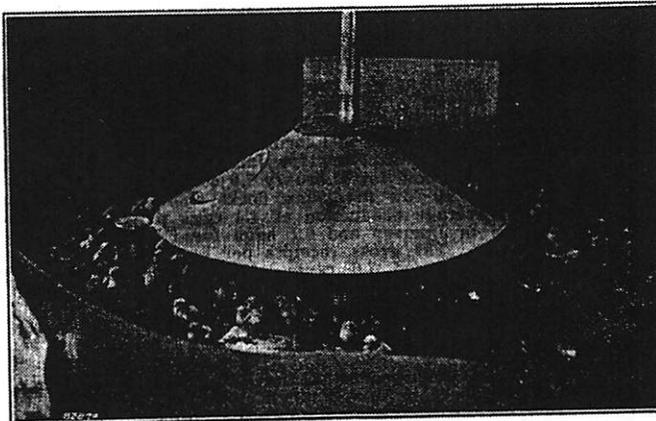
## GROUND CORN COBS AS LITTER Is Very Satisfactory for Use on Floor of Brooder House

During the first 2 months or the period in which the fire is kept in the brooder stove, crushed or coarsely ground corn cobs is one of the most economical and satisfactory materials for Iowa poultrymen to use on the brooder house floor. Low-cost litter is a very important item to consider in a frequent-cleaning program for the purpose of maintaining sanitary conditions.

The cobs should be ground or crushed so that the pieces are about the size of a kernel of corn, and should be kept in a dry place so that they do not become moldy before using.

If the chicks have learned to eat and drink the right kind of materials there is little danger of them eating fibrous material if they have access to an abundance of feed. Some people sift out the small pieces of cobs and others place feed sacks over the litter during the first 2 days.

After the brooder stove is taken from the house, the most practical kind of litter is clean straw over a thin layer of coarse sand. The sand helps to keep the droppings from sticking to the floor, and will aid in the cleaning of the house.



Teaching chicks to hover.

## Cooperation Necessary to Improve Situation

### Hatcherymen and Dealers Push Four-Point Program

By W. M. VERNON

Products which farmers must buy for their poultry flocks have advanced materially during the last year; therefore, all groups associated with the poultry industry are anxious to see market prices of poultry and eggs increase in proportion to the rise in cost. By cooperative effort certain things can be accomplished this spring and summer.

The four practices which farm poultrymen should resort to at this time are as follows:

1. Sell poor layers frequently throughout the spring and summer.
2. Avoid overproduction during the coming year by brooding only the number of chicks each person is equipped to brood. These chicks should be hatched during February, March, April and May, and the brooder houses should not be crowded.
3. Since corn is the lowest priced grain on the farm it should constitute 50 to 65 percent of the total mash and grain eaten by chicks and hens.
4. Give the chicks a well-balanced chick mash and the hens a well-balanced laying mash at all times, and keep the cost reasonably low by providing the mash in one of the following methods: (a) Purchase the necessary supplementary concentrate feeds and mix these with ground home-grown grains; (b) Purchase well-prepared mash mixtures that are ground and mixed by a nearby feed dealer.

The summary of demonstration flock records (page 2, column 2) shows that the principal expense item is the feed cost; therefore, flock owners must pay close attention to this factor.

Summer chicks brooded last year resulted in a market surplus, and most of these chicks were of poor quality. The poultry situation in Iowa can be greatly improved this year if the production of summer chicks is avoided.

Attractive colored posters emphasizing the most important phases of this educational campaign were sent to all hatcherymen, produce dealers and feed dealers to aid them in popularizing these practices. Many of these co-operators are handing out copies of the leaflet, "How Iowa Farmers Should Meet the 1933-34 Poultry Situation." They are being distributed on request.

## Factors Influencing Egg Quality Studied

### Henderson Reviews Recent Work in Poultry Research

By E. W. HENDERSON

Studies of the influence of rations on the loss of weight of eggs in storage showed at the Iowa experiment station that varying percentages of two kinds of protein concentrates had no influence.

The amount of thick white was apparently influenced by radical changes in the amount of meat and bone meal in the ration. Eggs from pens which were fed grain alone had 49.2 percent or dense white as compared with 64.5 percent from pens fed 10 percent of meat and bone meal as a supplement to an "all mash" ration.

At the California experiment station firmness of albumin of eggs seems to vary with individual hens and the present evidence points to inheritance as a factor. This station has also reported a study of the relationship of the candling appearance of eggs to their quality.

A summary of results of work of this type in progress for the past 3 years at the Iowa Station is available in the 1933 annual report.

#### Increasing Egg Size

In the Missouri bulletin, No. 332, the following program for increasing egg weight is recommended:

##### BRADING.

- Select breeding stock which produces eggs weighing from 24 to 28 ounces per dozen.
- When possible breed from males and females whose daughters laid large eggs.
- Select medium to large sized breeders within a given breed. Large birds tend to produce larger eggs than do small birds.
- Set eggs that are of the desired shape and color and which weigh from 24 to 28 ounces per dozen, or purchase chicks hatched from eggs of this character.

In some cases it will be advisable to discard the present stock and replace them with chicks or hatching eggs from some breeder who has bred the factor for large egg size into his stock.

##### FEEDING.

- Feed a complete or well-balanced ration throughout the year.
- Use some form of milk in the ration. Milk is beneficial in improving egg weight.
- Keep clean, fresh water before the birds.
- Maintain the body weight of the birds. If necessary use a moist fattening mash, and hopper feed the grain.

##### TEMPERATURE.

- During the summer months house the birds in cool quarters and provide shade. Egg weight is much reduced during the summer months when the temperature is high.

#### Yolk Color Survey

That preference for pale colored egg yolks was largely a whim of egg dealers in New York instead of consumers was demonstrated by a recent survey of New York consumers by the Missouri station.

Significant conclusions in their bulletin, No. 329, are that "a price premium for any yolk color is not justified from the standpoint of either consumers or distributors," and that "the advisability of altering production methods so as to meet the trade demands for white yolks is questionable. The latter would result in higher costs of production and actual quality would not be improved." They recommend "a program of consumer education designed to eliminate false prejudices against brown shelled and medium to dark yolk eggs."

## Demonstration Record Reports Aid Producers

### Extension Service Provides Flock Owners with Calendar

Flock owners cooperating with the Extension Service keep a complete flock record in order that they may learn important facts regarding production, mortality, expenses, various sources of receipts and profits realized by months, and then at the end of the year the record is summarized and recommendations are made. These flock owners use the Iowa Poultry Calendar, a record form provided by the Extension Service.

The table below was compiled from the January and February calendar flock reports.

Item	January	February
Number of flocks reporting.....	41	36
Laying birds dead or lost.....	1.6%	1.0%
Average price of market eggs.....	16.2c	10.5c
Average size of flock.....	319	316
Average eggs per hen.....	8.2	9.9
Receipts per hen:		
Market eggs.....	\$ .088	\$ .103
H. eggs, chicks and Br. stock.....	.009	.027
Market poultry.....	.023	.114
Total receipts per hen.....	.120	.144
Total expense per hen.....	.077	.074

The average price received for market eggs during January and February was better than the prices received a year ago. An average of 14.5 cents was received in January, 1933, and 10.3 cents in February of the same year. The average price received in January, 1932, was 15.2 cents, while 17 cents was realized in January, 1931.

The margin of gross profits realized by the flock owner for labor, interest and depreciation on investment was 6 cents per hen for January and 7 cents for February. In January, 1933, the margin of gross profits to the flock owner was 8 cents and in February only 3 cents.

The average production per hen during January and February was about the same as is usually secured by these flock owners. The production during February was greater than that realized in January; in 1933 production was higher in January.

The 10 high producing flocks of those reporting showed an average production of 12.9 eggs both in January and in February. These flock owners received a total income per hen in January of 22.2 cents and in February 22.6 cents. Their gross expenses for January were 8.6 cents and for February 7.9 cents.

The 10 low producing flocks showed an average production of 4.4 eggs per hen in January and 6.1 eggs for February. The gross receipts per hen for January was 7.6 cents and expenses were 7.7 cents. Therefore, they lost money. In February the receipts per hen were 8.4 cents and expenses 6.5 cents—a gross profit of 1.9 cents per hen.

The performance of the low producing flocks in this group of cooperators represents fairly closely the results realized by the average Iowa farm poultryman.

## Breeders Benefit from Record of Performance

### Brief Reports of This Work to Appear in "Review"

The record of performance breeding work is a program conducted cooperatively by the Iowa Poultry Improvement Association and the Extension Service of Iowa State College, with a group of trapnest pedigree breeders in Iowa. These breeders are members of the Breeders' Division of the Iowa Poultry Improvement Association. The Association assumes the responsibility for membership, advertising and the enforcement of rules. The Extension Service assists in the program by summarizing certain breeding records, by visiting flocks, by assisting in getting performance records and by advising breeders regarding the breeding program.

These pedigree breeders get a full year's trapnest record on the birds entered in record of performance work; eggs are weighed to get the average egg weight of each bird; the average body weight of the birds is determined; a hatching record is kept each spring, and a record is made of the color of the eggs produced. There are certain minimum requirements covering all of these phases of breeding work, and the breeders are making special effort to provide breeding stock with known good breeding tendencies. Brief reports of record of performance work will appear in future issues of this publication.

The breeders entered in record of performance work for 1934 are as follows:

#### WHITE ROCKS

Floyd Bloom, Shenandoah  
J. C. Doolittle, Estherville  
M. D. Mills, New Providence  
Willard Preston, Denver  
Ramsayer Poultry Farm, Palaski State Farm, Ames  
A. H. Ward, Independence

#### BARRED ROCKS

Floyd Bloom, Shenandoah  
Marion Kipp, Winfield

#### S. C. REDD ISLAND REDS

Mrs. George Armstrong, 804 E. 32nd street, Davenport  
Floyd Bloom, Shenandoah  
Mrs. Thomas Gerden, Washington  
Ramsayer Poultry Farm, Palaski State Farm, Ames  
Mrs. C. L. Stannard, Richland

#### WHITE WASHNETTES

Mrs. George Armstrong, 804 E. 32nd street, Davenport  
Floyd Bloom, Shenandoah  
J. C. Doolittle, Estherville  
Mrs. W. F. Stroud, Ragley

#### WHITE LEGHORNS

Floyd Bloom, Shenandoah  
Mrs. F. J. Hans, Shelby  
H. N. Kruse, Linn Grove  
Willard Preston, Denver  
Ramsayer Poultry Farm, Palaski State Farm, Ames  
H. Reynolds, Doon  
A. H. Ward, Independence

#### Clean the Brooder House

Each brood of chicks should be placed into a thoroughly cleaned house. It should first be scraped and swept, and the litter burned or spread on the ground far away from the poultry range. The floor and lower sidewalls should be scrubbed with scalding lye water perhaps two or three times. A common practice is to use 4 ounces of lye to 10 gallons of water. It is important that the water be scalding hot. Spray the sidewalls and the roof thoroughly with a 5 percent disinfectant solution.

## Article 9

From	
	<b>OFFICIAL EMBLEM OF QUALITY</b>
	Supervised by <b>The Iowa Poultry Improvement Supervisory Board</b>
To	
Eggs	Date
Chicks	of Hatch
Breed	

Shipping label used on chick boxes, egg cases and shipments of breeding stock by Iowa cooperators in the National Poultry Improvement Plan.





# BULLETIN

SEVENTH WORLD'S POULTRY CONGRESS AND EXPOSITION

Vol. 1 No. 6

CLEVELAND, OHIO

September, 1938

## QUOTAS IN DANGER AS FALL CAMPAIGN GETS INTO ACTION

### Commercial Concerns Taking Greater Interest In Drive For Membership

Having seen the Poultry Congress through the first year of its life, the various state committees after a little let-up during the hot month of August, are swinging into line following Labor Day.

Various methods of putting over membership quotas have been tried but with one accord, the states involved have come down to the necessity for county organization with a leader in each. In some cases this means large committees as for example in the big cities where many commercial interests are involved. In other instances it means a modest county committee to reach the various types of people interested in a given rural territory. Several states which had the idea in the beginning that the membership drive was easy and talked big and loud as to how soon they would put their quota over have now settled down to less spectacular but more productive methods.

It reminds us of "Mr. Dooley" in an essay on politics. "Now and then," he said, "a rayformer lands by erryplane but the chances are wan hundred to wan on the guy who tunnels thru". The Poultry Congress has now settled down to the tunneling stage and the state committees are swinging into the job. When the October bulletin comes out we will have much to report as to the progress made.

Notable during the summer has been active support by the commercial companies. Much more such support is in the making and state committees are not missing the chance to invite the companies doing business in their territory to come along and put a shoulder to the wheel.

#### BRAY CONTRIBUTES

Fred Bray, Canadian hatcheryman, promises a contributing membership of \$250.00. The money, he says, will be along as soon as the Canadian committee meets to accept it. This is the first hatchery to take a contributing membership and it comes from Canada.



#### "BITT" JOINS UP

H. A. Bittenbender has been added to the staff of the World's Poultry Congress. "Bitt" is well known in the poultry world, having been fourteen years at Iowa State College, Ames, Iowa, as head of the poultry department. He also has served with the Buckeye Incubator Company as head of the research department.

#### GENERAL CONGRESS COMMITTEE MEETS

On October 7th and 8th the General Congress Committee will meet in Cleveland. Headquarters will be the Cleveland Hotel, and matters will be handled in much the same manner as the meeting which was held at the Hollenden Hotel last winter. A full attendance will be helpful to the cause of the Congress.

A great deal of work needs to be done in the next ten months and plans for the campaign will be outlined at the meeting.

#### SPECIAL TRAINS PLANNED

A. H. Emskamp, president of the Inland Empire Hatchery Association, Spokane, Washington, advises that his group will run a special train to the World's Poultry Congress. Others are invited to travel with them. Further information can be secured from Mr. Emskamp. This is the second train which has been announced. Prairie Farmer of Chicago, Illinois, already are looking to participation by seven or eight hundred people on their tour.

G. C. Holloway, secretary of the Florida committee, reports that Dade County has sold two-thirds of its quota which "demonstrates that these tickets can be sold and we propose to sell them. We are prepared to devote the major part of the next three weeks to moving these membership tickets and hope to have a sell-out report."

#### OUR FINANCIAL POLICY

By SIDNEY A. EDWARDS

The World's Poultry Congress derives its income from four principal sources:

- 1—Loans from the World's Poultry Congress Corporation of Cleveland to the extent of \$25,000 if, and as needed. This money must be paid back.
- 2—Sale of Congress Memberships of various types.
- 3—Sale of Exhibit Space and Entry Fees.
- 4—Paid admissions at the gate at the rate of 50c per person per day.

The Executive Committee believes that current collections from the sale of Memberships should be sufficient to take care of running and promotional expenses prior to the Congress; that returns from the sale of exhibit space should be held in reserve for the actual operation of the Congress and admissions at the time of the Congress should serve as a "cushion" to take care of unanticipated expenses and leave the Congress thoroughly solvent when its operations have been completed.

Being committed to the policy of "paying as we go," it is vitally necessary that the income from the Membership Campaign be enough to carry all running expenses the next ten months.

In its attempt to truly reflect the attitude of the people in the poultry industry, the Executive Committee must be guided almost entirely by the financial response which the Industry manifests in support of the Membership Campaign.

It, therefore, should be made apparent to all those solicited for financial support that they by their moral and financial support are actually instructing the Executive Committee as to just how far to go and how fast.

At the present time, the National Committee needs more money for current expenses if our publicity and promotional program are not to suffer.

If every one deriving his income or a portion thereof from the sale of poultry and poultry products or the sale of feed, supplies, equipment, and material to poultrymen, will do his part, no individual, corporation, or state need feel that it is doing more than its proportionate share and the burden on each will be small.

#### UNITED PRESS PUTS CONGRESS ON THE WIRE

CLEVELAND, Aug. 19.—(U. P.)—Two poultrymen, one from Philadelphia, the other from Akron, Ohio, presented credentials to the ticket-taker at the Horticultural Gardens on the Lake Erie front today.

"We want to see the World's Poultry Congress," they said.

"So do I," retorted the T. T. "but it won't be held until 1939."



## Article 11

# Kraschel Buys Ticket



Register Staff Photo

Gov. N. G. Kraschel Tuesday purchased the first membership ticket sold in Iowa for the 1939 World's Poultry congress. Tom Dyer (left), chairman of the membership committee, made the sale while Prof. W. M. Vernon, executive secretary of Iowa's general committee on participation, looked on.

\* \* \* \* \*

## POULTRY EVENT DRIVE LAUNCHED

### Seek 22,000 Memberships for Congress.

Gov. N. G. Kraschel Tuesday became the purchaser of the first membership ticket in Iowa in the 1939 World's Poultry Congress.

This was the first step in a drive to finance Iowa's participation in the congress to be held in Cleveland, Ohio, in August, 1939.

The objective is to raise \$22,000 through sale of 22,000 tickets, part of the money to go to the congress expense and part to remain for use in Iowa.

### Meeting Friday.

A meeting of all county chairmen is to be held in Des Moines next Friday to be followed by a series of county meetings.

Prof. W. M. Vernon of the extension service of Iowa State college is executive secretary of the Iowa committee on participation in the poultry congress and Tom Dyer of Des Moines is chairman of the membership committee. They sold the No. 1 ticket to the governor.

Quotas have been set for the various counties of the state. The committee hopes to dispose of 600 tickets in Polk county and 500 each in Linn, Page and Wapello. The quota 400 has been set for Scott, Woodbury, Lee, Black Hawk and Cerro Gordo with smaller amounts for the other counties in the state.

### Finance Committee.

Secretary Vernon explained that of the amount realized from the sale of memberships, approximately 25 per cent or \$5,500 if the entire 22,000 tickets are sold, would go to finance the Iowa committee.

"It is our hope that educational exhibits totaling an expenditure of about \$20,000 can be financed through state appropriation," he said.

### Iowa Leads.

In all Iowans engaged in or interested in the poultry industry will spend about \$100,000 in participation in the congress. This sounds rather imposing but actually is comparatively a small amount in view of the millions of dollars of income the industry brings into Iowa annually and the front rank that Iowa enjoys in the industry."

Ray France of Cherokee is chairman of the Iowa committee with Secretary of Agriculture Henry A. Wallace honorary chairman of the congress committee. Dewey Termohlen, formerly of Iowa State college, is representing the government agencies in arranging for the congress and is at present touring Europe to interest poultrymen of other nations in the congress.



## Article 12

Retyped 1939 article

### First Twenty-Five Years of Poultry Husbandry Extension Work

This review of poultry husbandry extension work in Iowa covers the period of 1914 to 1939. The subject is treated in five year periods so that major causes and results may be emphasized. Poultry extension work started by using simple method demonstrations and lectures. Improved methods and facilities permit the 1940 poultry husbandry extension program to reach an increased number of Iowa farm people. There is no question but that the program of Iowa State College poultry research, resident teaching and extension teaching has been a large factor in the development of the poultry industry in this state.

#### The State-wide Situation

In 1913 the officials of Iowa State College saw the need for a poultry husbandry extension program and employed a poultry specialist. The situation at that time presented the following major problems:

- a. Poultry on 90 percent of Iowa farms, or a total of more than 200,000 farm flocks and many small flocks in towns.
- b. The average farm flock contained about 125 hens, and 200 chicks were brooded yearly with hens.
- c. Expansion of poultry population had occurred with little improvement in production methods.
- d. Mongrel flocks of poultry on most Iowa farms.
- e. Little or no systematic culling of unprofitable hens.
- f. Fall and winter egg production was extremely low.
- g. All poultry and eggs were sold on an ungraded basis.
- h. Losses from poultry diseases and parasites increasing, with avian tuberculosis considered the most important problem.

The development of new methods in poultry production, including artificial incubation and brooding, also improved feeding and new disease and parasite problems have kept the extension poultrymen busy with current problem projects. These changes have forced the extension poultrymen to periodically shift their program and therefore we do not have any result information regarding a project that has extended over the twenty-five year period.

During the latter one-third of this twenty-five year period, the extension poultrymen have been faced with problems caused by depression, drought, overproduction, new poultry diseases and another World War.

A review of the first twenty-five year period, from a program planning standpoint, shows that the extension poultrymen should continuously note the trend in the general poultry situation and adjust projects and organization work so that good long-time objectives are maintained and yet deal effectively with major current problems.

#### Changes in Poultry Specialists and County Agent Work

The work of the poultry specialists during the period of 1914 to 1919 emphasized the method of maximum contacts by holding general meetings, short courses and judging poultry shows. In 1914 poultry specialists were in the field for 165 days and held 194 meetings with a total attendance of 25,983 people. The record further shows that the specialists traveled 17,364 miles by train, 1,511 by automobile and 43 miles by team. In 1939 the travel was practically all by automobile.

Increased production of poultry and eggs by the campaign method was used in 1917 and 1918. The poultry specialists spent very little time in the office preparing new material and making plans for organization work because their program was simple.

This campaign method proved effective in reaching people with a simple message that "food will win the war." Specialists were in the field for 383 days in 1918, they held 572 meetings with an attendance of 27,572 people.

With the war over in 1919 and the poultry specialists staff increased to five in number, they shifted their program to a campaign of culling farm flocks. To accomplish this, they conducted culling schools at Iowa State College which were attended by county agents, home demonstration agents and farm poultrymen. In that year culling campaigns were conducted in 74 counties, most of which was done under the direction of the county Farm Bureau.

During the 1919-24 period, the work of the specialists was again changed from the culling campaign to the flock record demonstrations. The flock owners served as local leaders so meetings might be held at these farms.

From 1924 to 1929, the method was again changed to the holding of a large number of meetings, such as had been used during the first years of poultry extension work. This program was effective in reaching more people but there seems to be some question as to its effectiveness in influencing farm poultrymen to change major methods of management. During that period the Iowa Poultry Improvement Association was organized and the extension specialists developed methods of cooperation with that organization in doing extension work.

During the period of 1929-34, poultry specialists continued the cooperation with the Iowa Poultry Improvement Association and established new demonstrations known as Record of Performance breeding program, and turkey production. Their program included record flock improvement demonstrations, poultry shows, institutes and general meetings. As the national depression became more serious, they instituted an emergency poultry campaign to help reduce a surplus of poultry and eggs, cut feed costs and increase flock profit.

National farm recovery programs of 1934-39 demanded much of the county agents' time and the extension poultrymen did more of their work in cooperation with organized groups that could assist with educational programs to carry the message of improved practices to farm producers. In addition to cooperation with the Iowa Poultry Improvement Association, the specialists worked with produce dealers and individual hatcherymen in conducting poultry schools. A new program known as the National Poultry Improvement Plan was begun in 1935. In 1939 there were 44 states participating in this program.

County agricultural agents gave a large amount of time to the poultry projects during the early years of county agent work. Their work consisted largely of method demonstrations, and poultry campaigns interested them because poultry was found on 90 percent or more of Iowa farms.

As the economic situation became more serious for farm people, county agents turned to major agricultural problems such as cooperative marketing, insect pest control, educational assistance on the agricultural adjustment program, soil conservation and farm organization as an instrument for carrying out all of these programs and to maintain higher standards of living on farms.

## **POULTRY HUSBANDRY PROJECTS**

### 1914-1919

- a. One week agricultural short courses.
- b. Judging exhibits.
- c. Dual poultry and horticulture demonstrations.
- d. Increased production campaigns.
- e. Culling campaign.

#### 1919-1924

- a. Culling campaign continued.
- b. Record flock demonstrations.
- c. Judging exhibits.
- d. Egg grading schools.
- e. One-day poultry schools.

#### 1924-1929

- a. Flock record demonstrations.
- b. Poultry management schools.
- c. Egg marketing schools.
- d. Judging poultry exhibits.

#### 1929-1934

- a. Poultry management schools.
- b. Hatchery flock owner schools.
- c. Record flock demonstrations.
- d. Poultry club training schools.
- e. "Grow Healthy Chicks" campaign.
- f. Record of Performance breeding demonstrations.

#### 1934-1939

- a. Poultry adjustment campaign.
- b. Quality egg production demonstrations.
- c. Record flock demonstrations.
- d. Poultry breeding improvement.
- e. Turkey improvement.
- f. Judging poultry exhibits.
- g. General poultry meetings.

### **How Poultry Extension Specialists Helped During the World War**

The extension poultrymen conducted a state-wide campaign for the increase of poultry and eggs during 1917-18 to provide more food during the war period. This country was called upon to supply much of the food needed by European nations engaged in the World War and though poultry and eggs were not considered as the most suitable products for export, these products could replace some of the other livestock products in the home market that were being depleted by exports. The poultry extension staff was increased during the World War period to meet this emergency and the records show that during these two years, 600 days were devoted by specialists to poultry work in the field, they held more than 900 meetings that were attended by more than 50,000 people. Specialists' reports estimate that during 1918 the poultry production in Iowa was increased about 20 percent over the normal pre-war record.

When the war was over and the soldiers in Europe returned to their farms, there was need for curtailment in poultry production in Iowa; therefore, the extension poultrymen promptly conducted a state-wide poultry culling campaign to help reduce the poultry numbers on the farms and to avoid disastrous overproduction.

In 1919, the poultry specialists trained county agents and local leaders how to cull poultry by conducting culling schools. They supervised the culling work in 74 counties in cooperation with the Farm Bureau. They report that 2,967 flocks containing 300,000 birds were culled.

Twenty percent of the birds were removed from the flocks as culls. This demonstrational work encouraged other poultrymen to have their flocks culled. This culling campaign continued through 1920 and 1921. The reports show that in 1921 there were 4,684 culling demonstrations held and 142,000 culls were removed from flocks

containing a total of 645,500 birds. This was done at a cost of \$13,000 but the saving to flock owners totaled \$71,000.

### **How Extension Poultrymen Assisted With New Deal Program**

Extension poultrymen in Iowa continued with regular poultry educational work throughout the depression years and did not assist with the corn-hog program or the wheat program in Iowa. There were poultry emergency situations that needed definite attention; therefore, the extension poultrymen conducted an emergency campaign designed to help correct the disastrous situation that faced farm poultrymen during 1933 and 1934.

During this period poultry prices dropped to 5¢ per pound and eggs sold as low as 8¢ a dozen. Farm poultrymen had striven to offset their reduced income by producing more poultry but this served only to push prices lower. During the period of good poultry prices, there was good opportunity for selling high priced commercial feed. Farm poultrymen were continuing to pay these high feed prices.

The extension poultrymen first analyzed the situation and prepared charts and tabulated information regarding supplies of poultry and eggs, number of birds on farm, the continuous fall in poultry profit, and set forth several recommendations regarding what the farmers might do to improve the poultry situation quickly. These recommendations were as follows:

1. Brood 20 percent less chicks in 1933 than were brooded in 1932.
2. Reduce the number in the laying flock by 20 percent and cull the flock earlier than usual.
3. Cut feed costs by using home mixed mash or purchase a concentrate supplement to mix with home produced feed.

Extension poultrymen held 55 meetings with 1200 leaders in all parts of the state. Facts regarding the serious situation were discussed with these leaders and recommendations for improvement given. These people were requested to discuss these problems with others in their communities so that there would be an awakening throughout the state regarding these few ways of improving the poultry situation.

It was soon evident that this campaign was having the desired effect because reports from 13 large poultry buyers showed that there was a much larger early season movement of poultry during the spring when this campaign was conducted than was normal for that time of the year. Hatcherymen found that there was a smaller demand for chicks and the feed dealers found that there was increased demand for concentrate mash and less demand for the complete mixed poultry feed.

The drought in 1934 and 1936 presented emergency situations regarding feed supplies. One year farmers would have a good supply of corn but practically no small grains while the next year they would have small grain but practically no corn. The extension poultrymen prepared emergency rations recommended by the College and distributed copies of these leaflets throughout the state so that farmers would continue to give their birds a balanced ration at minimum cost. There was no way to measure the exact benefit from these emergency campaigns. The specialists proceeded on the idea that an inexpensive leaflet containing the brief message of facts would do its good work if it could get into the hands of the maximum number of farm poultrymen.

### **Benefits to Iowa Farmers Resulting From Major Poultry Extension Projects**

1. **Culling Campaign:** With the assistance of resident staff members, the extension poultrymen of Iowa State College initiated the practice of culling farm flocks. Few, if any, Iowa farmers at that time could identify unprofitable layers. This project extended over a period of several years and was conducted in every county. The total savings in feed consumed by the culls, the improvement in market prices of poultry resulting from the spreading out of the volume of hens

sold off the farm and the better performance of desirable birds left in the flock resulted in a benefit to Iowa farmers of about \$6,000,000 a year.

2. **Grow Healthy Chick Campaign:** Increased chick losses from widely spread pullorum disease, coccidiosis and worm infestation necessitated a change in the general method of chick raising in Iowa. The Extension Service recommended a program of sanitary management and conducted a campaign in cooperation with leaders in all counties to demonstrate how chick mortality might be reduced from an average of 30 percent to 15 percent. These demonstrations also proved that chicks grown according to these recommended methods resulted in better growth of the healthy birds.

This program emphasized:

- a. Early hatching.
- b. Chicks from healthy flocks.
- c. Clean brooder houses.
- d. Clean ground range.
- e. Clean, well-balanced feed.

A majority of Iowa farm poultrymen yet have not adopted all of these practices and the estimated annual benefit now would be about \$2,000,000, but the potential benefit by more extensive adoption of this program might equal \$10,000,000 a year.

3. **Improved Feeding:** The College Poultry Department was the pioneer agency in improved poultry feeding and this good work has continued. There are now several hundred Iowa feed companies that are rendering excellent service on improved poultry feeding.

Better feeding and management by farm poultrymen in Iowa has raised the average egg production per hen from about 60 eggs to 90 eggs a year and rate of growth of young birds has been greatly improved. In 1914 Iowa farmers did not expect fall and winter eggs and a few of them fed a chick mash or laying mash. Then, egg prices were 10¢ per dozen in the spring and 50¢ in late fall and winter. Greater stabilization in volume and prices of poultry and eggs is being accomplished by the adoption of the recommended practices of feeding and management.

Improvement in the diet by farm people has resulted from this stabilization in volume and prices of poultry and eggs so that now about 25% of the poultry and eggs produced in Iowa are consumed on the farm.

It is difficult to estimate the dollars and cents benefit to Iowa poultrymen as a result of this continuously conducted project on improved feeding, but the increase of two and a half dozen eggs per hen at 20¢ a dozen would total twelve million dollars and the improvement in the livability and growth of the 45 million chicks grown annually to maturity or market age would, at 15¢ per chick, total more than six million dollars improvement. These estimates do not include increased business resulting from feed service programs by local agencies.

4. **Demonstration Flocks:** In 1918, the extension poultrymen established demonstration flocks so that the more complete program of flock improvement might be shown to farm poultrymen in each county. These demonstrations have served as "proving ground" for recommended practices. A large number of these demonstrations were conducted in the ten-year period of 1920-1930.

These demonstrations were of inestimable value in emphasizing improved breeding flocks, better housing and equipment, home mixed rations, clean ground range, and the profit that might be realized by adopting the well-rounded program of management.

An important benefit to farmers has been the balancing of labor on the farm and the providing for more adequate weekly income to supply current farm family needs. Extensive adoption of the poultry husbandry program recommended by the extension service will be an important factor in the attainment of the goal of *a high standard of living on every Iowa farm.*

5. **The National Poultry Improvement Plan :** This new and well-organized program affords the best opportunity for widespread poultry improvement. In

1939 there were 50 hatcheries and 13 specialized breeders and 1,877 hatchery flocks participating in the program.

It is reasonable to expect that in a few years Iowa might have 15 Record of Performance flocks, 100 U.S. Certified flocks and 150 or more hatcheries with about 8000 hatchery supply flocks participating in this improvement plan. When this cooperation is attained, quality improvement in Iowa will be definitely influenced.

### **Trends in Poultry Husbandry Extension Work**

A review of the first twenty-five years of poultry husbandry work reveals the fact that projects have been changed frequently to meet current needs and that campaign methods have proved helpful in securing widespread appreciation of the problems and the way to deal with them. Result demonstrations have also gained a prominent place in the picture because most people are influenced most by seeing. Extension literature has helped greatly because the publications presented the unbiased facts.

Looking ahead, we believe that the organizing and conducting of poultry husbandry extension work will be done largely in the following ways:

1. Greater use of news stories and radio in disseminating poultry information.
2. Greater use of pictures and charts in subject matter meetings.
3. More material prepared by poultry specialists for use by local leaders.
4. More assistance to organizations that are willing to help spread unbiased facts.
5. Continuation of well-organized result demonstrations.
6. More periodic area surveys to determine major problems and progress attained.
7. Adaptation of types of poultry production and size of the enterprise to the general farm management program.
8. More emphasis upon coordinated projects conducted in large areas.
9. Modernized use of campaign methods.
10. Greater emphasis upon quality production methods, sound grading standards and adequate grade price differentials.



# Iowa Poultry Producers and the National Defense Program

ducer should have one or more shelter-porches. They can be used to provide temporary housing for the larger number of pullets or market cockerels produced this year. For winter use, the shelter-porch should be covered with straw and corn fodder to insulate the roof and sides.

Range feeders and waterers help to cut labor costs and promote rapid growth of pullets and market birds. They should be located a short distance from the range shelter or brooder house on clean range.

The following leaflets give additional information that may be helpful in maintaining flock health and securing better egg production of hens and growth of market birds. Copies will be supplied upon request at county agricultural agents' offices or the Agricultural Extension Service, Merrill Hall, Ames, Iowa.

- P-507—Shelter-Porch for Chickens
- P-329—Homemade Waterers and Feeders for Chickens
- P-611—Iowa State College Poultry Rations
- Ext. Circ. 223—Turkey Production
- Ext. Circ. 263—Sorting the Laying Flock

quire more brooder room, more shade and more feed per pound grain, hatch an extra brood in September or October for winter sales and avoid glutting the market during fall.

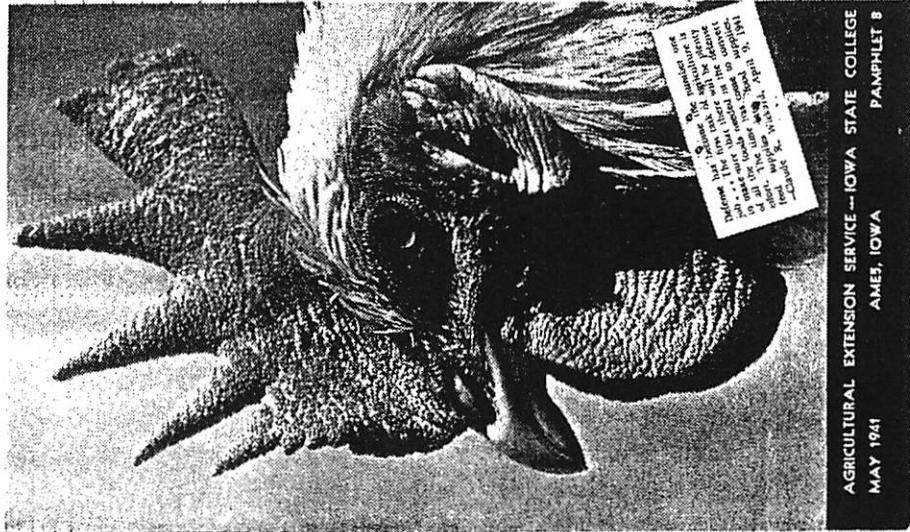
*Crowding is expensive* for, while house and fuel costs may be reduced, feed and labor costs increase far out of proportion to the saving. Give 250 chicks a 10'x12' house with a sanitary sun porch or clean ground pen to enable the chicks to grow to a 2-pound average when 8 weeks old. After that the cockerels and the pullets should be separately housed and given 1 to 2 square feet of floor space per bird.

*Scanty feed and drink space*, if carried to excess, causes starvation. Each chick should have 2 inches of feeder space and ¼ inch of drink space. This should be supplemented by using feeders and fountains large enough to necessitate filling not over twice a day. Keep the feeders one-half filled with mash. A small investment in outdoor mash feeders will reduce the labor and increase the practicality of clean range for the birds.

*Confine the market cockerels* or range them in a small pen on clean ground. Allowing the birds to run over the farm obviously increases contact with disease carriers, reduces their fleshing and increases the hard-meated quality which disappoints both the producer and the consumer.

*Hot houses reduce rate of growth* because the birds lose weight at night from excessive respiration. Make the house as comfortable as possible by removing the windows. Place some of the feeders and fountains out of doors in a shady pen. The water and feed should be in convenient locations where the birds stay during the middle of the day.

*The shelter-porch* is a shelter recently designed by Iowa State College to serve as sun porch for chicks, range shelter for pullets and sanitary porch for hens. The shelter-porch protects chicks against diseases, parasites, predatory animals and brooder house crowding. Each poultry pro-



AGRICULTURAL EXTENSION SERVICE — IOWA STATE COLLEGE  
AMES, IOWA  
MAY 1941  
PAMPHLET 8

Cooperative Extension Work in Agriculture and Home Economics, Iowa State College of Agriculture and Mechanical Arts, Ames, Iowa. Department of Agricultural Cooperation, R. K. Bliss, director, Ames, Iowa.  
(Distributed in furtherance of the acts of Congress of May 8 and June 30, 1911.)

50,000 copies printed



# IOWA TURKEY NEWS

Volume 1 February, 1941 No. 1

PUBLISHED BY THE IOWA TURKEY GROWERS' ASSOCIATION

## WHY ORGANIZE?

Growers Benefit by Group Action  
By W. R. Whitfield

Can a district, a state or a national organization aid the turkey industry? We believe it can. By intelligent planning, many individual growers working through an organization will learn about improved methods of production which unorganized individuals would be slow to hear about. Organization promotes contacts between growers by sponsoring meetings, publications and programs

From a selfish viewpoint the grower who does not unite his effort with others in an organization fails to accomplish the most success possible and is therefore unintelligently selfish. One grower seldom has as many good ideas as he can get from 10 men when all are joined in an organization committee to studying better production methods.

A district organization offers immediate benefits to the growers by focusing attention upon such problems as disease control, sources of poults of superior quality, market outlets, feed requirements, etc. The solution to these problems lies in group action which may be used to sponsor meetings where reliable sources of information are obtainable. The lone individual is at the mercy of unreliable informants who prey on uninformed individuals.

A state organization offers much for little, just as in the district organization, for all officers do their work gratis. But what does the state organization offer which is not obtainable in the district set-up? Without large organizations, little can be done of large scale importance. Many important services to members such as the

(Continued on page 4)

EXTRA!

EXTRA!

EXTRA!



Turkey Gobblers, All!

By Mrs. Shirley Schultz, Ida Grove, Ia.

The campaign to increase the consumption of turkey was started some time ago when February 22nd, George Washington's birthday, was set aside as National Turkey Day.

Each and every grower should push the "eat more turkey" campaign and make it national in scope. Every effort should be expended to advertise turkeys as a fowl that can be eaten not only a few months of the year but all year round. The public must also be educated to the fact that turkeys, like chickens, are delicious at various stages of maturity.

Anything that will create a greater appetite for turkey and encourage the consumer to buy it oftener is not only good for the grower and the whole poultry industry, but it is evident with the present annual consumption of less than 5 pounds per person that the consumer also would benefit.

It has been said by many consumers that the reason that they do not buy more turkey is due to the price and the amount of work that it takes to get a turkey ready for the oven. These problems which stand in the way of a greater sale of turkeys can easily be taken care of. Growers who have been catering to the local trade will find it well worth their while to eviscerate their birds, and comparison of the edible portion of turkeys and other meats of comparable quality will often show the turkey up to advantage.

## TURKEY OUTLOOK FOR 1941

By Ralph Baker

The year 1941 may be an "Anything-can-happen" year for the turkey grower. Consumer demand for turkeys will undoubtedly be as good or better than during the 1940 season with defense program spendings keeping employment at a relatively high level.

Cold storage holdings of turkeys on Jan. 1, 1941 of 60 million pounds were the largest on record. Total poultry stocks were also at a new high of 208 million pounds. Neither, however, should be a particular drag on the market.

Turkey prices recovered fairly well after a low start during the 1940 season. The price of fancy large toms rose relative to fancy hens as the marketing season progressed. Differentials on the New York market were about 3 cents per pound between light and heavy fancy birds for the Christmas market. On the other hand, there was a 6-cent spread between unfinished and top grade birds of the same weight class.

With prices being fairly good during the latter part of the 1940 season and with prospects of consumer incomes being fairly high in 1941, many producers may increase their flock size -- if total numbers are much greater than this year prices will be lower. On the other hand, feed costs may be lower and certainly no higher during 1941 than 1940. at least during the first half of the growing season. Corn and oat stocks on Jan. 1, 1941 were the largest on record. Supplies of vegetable proteins are high. Animal protein prices may be slightly higher, however.

Probably the most significant item in the 1940 marketing season was the rise in the price of large toms in relation to hen prices. Most of this change was probably due (1) to a more progressive price policy (selling heavy toms at retail at a price somewhat lower than the hen price), (2) to the fact (Continued on page 4)

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## TURKEY IMPROVEMENT

By Leo Brown  
Indianola, Iowa

The Iowa Turkey Improvement Plan has been developed with the objective of bringing about an improvement in the quality of market turkey, poults, eggs and breeders.

Various breeding stages and pulorum control divisions are provided for in the plan to give it sufficient flexibility to apply to most hatcherymen and breeders. In this way it may be said that the primary purpose of the plan is to identify authoritatively, turkey breeding stock, eggs and poults with respect to quality. This is done by setting up standards uniformly accepted in all parts of the state. Breeders and hatcheries are enabled to advertise their products according to these standards and purchasers are enabled to buy from members with greater assurance as to what they are getting than is the case when they must accept the claims of the seller.

Adherence to the required standards is assured by periodic inspection by licensed state inspectors who insist on proper sanitary conditions as well as all other requirements of the plan.

Hatcherymen and breeders are benefited by being able to describe definitely in known terms to the prospective buyer the quality of product offered for sale and non-cooperators are prohibited by law from using the terminology of the plan in their advertising. This affords members and also buyers some degree of protection against unscrupulous operators whose advertising claims might be misleading.

The benefits of the plan are shared by the breeder, the hatcheryman and the market grower. Although perhaps not directly interested in some of the details of the plan the market grower is very much interested in the quality of the poult which he buys, whether or not it is healthy, and the kind of a turkey which it makes at market time.

THE CARVER

The carver is a noble beast,  
Before the crowd he stands,  
With gravy on his coat and vest,  
And hardware in his hands.

His brow is drawn with doubt and fear;  
There's anguish in his heart  
But his jaw is square and rigid  
As he tears that bird apart.

His water glass is moved away,  
Or else is knocked aside,  
As the unsharpened carving knife  
Skids off the turkey's hide.

The first two plates lack dressing,  
No potatoes on the third.  
The guests all watch in silence.  
Can't someone say a word?

There's dark meat for the lady  
Who is very fond of brest.  
And a great big, gristly gizzard  
For the man whose teeth need rest.

At last the task is finished,  
Each guest has food to burn.  
The carver eyes the turkey  
With a shadow of concern.

A neck, a rib, a tip of wing,  
Well - that's worth waiting for.  
When Bill holds up his empty plate,  
"Please, Dad, I want some more."

-- K. F. Warner, U.S. Dept. of  
Agric., Washington, D.C.

As printed by TURKEY WORLD, Mount  
Morris, Illinois

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The Denison District Turkey Growers Association held a planning meeting at Denison, January 28. Committees for membership and entertainment were appointed.

The next meeting is to be a banquet on March 25 to be held at Denison.

Smoked turkey is to be served.

TURKEY GROWERS, ATTENTION!

You are invited to join the Iowa State Turkey Growers' Association now. Membership fee of \$3.00 per year entitles you to all district and state meetings held throughout the coming year.

If your county is not organized yet, and you want to belong to the state organization, send your \$3.00 to the State Secretary-Treasurer, Mottie B. Friedman, at Ottumwa, Iowa, and you will be entitled to all services of the State Association including the Turkey News Sheet.

Any grower in the following districts should pay his 1941 dues of \$3.00 to the secretary-treasurer in his district, if not already paid.

Charles City District includes: Worth, Mitchell, Howard, Cerro Gordo, Floyd, Chickasaw, Franklin, Butler, Bremer. Sec'y.-Treas. - H. G. Patton, Charles City, Iowa.

West Union District includes: Winneshiek, Allamakee, Fayette, Clayton, Buchanan, Delaware. Sec'y.-Treas. - H. D. Campbell, Strawberry Point, Iowa

Denison District includes: Woodbury, Ida, Sac, Monona, Crawford, Carroll, Harrison, Shelby, Audubon, Sec'y.-Treas. - Garth Fuller, Manilla, Iowa

Boone District includes: Calhoun, Webster, Hamilton, Greene, Boone, Story, Guthrie, Dallas, Polk. Sec'y.-Treas. - Not elected.

Toledo District includes: Hardin, Grundy, Black Hawk, Marshall, Tama, Benton, Jasper, Poweshiek, Iowa. Sec'y.-Treas. - John Gruenwold, Blairstown, Iowa

Iowa City District includes: Linn, Johnson, Cedar, Washington, Muscatine. Sec'y.-Treas. - Chas. Heezen, Muscatine.

Red Oak District includes: Pottawattamie, Cass, Adair, Mills, Montgomery, Adams, Fremont, Page, Taylor. Sec'y.-Treas. Mrs. Clinton Buckingham-Garson.

Osceola District includes: Madison, Warren, Marion, Union, Clarke, Lucas, Ringgold, Decatur, Wayne. Sec'y. - Treas. - Mrs. Ruth Scott, Milo, Iowa

(Continued on page 4)

PROTECTION FOR BREEDING FLOCKS

By Mrs. Shirley Schultz  
Ida Grove, Iowa

Much as we dislike being reminded of the November 11th storm, we can well say "It is an ill wind that blows no man good". Contrary to the opinion often held that turkeys are able to endure anything and everything as far as the weather is concerned, we have learned differently. So, if we have not already done so, we should provide some kind of protection for our breeder flocks that are not housed. Although turkeys do like more open houses than do chickens, ample protection should be provided from snow, cold winds and possible losses and also as an incentive for early spring egg production.

If you have no laying quarters, try banking your shelters with corn stalks, cane bundles, baled or loose straw. Use drop curtains made of your old feed sacks sewed together and hung on poles. Your turkeys will probably repay you by spending less time trying to keep warm and more time getting ready for early egg production. It will pay!

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WHY ORGANIZE?

(Continued from page 1)

purchase of supplies, the development of statewide programs of disease control, local consumer advertising of turkeys await the development of a large statewide membership.

Finally, can Iowa, which is fifth in volume of turkey production, afford to stay out of a national organization which is already studying the problem of legislation and national advertising campaigns in heavy consumption areas? The answer can not be "No" unless we as a state wish to lose our advantage in important national affairs. Only the grower can direct and build a successful organization.

TURKEY OUTLOOK FOR 1941  
(Continued from page 2)

that the large storage holdings of last year and the necessity for moving these turkeys out resulted in many restaurants, hotels, etc., learning how to better fit turkey into their menu, (3) the fact that the Surplus Marketing Administration stood ready to buy heavy toms when the price dipped too greatly.

At least, the first two of the above reasons should assist in improving demand for turkey generally.

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TURKEY GROWERS, ATTENTION!  
(Continued from page 3)

Ottumwa District includes: Mahaska, Keokuk, Monroe; Wapello, Appanoose, Davis Van Buren, Jefferson. Sec'y.-Treas. - Dick Vanderwilt, Oskaloosa, Iowa.

The unorganized counties are: Lyon, Sioux, Plymouth, Osceola, O'Brien, Clay, Cherokee, Dickinson, Buena Vista, Emmet, Palo Alto, Pocahontas, Kossuth, Wright, Humboldt, Winnebago, Hancock, Dubuque, Jones, Jackson, Clinton, Scott, Louisa, Des Moines, Henry, Lee.

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Potluck has been good enough for the Osceola District Turkey Growers' Association, and why not, when turkey sandwiches were served with trimmings.

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Turkey records for the past season are to be summarized soon. Any grower who wishes to send in his financial summary for analysis should address it to W.R. Whitfield, Poultry Extension Service, Iowa State College, Ames, Iowa

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*Mr. Farmer:*  
*This is your*  
**WAR EMERGENCY  
LIVESTOCK  
AND FEED  
BUDGET!**



**SECRETARY WICKARD SAYS:**

"The new 1942 goals call for the greatest production in the history of American agriculture, and for putting every acre of land, every hour of labor, every bushel of feed and every bit of farm machinery, fertilizer, and other supplies to the use which will best serve the nation's wartime needs. The coming production season is the most crucial in the history of American agriculture. To American farmers, the nation looks for enough production this year to feed and clothe our own people for their war time task. To American farmers, the United Nations look for indispensable supplies of food and fiber for their people and fighting forces."

**IN 1942 IOWA FARMERS  
INTEND TO PRODUCE . . .**

1. Twenty-eight percent more spring pigs than in 1941
2. Nearly 8 billion pounds of milk—11 percent more\*
3. Over 279 million dozen eggs—24 percent over 1941\*
4. At least 50 percent more soybeans grown for grain
5. Five percent more beef cattle sold than in 1941\*
6. Maximum increases in other desired food products

\* AAA Intentions Survey

**There Is No Danger Of Producing Too Much!**

**AGRICULTURAL EXTENSION SERVICE**

Iowa State College

Ames, Iowa

February, 1942



Article 16

**CITY AND TOWN**

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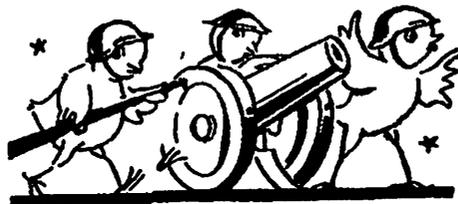
**Wartime  
Poultry  
Production**

**159**

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**MEAT AND EGGS  
FROM YOUR OWN BACK YARD**

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AGRICULTURAL EXTENSION SERVICE—IOWA STATE COLLEGE  
Ames, Iowa

P-352



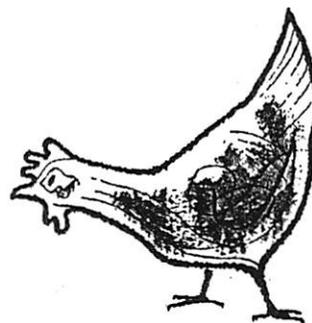
## Article 17

### 1948-1949 PROGRAM OF WORK

- I. The Demonstration Flock Record Project
- II. Quality Meat and Egg Project
- III. Quality Poultry and Egg Projects: R.M.A.
- IV. 4-H Club Work
- V. Hatchery and Builders School Project
- VI. National Poultry Improvement Plan
- VII. The Radio Programs - W.O.I.
  - A. Chicken Chats with Martha Duncan
  - B. Weekly "Down on the Farm" Broadcast



## Keep Layers in Cages ?



If you're thinking of converting to a caged layer system, here are some of the things to consider. Since what may be an advantage for one person may be a disadvantage for another, appraise your situation carefully.

by P. R. Walther and L. Z. Eggleton

CAN YOU make more profits from your laying hens by putting them in cages? That's a "package" question. Unfortunately, we can't give a neatly packaged answer. The best general answer is that "it depends." A more specific answer depends on you and your individual situation.

We can, however, give you some of the facts we now have so that you may consider them in the light of your own situation. Where costs are involved, we'll use a laying flock of 1,000 hens as a base point. This also approximates the average size flock for which cage laying is now being used in Iowa. Costs per hen tend to decrease for larger size flocks and to increase for smaller size flocks.

---

P. R. WALTHER is associate in poultry husbandry, and L. Z. EGGLETON is professor of poultry husbandry.

**House Cost:** The building itself may be built and insulated for about \$5,000 in Iowa—or a cost of about \$5 per bird. This includes a concrete floor and a 9-foot ceiling. Both of these features are important in maintaining sanitation and ventilation. With 8- by 18-inch double-decked cages, one hen can be housed for each approximately  $1\frac{1}{3}$  square feet of floor space.

**Equipment Cost:** Heat and moisture control are problems in a cage system because of crowded conditions. Walls and ceiling must be fully insulated to conserve heat in the winter. If insulation is provided, additional heat, other than the body heat of the hens isn't needed. Insulation also helps to keep the house cool in the summer.

A forced-air ventilation system is necessary to remove warm moist air and to supply fresh air. Adequate ventilating systems cost from 40 to 60 cents per bird. Much of

the moisture can also be removed from the building through the use of a mechanical droppings remover. This would cost from 40 to 90 cents per bird, depending upon the degree of mechanization.

Cages—with feeders, waterers and hangers—and the labor for assembly and installation average about \$1.35 per hen. But there are no expenditures for nests or roosts with the cage system.

Total initial investment per bird for a cage house and equipment is about \$1 less than the initial investment per bird for an adequately equipped floor house. Because of the greater equipment requirements for cage operation and relatively high depreciation, however, depreciation for buildings and equipment is about  $4\frac{1}{2}$  cents more per bird per year for cages than for floor operations.

**Labor:** The time spent for each cage hen during the year by Iowa



## Article 19

P-40-1

### POULTRY AND EGG CONFERENCE

Thursday, November 6, 1958

Council Chamber, Memorial Union

Robert E. Phillips, Chairman

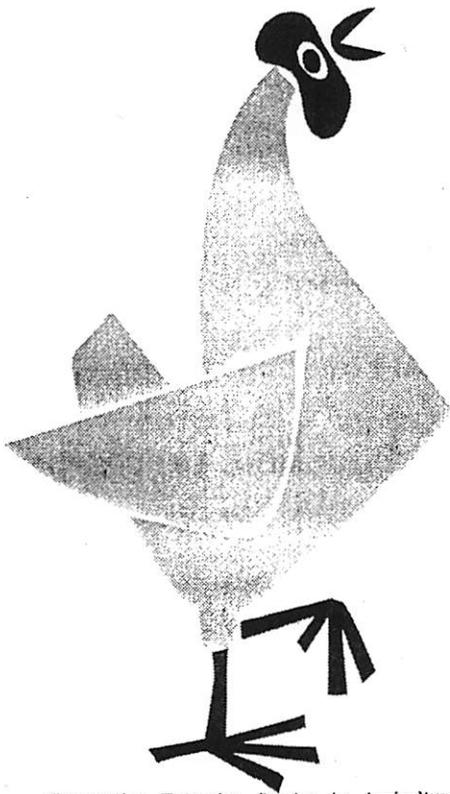
9:30	Registration	
10:00	Contribution of College to Meet the Needs of Agriculture	Dean Floyd Andre
10:30	Changes and Trends in the Poultry Industry	R. D. Carter
10:45	Have You Adopted New Management Practices?	W. R. Whitfield
11:05	The Changing Market Picture	L. Z. Eggleton
11:25	Our Youth Program Fits a Changing Poultry Industry	P. R. Walther
11:45	Changes in Diseases and Disease Control	C. D. Lee
12:05	Questions Period	
12:15	Lunch	
1:10	Film of Iowa Multiple Unit Test	LeRoy Kruskop
1:30	Where are We and Where are We Going in Poultry Breeding?	A. W. Nordskog
2:00	Modern Nutrition to Fit Our Changing Industry	S. L. Balloun
2:30	New Emphasis on Egg Quality	W. W. Marion
3:00	Respiratory Disease Research at I.S.C.	M. S. Hofstad H. W. Yoder, Jr.
3:30	Question Period	R. E. Phillips
3:45	Tour of College Poultry Farm	L. T. Smith



# Look Ahead

with a  
laying  
flock  
project.

Something  
to  
Crow  
About



Cooperative Extension Service in Agriculture and Home Economics, Iowa State College of Agriculture and Mechanic Arts and the United States Department of Agriculture cooperating. Floyd Andre, director, Ames, Iowa. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.

## 4-H LAYING FLOCK PROJECTS

COOPERATIVE EXTENSION SERVICE — IOWA STATE COLLEGE  
AMES, IOWA                      NOVEMBER, 1958                      P-26



Dear Cooperator:

You, as well as your neighbors, are probably wondering just what the poultry enterprise promises to you as an Iowa egg producer during the foreseeable future. Your plans to continue or expand the poultry enterprise depends upon your own convictions. A careful look at the general situation as well as your own circumstances is well worth while. Here are our views on the questions.

Vast opportunities lie ahead for Iowa poultrymen who take advantage of the great heritage of grain supplies which comprise the bulk of the poultry ration. Iowa people have a keen interest in agricultural progress and especially in livestock. Iowa leads the nation in volume of egg supplies for primary markets. The trend toward development of larger units may well increase this volume. The development of refrigerated transportation equipment is well suited to delivery of high-quality eggs to its discriminating markets. The enforcement of the Iowa egg law will also add impetus. Those who easily adapt themselves to poultry management and the conditions it imposes upon the operator are sure to succeed. Those areas of the state which develop organized effort will have special opportunities to attain great success in the years ahead.

Here are some of the reasons Iowa should progress. The major cost involved in the production of eggs is feed cost. The major portion of the poultry ration is the grain content. For this reason alone, Iowa has no peer in being able to produce eggs at the lowest possible cost. Protein, the next most important cost item in the ration, is also produced locally. It and the necessary mineral content of the ration can be had with the least transportation and other handling costs. The remaining feed constituents are minor in quantity and small in cost. The difference in cost of producing eggs in Iowa as compared with other concentrated egg producing centers, would amount to 5 cents or more per dozen eggs. This figure in itself makes it possible for Iowans to make a reasonable profit where others fail.

There are few areas in the United States where there is a greater concentration of agricultural progress or investigation into the principles involved in agricultural science than in Iowa. The most up-to-date sources of information concerning poultry husbandry are available in any county agricultural extension office and on many commercial man's counter.

The increasing importance of developing larger size units to economize on labor and improve the marketing advantage is being realized by a large portion of the successful Iowa producers. This is putting poultry in stronger competition with other large enterprises such as corn, hogs and cattle which have held top place in Iowa's agriculture. Increased skill and use of more labor-saving equipment is displacing laborious chore routes. This trend in labor-saving equipment is just being developed and much faster advancement is in store. When eggs are gathered automatically, which is now in the offing, there will be practically no limit to the volume of eggs one man can produce.

With the development of larger size flocks has come a greater interest in eggs of superior quality for discriminating markets at premium prices. The passing of the Iowa egg law requiring the grading of eggs for the market had a psychological effect upon producers who for the first time were paid on a basis of quality and weight. Being a state which exports over 80 percent of its entire egg crop, these factors would have been little avail if the major markets had been as far removed in time as formerly. Fast, refrigerated truck transportation has brought Iowa's egg supply within 2 days of the best egg markets. This has meant getting a price for Iowa eggs comparable to those from nearby sources.

There are no resources so important to success as the devoted interest of a flock owner and a desire to increase his skill in properly managing the flock. Some people

adjust more easily to this demand than others. Certainly, mere interest in the revenue from the flock is not enough to guarantee success. Therefore, the proper attitude toward the poultry enterprise is most essential. It not only adds to the individual's success, but increases his value in helping group organizations solve major problems. Are you helping all you can?

W. R. Whitfield  
Extension Poultryman

WRW:se

### Iowa's Changing Interest in Poultry

A significant development of Iowa's agriculture and particularly its poultry enterprise, is the farmer's attitude toward specialization. Just as dairying, hog production and sheep raising have become more specialized on many farms with a corresponding loss of interest in these same enterprises on other farms, so has the poultry enterprise grown in importance and size or it has lost ground. More efficient management through improved housing and the use of labor-saving equipment have followed this development. This evolutionary process is not only apparent on individual farms but it is true of whole sections throughout the state.

A quick trip around Iowa will show the degree to which this change has occurred in recent years. The southern counties and especially the lower one-third of the state have lost heavily in poultry population but more particularly in numbers of flock owners. The river counties on both east and west borders have also seen poultry decline in importance. Some counties have lost almost 50 percent of their flocks in the past five years.

Only in the northern counties is there a marked gain or a status quo in flock size and poultry population. The picture has changed rapidly since the profit per dozen has declined in recent years, many producers are in doubt as to the future profits from poultry. We find some producers so discouraged that they will no longer put forth the effort to expand their flocks and improve their management and housing. Many of them are quitting chickens entirely. Others are confident that with larger flocks and greater skill they continue to make good profits. Tables found elsewhere in this report show that either decision is valid as it applies to the situation.

Other factors help to accelerate this evolution. Just as the attitude toward poultry affects the character of the farm enterprise so it also affects the services of the different agencies which depend upon the poultry enterprise for their subsistence. It is well recognized that where flock size is small and interest is low, a corresponding lower quality of egg is being produced. Quality of product goes up with the importance of the enterprise which in turn is greatly influenced by size of the enterprise. Egg price changes are quick to reflect egg quality.

As the volume of poultry and eggs decline in any area so does the demand for other services such as feed, equipment and housing. This cuts the profits of the business men offering these services who in turn often are forced to charge a higher price for the products they sell than they would if the sales were larger. Small lots of feed or single pieces of equipment are sold retail to small-flock owners not wholesale as is the privilege of the large buyer. The next step is the actual disappearance of some of the better services--shell egg markets being replaced by frozen egg markets. This is just the opposite of what is occurring in the areas where flock size is increasing. There we find refrigerated trucks covering the territory offering substantially higher prices on the farm than are being paid in low volume areas for eggs delivered to the plant. Whereas in northern Iowa many hatcherymen are increasing their volume of chicks and their sale of feed or equipment, many southern Iowa hatcherymen are closing their doors or losing volume every year.



## Article 22

Reprinted from  
The Iowa State College Veterinarian  
Vol. XXI, No. 1, 1958-59, pp. 9-12

# Principles and Practice of Artificial Insemination in Turkeys

R. D. CARTER, M.S.

**L**OW FERTILITY is one of the most common and most costly problems in turkey breeder flocks. As a partial solution to this problem, there has been a growing interest in artificial insemination of turkeys. Artificial insemination is a practical solution to infertility due to inactive toms, inefficient toms and non-receptive hens, but is not a solution to infertility due to poor management.

The practice of artificial insemination is costly and time consuming. In commercial flocks it is practical because at the present time there is no other way to correct for the fact that the tom is not doing the job properly.

### COLLECTING SEMEN

The basic principles involved in the practice of artificial insemination are that of obtaining semen from the tom and placing it in the oviduct of the hen. Stimulating the male to protrude his sex organ and "milking" semen from this organ is the most difficult part of the procedure.

Three operators are required for maximum efficiency in collecting semen. One operator holds the male, the second stimulates him to ejaculate and the third collects the semen. It is very important to hold the tom in a resting position. This can be accomplished by placing a sack of shavings or other litter material on a table or barrel about four feet high and

placing the tom on the sack (Figure 1). The person holding the bird grasps the thighs so that the bird is held in an upright and comfortable position. The protrusion of the sex organs is brought about by massaging the abdomen along the underside of the pubic bones with the fingers and thumb of the right hand. At the same time, the back and tail head are stroked with the left hand. As soon as the

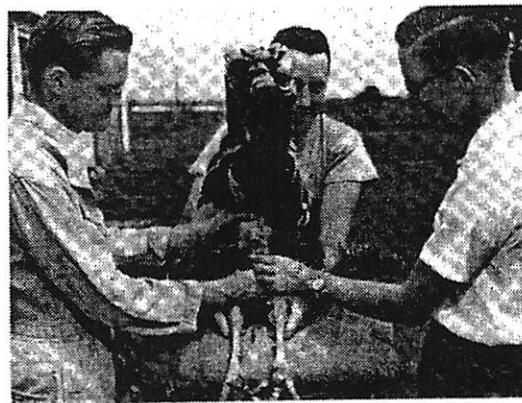


Fig 1. Suggested position for holding toms while collecting semen. Mr. Carter is the operator on the left.

bird is stimulated, the tail is pushed toward the back with the left hand. The bird is further stimulated by the right hand and the thumb and forefinger of the left hand are brought into position to "milk" the semen from the bulbous ducts (vas deferens) of the sex organ the instant it is protruded and ejaculation takes place (Figure 2). "Milking" involves the application of pressure with the thumb and forefinger on both sides of the base

Mr. Carter is an assistant professor in poultry husbandry at Iowa State College. He has a B.S. in poultry husbandry and a M.S. in poultry nutrition from Ohio State University.



## Article 23

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F-112

TURKEY DAY  
October 16, 1959

Cooperating: IOWA STATE UNIVERSITY of Science and Technology  
Iowa Turkey Breeder Hen Committee  
Iowa Turkey Federation

Morning Program - R. D. Carter, chairman

9:30 Registration  
10:00 Welcome -- Dr. George Browning  
10:15 Turkey Research at Iowa State University  
Nutrition - S. L. Balloun  
Recent Studies on Turkey Sinusitis Control - H. W. Yoder, Jr.  
Institutional Use of Turkey Rolls - Frances Carlin  
Turkey Breeder Project - L. T. Smith

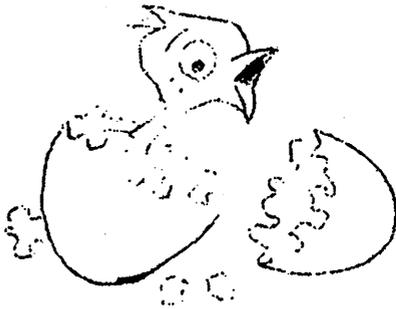
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Afternoon Program - John F. Planalp, Iowa Turkey Federation, chairman

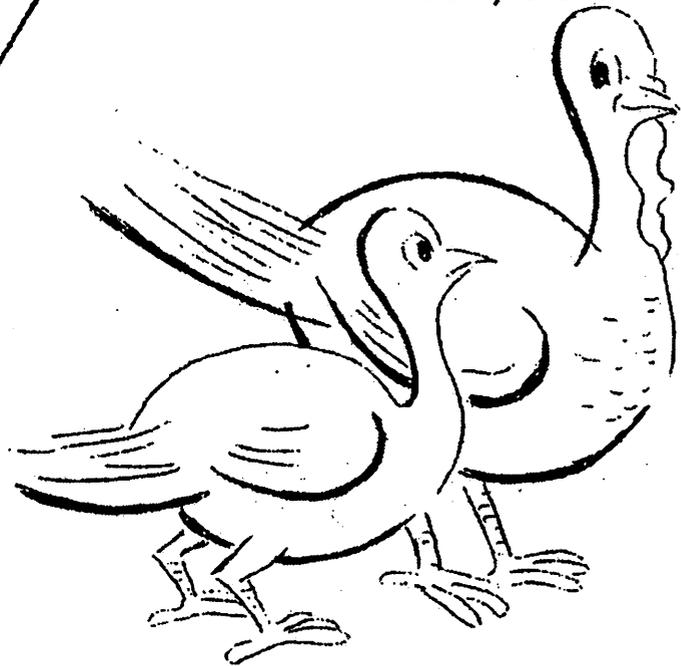
1:00 Managing the Breeder Flock - T. T. Milby, Larro Research Farm  
1:45 A Future for Turkey Breeding in Iowa - A. W. Nordskog  
2:15 Disease Control Program of Iowa Turkey Breeder Hen Committee - Le Roy Kruskop  
and Dr. C. D. Lee  
2:40 Turkey Outlook for 1959-1960 - F. A. Kutish  
3:00 Adjourn



# IOWA TURKEY RATIONS



From start . . . . . to finish



Prepared by S. L. Balloun,  
professor of poultry  
husbandry, and R. D. Carter,  
extension poultryman

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IOWA STATE UNIVERSITY of Science and Technology  
COOPERATIVE EXTENSION SERVICE  
Ames, Iowa . . . August, 1961 . . . P-122 (Rev.)



## Article 25

P.-916, Rev.

POULTRY EVENING SCHOOL  
AGRICULTURAL EXTENSION SERVICE  
IOWA STATE COLLEGE  
AMES, IOWA

### Objectives

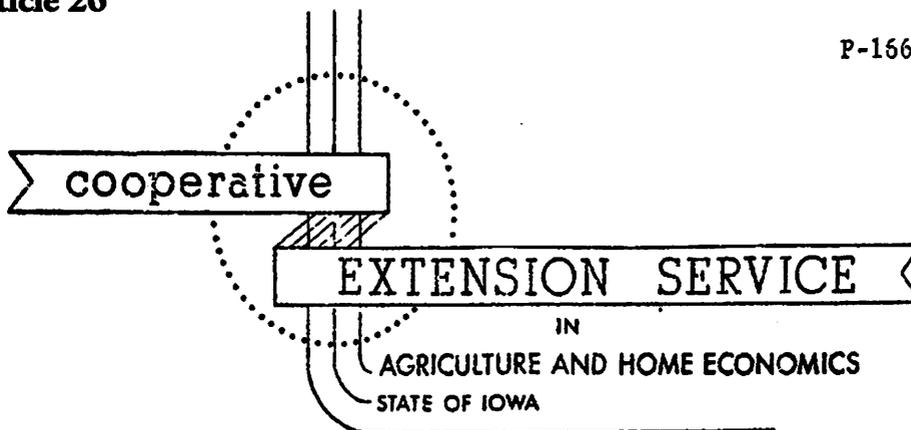
1. To encourage persons now engaged in poultry production, marketing and allied field to solve local problems by cooperative endeavor.
2. To provide each part of the poultry industry on the local level with a working knowledge of the operational problems in each phase of poultry production and marketing.
3. To develop leadership among producers, and personnel of commercial and educational organizations in the county in carrying out a well rounded poultry industry improvement program.

### Operational Plan

The Poultry and Veterinary sections of the Agricultural Extension Service will conduct a series of eight, two hour period of instruction, including laboratory exercises and demonstrations beginning in January and continuing until March. County Extension Director, local veterinarians and business leaders will participate in programs where appropriate.

1. County Extension Director will be in charge of local arrangements, appoint committees and act as discussion leader or appoint local leaders for this purpose.
2. Course will be jointly sponsored by the County Extension Office and local organization set up for the advancement of the poultry industry in the county.
3. Attendance will be on a sign-up, enrollment basis and open to persons now engaged in poultry production, or some phase of the industry (ie) feed sales, hatchery service, lumber sales and construction, processing and marketing of poultry products and veterinary work. A minimum of 25 enrolled persons will be required to establish the series, and a maximum of 35 is recommended.
4. Designated meetings will be open to the public on a county-wide basis at the discretion of the local committee.
5. Local arrangements and expenses to be assumed by county committee.





IOWA STATE UNIVERSITY  
of Science and Technology  
U.S. Department of Agriculture,  
cooperating

October 20, 1961

EXTENSION SERVICE  
AMES, IOWA

DEMONSTRATION FLOCK MONTHLY LETTER

Automation for Profitable Egg Production\*

Automation for profitable egg production requires good housing, adequate functional equipment, good stock and management.

A good house should be insulated with 2 inch batts or fill in the side walls and 4 inch batts or fill in the ceiling or a material which would be equivalent. A vapor barrier should be placed between the inside wall and the insulation to keep moisture out of the insulation. Concrete floors are desirable, but it is possible to obtain excellent results from dirt floors. Ventilation is necessary to remove excess moisture and foul air. Adequate lighting should be provided and evenly distributed for maximum benefits.

Adequate equipment would include 16 feet of feeder space per 100 layers, 6 feet of watering trough per 100 layers, 1 standard size rollaway nest for every 6 layers or 1 standard size litter nest for every 4 layers, 6 inches of roosting space per layer and 1 grit and shell hopper for every 200 square feet of floor space. The equipment should be designed and arranged to cater to natural habits of layers and to reach top performance. The needs of the caretaker must be met to make most efficient use of his labor. Equipment should be engineered for trouble free performance and long life. It should be installed under close supervision of factory trained personnel to assure proper installation. Equipment should be easily serviced, and repair parts should be readily available.

Good stock and management should enable the producer to obtain 240 or more eggs per pullet housed annually with a feed conversion of less than 4.3 pounds of feed per dozen eggs produced. The eggs produced should have clean, strong egg shells and high interior quality. Mortality and culling should be less than 1 percent per month.

\* Taken from a bulletin based on lectures by Dr. Glenn Bressler

### How Much Automation?

The need for automatic equipment should be considered when flock size increases. When flock size is less than 1000 layers, automatic waterers can be justified since they can save as much as 30 minutes of labor per 1000 layers per day.

Hand feeders, either trough or hanging, are recommended when flock size is less than 1000 layers. They cost less and can be readily shifted about. Hand feeding requires extra work and attention. Feed may be wasted if feeders are over filled.

Litter or rollaway nests may be used since the initial investment is relatively low. Litter nests are generally attractive to layers and can keep floor eggs at a minimum if enough nests are provided. Nests are arranged to satisfy the basic laying habits of the layers and nesting material is kept in the nests at all times. Some disadvantages are the high labor in egg gathering, a substantial amount of egg breakage and soiling and the fact that eggs stay warm longer.

From 1000 to 3000 layers, more automation can be justified. In addition to the automatic waterers, a mechanical feeder becomes profitable. It can save as much as 20 minutes of labor per 1000 layers per day. Bulk feed bins can be used with the mechanical feeder. A bulk bin enables producers to buy feed in quantity and eliminates handling feed sacks.

Rollaway nests reduce hand gathering of eggs from about .6 of a minute per dozen to about .3 of a minute per dozen. Nesting material is not necessary, and egg breakage may be reduced. Eggs may be gathered on a conveyer operated on an overhead track. The conveyer is easy to install and cost is low. The conveyer forces the producer to enter the laying house more often and floor eggs may be picked up more often.

When flock size is 3000 to 5000 layers, mechanical egg collectors and pit cleaners are justified in addition to the automation used in 1000 to 3000 layer flocks. The mechanical egg collector is only justified when used with a rollaway nest which results in less than 5 percent floor eggs. A mechanical egg collector can save about .1 of a minute per dozen in egg gathering when compared with hand gathering from rollaway nests into filler flats carried on an overhead track. The initial investment is high in relation to the small savings on a per dozen basis. It may increase breakage over hand gathering from rollaway nests.

A pit cleaner saves labor when fully automatic. It helps control moisture in the laying house and reduces odors except at cleaning time. It prevents manure and filth from accumulating in the house. However, it requires frequent operation and disposal of manure may be a problem during bad weather.

With flocks over 5000 layers, complete automation can be profitable provided: (1) High production, good livability and good feed conversion are achieved with layers housed near 1 sq. foot per layer. (2) The equipment is functional and of good quality to give years of labor saving. (3) The equipment is arranged to satisfy demands of layers and to make your labor most efficient.

In the following table, the amount of labor saving from automation can be found.

Approximate Labor Savings Which May Result  
from the Use of Mechanical Equipment

Chore	Savings per 1000 layers daily
	<u>minutes</u>
* Watering	30
* Feeding	20
* Bulk bin	varies widely
* Rollaway nests and overhead track over litter nests and track	15
* Rollaway nests and mechanical collector over litter nests and track	21
* Pit cleaner	varies widely
* Egg washer	25

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Determining How Much to Invest

A simple rule of thumb to follow is as follows:

- (1) Determine how much time can be saved each day by mechanizing the job.
- (2) Figure the value of the time saved at the wages paid per hour.
- (3) Determine how the time saved can be used to increase returns to offset the additional investment.
- (4) Figure the value of the labor saved per year by multiplying the value of daily savings by 365.
- (5) Multiply annual value of labor saved by 5 to get investment justified.

Example:

1 hour saved daily at \$1.00 per hour would be worth \$365.00 per year.  
 $\$365.00 \times 5 = \$1,825.00$  justified as an investment in mechanical equipment which brought about the saving.

*Donald L. Miller*  
 Donald L. Miller  
 Extension Poultryman

DEMONSTRATION FLOCK REPORT

		Your report
Number of flocks reporting . . . . .	33	_____
Total number of females . . . . .	51721	_____
Females lost or died: Number <u>540</u> _____ percent . . .	1.0	_____
Total hours labor per 100 birds (laying flock) . . . . .	5.6	_____
Price market eggs . . High <u>.41</u> Low <u>.21</u> Average . . . . .	.32	_____
Average price hatching eggs . . No. Doz. <u>None</u> . . . . .	None	_____
Average price of market birds . . Lbs. <u>1693</u> . . . . .	.06	_____

COMPARISON OF FLOCKS FOR THE MONTH	Ave. of 33 flocks	5-high prod. flocks	5-low prod. flocks
Average size of flock	1567	1062	640
Average no. of eggs per hen	18.4	23.5	13.7
Receipts per bird:			
Market eggs	.50	.54	.36
Market poultry	.02	.00	.00
Hatching eggs	None	None	None
Total receipts per bird	.52	.54	.36
Total expenses per bird	.26	.25	.09

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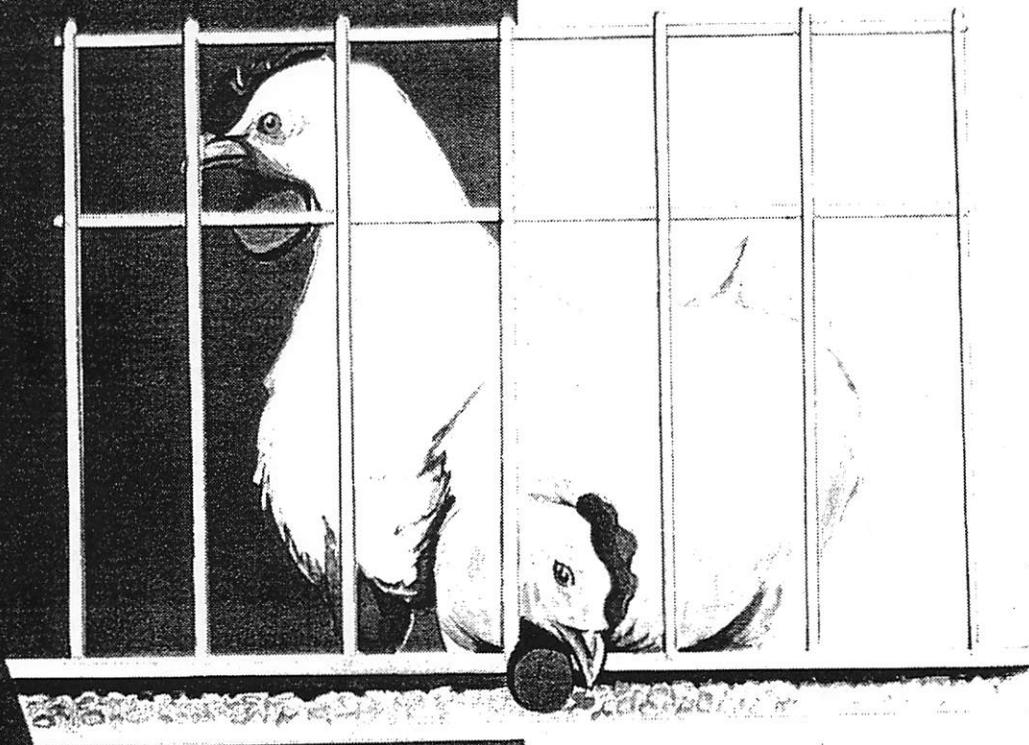
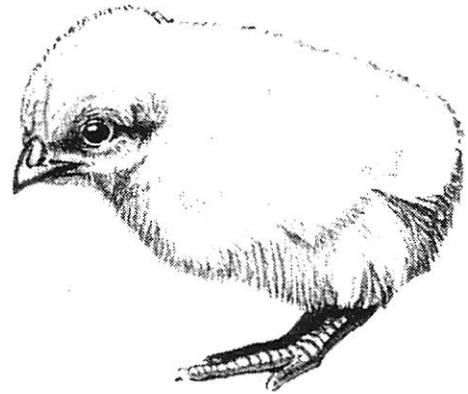
September Egg Prices

Demonstration Flock average prices ranged from 21 to 41 cents, mostly 31 to 33 cents per dozen. Pullet flocks coming into production will account for the wide variation in egg prices. Egg production per hen was lower in September than any month this year. This is not only true with the Demonstration Flocks, but with the U.S. One would expect egg prices to gain during the latter part of October and reach a peak sometime in November.

Report Promptly

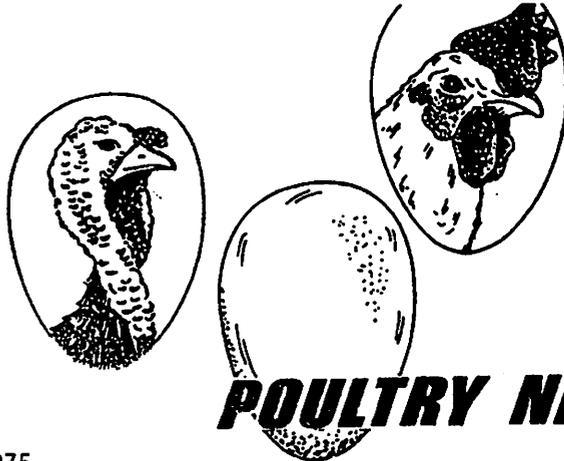
During the last two months, many reports were received after the summary was completed. Harvest time is upon us, but so is the season of high egg prices. Don't neglect your report since it is also part of your farm business. Sit down and relax for a few minutes so your report will reach us by the 7th of the month.

**FEEDING  
REPLACEMENT  
PULLETS AND LAYING HENS**



IOWA STATE UNIVERSITY of Science and Technology  
COOPERATIVE EXTENSION SERVICE  
Ames, Iowa . . . . . December, 1966 . . . . . Pm-354





# POULTRY NEWSLETTER

October 1975

PS 138

## Marketing

### EGG RESEARCH AND PROMOTION ORDER

The final steps in the activities allowed under the Egg Research and Consumer Information Act of Oct. 1, 1974, are now being taken by the USDA. The act, Public Law 93-428, allowed the Secretary of Agriculture to issue orders to persons engaged in the production of commercial eggs and others concerned in such egg production. These orders are to carry out the policy set forth in the act, to establish an orderly procedure for financing by assessment a continuous program of research, consumer and producer education, and promotion.

The current order developed by an industry task force has been subjected to all the required hearings and revisions prescribed by the ERC1 Act. It was printed in final form for purposes of referendum on Oct. 1, 1975. It is up to individual producers to ratify the order as developed by the Secretary of Agriculture from all the various industry requests, hearings and comments. The balloting will be taking place Nov. 3 through 28. Ballots must reach the referendum agent by Nov. 28th so early mailing is advisable.

Confirmation by producers is required by a section in the original law. It states that any order must be favored by at least two thirds of the producers voting in the referendum, or by a majority of those voting if that majority produced not less than

two thirds of the eggs produced during the period June-August 1975 by those voting.

Producers eligible to vote will receive ballots and instructions for voting by mail. If these are not received by Nov. 3, eligible producers should obtain copies at the local county Agricultural Stabilization and Conservation Service office or by writing the Director, Poultry Division, Agricultural Marketing Service, USDA, Washington, D. C. 20250.

Copies of the order are available from Extension Poultry Marketing Specialist, 201A Kildee Hall, Iowa State University, Ames, IA 50011 for those who wish to have complete details. A summary of the major provisions issued by the Agricultural Marketing Service, USDA, is mailed with this newsletter. (L. Z. Eggleton)

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## Food Processing Technology

**AFLATOXIN  
WHAT IS IT?  
WHAT CAN IT DO?**

At about the time the yellow rice problem occurred in Japan, outbreaks of an unusual liver disease were becoming prominent in poultry and other livestock in England. This disease became known as "turkey X disease" after severe losses of turkey poults occurred in 1960. Subsequent

Cooperative Extension Service  
**IOWA STATE UNIVERSITY**  
Ames, Iowa 50011



investigation soon showed that the disease in poultry resulted from including certain lots of Brazilian peanuts in the rations. Further work has shown that toxic peanut meals have also originated in East Africa and in the United States.

In 1961, the cause of the fatal liver disease was found to reside in the infections of the peanuts by a toxin-producing strain of mold known as *Aspergillus flavus*. The fluorescing toxic factor was termed "aflatoxin" and further studies have shown that several toxic substances are produced by this mold. Two compounds highly toxic to the liver, aflatoxin B<sub>1</sub> and aflatoxin G<sub>1</sub>, known also as aflatoxins B and G--the letters denote their blue and green fluorescence, respectively, in ultraviolet light--and their less toxic derivatives (B<sub>2</sub> and G<sub>2</sub>) have been isolated from the toxic *A. flavus*. These *A. flavus* toxic compounds injure the liver in a variety of species with the development of characteristic lesions. The duckling, guinea pig, and rainbow trout are especially sensitive.

The high toxicity and carcinogenicity of aflatoxins and their sporadic occurrence in a staple food used for livestock and humans have caused considerable concern. Damage in harvesting and improper drying and storage are important factors favoring contamination and toxin production by *A. flavus* in various grains including oats, soybeans, corn, rye, buckwheat, wheat and rice. Since aflatoxins are heat stable, prompt lowering of the moisture content after harvesting and during storage is necessary to inhibit the growth of the mold and thus toxin production.

The presence of aflatoxin in poultry rations can produce various defects in both the egg and bird depending on the toxin level. At low levels, less than 5 ppm aflatoxin can sharply reduce pigmentation in both the carcass and egg yolk, increase liver fat, decrease shell strength, and lower disease resistance. Dietary aflatoxin levels of as low as 0.6 ppm can significantly reduce immunity in chickens and with higher levels reducing immunity by as much as 50 percent. Layer rations containing more than 5 ppm of aflatoxin can increase yolk viscosity, decrease production,

increase liver damage and cause death. The ingestion of aflatoxin by poultry will also result in the distribution of aflatoxin in all body tissues as well as in the egg and feces, all of which can lead to substantial financial losses.

The poultry industry, as well as all the livestock production industry, must be aware of aflatoxin and the problems it poses. Only through adequate testing in a laboratory can one be assured of an aflatoxin free ration. (R. J. Hasiak)

## Nutrition

### SINGLE CELL PROTEIN

As the cost of feedstuffs used in poultry diets continues to rise, more interest is generated in finding alternate sources of protein and energy. Single-cell protein derived from bacteria, yeast, algae and fungi is a possible source of lower-cost protein supplements. However, to date little research is available on the nutritive value of such protein sources. A study to examine the nutritional value of yeast grown on different hydrocarbon feedstocks with variation in methods of processing was reported in a recent issue of *Poultry Science*.

Samples of yeast produced on different hydrocarbon feedstocks with variations in methods of processing were evaluated as a sole protein source in chick diets. Net protein utilization (NPU) and nitrogen efficiency ration (NER) values were determined as a relative index of quality compared with an isolated soybean protein. All diets were supplemented with 0.3 percent DL-methionine to emphasize the value of the other essential amino acids. NPU values for the yeast samples ranged from 40.8 to 73.5 compared with a value of 85.5 for the soybean protein. NER values ranged from 4.91 to 15.55 for the yeast compared with 19.70 for the soybean protein. A large portion of the nitrogenous fraction of the yeast is not in the form of amino acids. This tends to downgrade the value of these products when compared on the basis of total nitrogen.

Chicks fed the diets containing the reference soybean had significantly greater gain in body weight, consumed more nitrogen, and had superior NER and NPU scores than chicks fed any of the diets containing yeast. Significant differences were also observed on the various yeast samples, indicating that the conditions under which these organisms are grown or stored may influence their subsequent nutritional value. Results of the experiments indicate that standardization of processing and storage conditions should be established for the production of yeast grown on hydrocarbon fraction to obtain maximum nutritional value.

#### HIGH PROTEIN SORGHUM GRAIN

A search for alternate sources of energy and protein for poultry feeds is evident in other fields also. Several years ago it was reported that two lines of sorghum grain were discovered that had high lysine and relatively high levels of protein. A study to evaluate the nutritional value of these high-lysine sorghum samples in the diet of young chicks is reported in a recent issue of Poultry Science.

Growth studies were conducted with day-old chicks to compare the nutritional quality of a high-lysine sorghum grain with two low-tannin commercial sorghum grains in diets containing various protein levels. When the sorghum grains were compared on either an equal weight or equal protein level in diets in which all protein was supplied by the sorghum grains, high-lysine sorghum produced weight gains of approximately three times those noted with commercial "normal" sorghum, with approximately 50 percent less feed required per unit of gain. Supplementation of the "normal" sorghum diet with lysine to equal

the level supplied by the high-lysine sorghum resulted in similar chick growth and feed efficiency. These results indicate that improved performance of the chicks fed high-lysine sorghum was due solely to its higher lysine content. (W. J. Owings)

\*\*\*\*\*

#### MEETING CALENDAR

##### Extension Area Poultry Meeting Dates

##### Central Iowa (Eldora)

Jan 14  
Feb 11  
Apr 14

##### Central Iowa (Newton)

Jan 8  
Feb 12  
Apr 8

##### NIAD

Dec 1  
Feb 2  
Apr 5

##### Waterloo

Dec 8  
Feb 9  
Apr 12

##### Cedar Rapids

Dec 2

\*\*\*\*\*

Iowa Turkey Day, December 2 and 3, Adventureland Inn, Altoona, Iowa.

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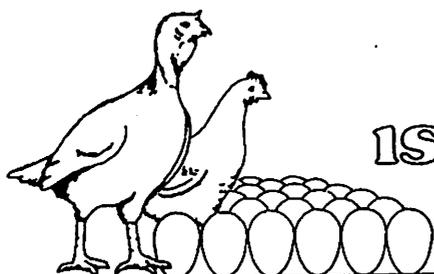
Egg Research and Promotion Referendum enclosure reprinted courtesy of the Iowa Poultry Association.

#### ... AND JUSTICE FOR ALL

Programs and activities of Cooperative Extension Service are available to all potential clientele without regard to race, color, sex or national origin. Anyone who feels discriminated against should send a complaint within 90 days to the Secretary of Agriculture, Washington, D.C. 20250.







# isu poultry newsletter

JULY 1979

PS-203

## In This Newsletter

DIETARY FAT - TURKEY ECONOMICS

WATER QUALITY AND POULTRY

NORDSKOG RESEARCH GRANT

NEW POULTRY NEWSLETTER FORMAT

COMING EVENTS

IOWA DEMONSTRATION EGG PRICE STUDY

## Economic Consideration with Fat Supplementation of Turkey Diets

J. L. Sell, Professor of  
Animal Science

and

W. J. Owings, Extension  
Poultry Specialist

The usefulness of supplemental fat in turkey feeding programs continues to be of interest despite the recent sharp increase in the price of this feed ingredient. Several potential benefits are associated with supplemental fats, especially when they are added to all-mash (meal) type diets. Fats improve the physical texture of feed and make it more attractive to turkeys. Fats also decrease feed wastage and dustiness of the diet, and enhance the dispersion of micro-ingredients in the feed mixture. Most im-

portant, however, is the increase in energy density of the diet obtained through fat supplementation. An increase in energy density and simultaneous maintenance of proper nutrient balance of the diet will be stimulated too.

Research is being conducted at Iowa State University to obtain definitive information about the effects of supplemental fat on turkey performance, including an economic assessment of returns above feed costs. Preliminary research showed that, under the economic conditions prevailing in 1977 and most of 1978, including 3 or 6% feed grade fat in tom diets increased the net return above feed cost by 35¢ or more per tom.

A more extensive experiment (supported in part by a grant-in-aid from the Iowa Turkey Marketing Council) was completed recently. The objectives of this experiment were to test the effectiveness of using supplemental fat at levels of 1, 3, 5 or 7% of the diet on performance of turkey toms from one day to 20 weeks of age. Concurrently, the importance of maintaining theoretically "optimum" metabolizable energy (ME) to nutrient ratios for tom performance was evaluated. An outline of the ration treatments, illustrating the ME and protein levels used in the "adjusted" and "non-adjusted" starter diet series, is shown in Table 1. Adjustments made in the protein level of the "adjusted" series was proportioned to the increases in dietary ME with each increment of supplemental fat. Consequently, the ME:protein ratios of the "adjusted" series were kept the same as that of the control diet. In contrast, no ad-

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Cooperative Extension Service  
**Iowa State University**  
Ames, Iowa 50011

July 1979 | PS-203

**Table 1. General outline of ration treatments used in evaluating fat supplementation for turkeys.**

Level of added fat	Nutrient to ME Ratio	Dietary ME (kcal/kg)	Protein in starter %	ME:protein ratio
(controls) None	Base line	2805	28.50	98.4
1%	Adjusted	2842	28.9	98.4
3%	Adjusted	2916	29.6	98.5
5%	Adjusted	2990	30.4	98.4
7%	Adjusted	3064	31.1	98.5
1%	Non-adjusted	2842	28.50	98.4
3%	Non-adjusted	2916	28.50	102.3
5%	Non-adjusted	2990	28.50	104.9
7%	Non-adjusted	3064	28.50	107.5

adjustments were made in the unadjusted series and the ME:protein ratio became larger with each increase in fat level. Similar adjustments were made in the adjusted series, but not in the non-adjusted series, for lysine, methionine, total sulfur amino acids, tryptophan, calcium and available phosphorus levels.

Diets were formulated for each of the following age intervals: 0-3, 3-6, 6-9, 9-12, 12-16 and 16-20 weeks. All diets were formulated by least-cost linear programming using feed ingredient prices prevailing at the time. The price of the blended fat ranged from 16¢ per lb at the start of the trial to 18¢ per lb at the end. Corn and soybean meal (48% protein) ranged from 3.4 to 3.85 and 9.5 to 10.5¢ per lb, respectively, during the trial. The diets were fed in meal (all-mash) form.

The average body weights per tom at specific ages are presented in Table 2. In comparison with the toms fed no supplemental fat (controls), toms fed varying levels of fat were heavier at all age intervals, irrespective of adjusted or non-adjusted ME:nutrient ratios. The largest increases generally were associated with the use of adjusted ME:nutrient ratios, especially with 3% or more supplemental fat.

The largest relative improvements in body weight due to supplemental fat oc-

curred prior to 12 weeks of age. For example, toms fed the 7% fat, "adjusted" diet were 15.6, 16.7 and 17.3% heavier than the control toms at 6, 9 and 12 weeks of age, respectively. This difference decreased to 12.7 and 10.7% at 16 and 20 weeks, respectively. Similar patterns of response were observed with all other treatment groups. These data seem to contradict the general concept that turkeys respond more to supplemental fat during late stages of growth than during the early growth period.

Overall mortality was 8.8% and was not affected by ration treatments.

Supplemental fat improved feed efficiency through 20 weeks of age (Table 2). The magnitude of improvement with each increment of added fat was consistent in the "adjusted" ME:nutrient series. One inconsistency occurred in the "non-adjusted" series. For an unknown reason, toms fed the 5% fat, non-adjusted diet grew and utilized feed poorly from 16-20 weeks of age. Consequently, the body weight and feed efficiency of this group did not follow the general pattern of response observed with other treatments.

The prices of feed ingredients used and the market price received when the toms were marketed were used to assess the economics of fat supplementation. An evaluation of samples of toms taken from each experimental unit showed that no

**Table 2. Body weight and feed efficiency of toms.**

Ration treatment	Body weight per tom (lbs) by age				Feed/Gain	
	6 wks	12 wks	16 wks	20 wks		
(% added fat)						
(controls) 0	3.96	12.5	19.4	25.8	3.26	
Adjusted ME: nutrient ratios	1	4.16	12.5	19.5	26.0	3.13
	3	4.40	13.6	20.3	27.2	3.09
	5	4.38	13.8	20.6	26.9	2.96
	7	4.58	14.6	21.8	28.6	2.90
Non-adjusted ME: nutrient ratios	1	4.16	12.9	20.0	26.4	3.19
	3	4.09	13.2	20.1	26.6	3.08
	5	4.18	13.6	20.4	26.3	3.12
	7	4.29	13.6	20.9	27.7	2.92

**Table 3. Economics of fat supplementation of turkey diets.**

Ration treatment	Income received per tom <sup>a</sup>	Feed cost/lb tom marketed	Feed cost/tom	Income above feed cost/tom	Net return/tom above controls	
(% added fat)						
(controls) 0	\$12.134	20.10¢	\$5.186	\$6.948	-	
Adjusted ME: nutrient ratios	1	12.228	19.81	5.151	7.077	\$0.093
	3	12.792	20.49	5.573	7.219	0.271
	5	12.651	21.16	5.670	6.981	0.033
	7	13.451	21.84	6.247	7.204	0.256
Non-adjusted ME: nutrient ratios	1	12.416	19.76	5.216	7.200	0.252
	3	12.510	20.59	5.476	7.034	0.086
	5	12.368	21.79	5.710	6.658	-(0.290)
	7	13.027	20.83	5.769	7.258	0.310

<sup>a</sup>Toms marketed at 47¢/lb live weight and fat price ranged from 16 to 18¢/lb during the experiment.

**Table 4. Net returns/tom when fat price = 23¢/lb.**

	Ration treatment	Net return/tom above controls -- fat @23¢
	(% added fat)	
Adjusted	1	\$0.044
ME:	3	0.120
nutrient	5	-(0.206)
ratios	7	-(0.092)
	1	0.201
Non-adjusted	3	-(0.041)
ME:	5	-(0.536)
nutrient	7	-(0.030)
ratios		

differences in carcass grade among the various treatment groups. Therefore, a straight-forward economic comparison was deemed appropriate. The gross income received per tom (@47¢ per lb live weight) ranged from a low of \$12.13 for the control group to \$13.45 for the 7% fat, "adjusted" group. These data are shown in Table 3. Also shown are data on feed cost per tom, income above feed cost and the net gain per tom as compared to the control group. Feed cost per lb and per tom were lowest for the 1% fat and control diets. Conversely, the highest costs were incurred with 7% fat additions, especially when the ME:nutrient ratios were adjusted. The most important parameter, extra return over feed costs as compared with the control group, illustrated that, with one exception, the use of supplemental fat increased net monetary returns. The one exception was the 5% fat, non-adjusted group that did poorly during the 16 to 20 week period. Otherwise, net returns were increased by as little as 3.3¢ per tom with the 5%, adjusted diet to as much as 31¢ per tom with the 7%, non-adjusted series.

Noteworthy was the generally good performance and economic returns obtained from toms fed the fat-supplemented, non-adjusted diet series. Although these

turkeys did not respond to fat supplementation quite as well as the toms fed in the "adjusted" series in terms of growth and feed efficiency, the feed costs per lb of tom marketed (except for the 5% fat group) were lower. Consequently, net monetary returns were relatively high for the 1, 3 and 7% fat, non-adjusted groups.

One should keep in mind that these data were collected under the feed ingredient price situation described earlier. Fat price ranged from 16 to 18¢ per lb. To demonstrate the influence of fat price on net returns, the net return data were recalculated using a fat price of 23¢ per lb with all other prices remaining the same. These data are presented in Table 4. The impact of fat price on net returns is obvious. Only low levels of fat supplementation (1 to 3%) could be justified on a net return basis. High level fat supplementation that was profitable when fat price was 16 to 18¢ per lb (i.e. 7%) became a losing proposition with the higher priced fat.

The information presented in this report demonstrates the effectiveness of fat supplementation for improving rate of growth and feed efficiency of turkeys. Also, the potential economic advantages of fat supplementation under specific conditions was shown. However, several factors will determine whether or not fat supplementation will be economically beneficial. A primary factor is the price of fat. Other factors of importance include the cost of major feed ingredients (corn, soybean meal), the target market weights, and the market price of turkeys. Additional research is underway at Iowa State University with the objective of developing a system that will enable producers to evaluate all these factors as a basis for making decisions about fat usage in their turkey feeding programs.

## Water Quality for Poultry

W. J. Owings, Extension  
Poultry Specialist

The simple chemical compound water is of unequalled importance in the metabolism of all animals. Water holds this unique position in nutrition mainly because of its physical properties. It acts as a transport medium for all other nutrients and products of metabolism and enhances cell reactions. It can absorb the heat of reaction produced in the metabolism of carbohydrates and fats with little rise in temperature. Water evaporates readily removing many calories of heat from the body as latent heat of vaporation. Water is such a commonplace object that it usually is taken for granted in any phase of poultry production, even though more than half of the body weight of a chicken or turkey is water and nearly 75% of an egg is water.

Water consumption is influenced by size and age of bird, environmental temperature, type and amount of feed consumed and other factors. The normal adult male chicken consumed water in the amount of 5.5% of its body weight in 24 hours. A young growing chicken 3 to 4 weeks of age would consume water at 18 to 20% of its body weight. Adult laying hens consume water at the rate of 13.6% of body weight, with a water to feed ratio of about 2 to 1.

Standards for human health frequently are applied to poultry because data are limited on the affects of various inorganic materials in the drinking water of poultry. For example, the permissible level of either sulfate or chloride in drinking water for humans is listed at 250 mg/liter.

Levels of 250 ppm or 1000 ppm total sulfate had been reported to have no significant effect on egg production or other parameters measured with laying hens. Research has shown that levels of 4000 ppm of total sulfate as sodium sulfate or magnesium sulfate significantly depressed feed consumption and hen day egg production, with magnesium sulfate being most potent. At 4000 ppm, sodium sulfate significantly increased water consumption

and fecal moisture content while magnesium sulfate significantly decreased water consumption.

Reports also indicate that some salts are more toxic for poultry than others. Sodium chloride and magnesium sulfate were shown to be more toxic in the drinking water of laying hens than sodium sulfate.

Levels up to 18,000 ppm of magnesium sulfate have been given to turkeys in their water from hatch to 4 weeks of age. This level caused birds to drink more water, to have loose droppings and to grow more slowly. These birds showed recovery when they were returned to normal water.

In Iowa, a number of public water supplies exceed the Public Health Service concentration limit of 250 mg of sulfate per liter for human drinking water.

One of the intermediate breakdown products of nitrate, upon ingestion in poultry is nitrite, which is more toxic to poultry. If nitrate and bacteria are present in drinking water some of the nitrate may be converted to nitrite, particularly if the water temperature is favorable, the more toxic nitrite could be consumed directly. Sources of nitrate in drinking water include nitrogen fertilizer, naturally occurring deposits of nitrate-containing material, nitrogen fixed by soil bacteria, crop residue, and manure.

The symptoms of nitrate-nitrite toxicity vary with age and kind of bird, level of nitrate or nitrite consumed and ration composition. Growing birds generally show unthriftiness, loss of appetite, depressed growth, incoordination, muscle tremors, labored breathing and high mortality. Laying hens may have a lower peak egg production and loose droppings.

Results from experiments designed to determine the effects of nitrates and nitrites on chicks, poults and laying hens have been varied. Seemingly poultry are more tolerant of dietary nitrate-nitrite than humans. Water having a nitrate concentration above 45 mg/liter are in the range which may cause nitrate cyanosis or methemoglobinemia (blue babies) when used in feeding infants under one year of age, including use in preparing an infant's

formula. Levels up to 2000 ppm of nitrates have been placed in drinking water of poults until they were 4 weeks of age. The highest levels depressed rate of growth about 10%, but the birds fully recovered when they were given normal water. Turkeys that received 675 ppm of nitrate as sodium nitrate in drinking water for 4 weeks and then normal water thereafter were significantly heavier in body weight at 8 weeks and continued to be heavier up to market age of 20 to 24 weeks. The author repeated this test three different years and had the same results each year.

Day-old turkey poults were fed practical starting diets containing 400 ppm of nitrite as a potassium salt in another experiment. Mortality was very high with 17 out of 25 poults dead at the end of 4 weeks in one experiment. In addition to

high mortality, the poults showed inability to maintain balance, rapid breathing indicating insufficiency of oxygen in the blood, some frothing about the mouth and reduced growth. The addition of 9090 I. U. of vitamin A per pound of diet prevented the mortality and allowed normal growth in the poults.

The addition of either nitrate or nitrite at levels up to 300 ppm of nitrate and 200 ppm of nitrite-nitrogen to drinking water of laying hens had no effect on egg production, egg weight, Haugh units or shell thickness.

Table 1 is a listing of microelements in drinking water and their threshold levels for poultry as presented in a Talk at the 26th Western Poultry Disease Conference, University of California-Davis. Several of the elements have higher limits for poultry than those listed by the

**Table 1. Threshold levels of micro-elements in water for poultry.**

Factor	Threshold	Concentration	Limit	Concentration
		mgm/Liter		
Total dissolved solids	2500	2860	5000	4000
Total alkalinity	500	1000	?	?
Calcium	500		1000	1000
Magnesium	250		500+	400
Sodium	1000		2000+	2000
Bicarbonate	500		500	500
Chloride	1500		3000	-
Fluoride	1		6	100
Nitrate	200	300	400	400
Nitrite	Nil	-	Nil	50
Sulfate	500		1000+	1000
Copper	1	1		1
Cadmium	5	2		2
NaCl	variable	1500		3000
Iron	-	2		5
		Poultry		Poultry
Range of pH	6.0 - 8.5			5.6 - 9.0

26th Western Poultry Disease Conference

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Public Health Service for human drinking water.

There is only one way to be sure that the well water is free of unsafe organisms, minerals and chemicals, and that is by testing. Even then water free of impurities today may be polluted tomorrow if the well was not properly located and properly constructed. Well water should be tested periodically. A change in appearance, flavor or odor of water would be a good indication of a need for testing.

Iowa's water testing station is the State Hygienic Laboratory at the University of Iowa in Iowa City. A telephone call (319-353-5990, ask for the Water Laboratory) will put you in contact with someone who will be able to determine along with you what testing needs to be done and the number of samples you need to send. They will also ship you sample containers.

The testing fee will depend upon tests that are run. As an example: coliform bacteria, \$3.00; nitrate, iron and hardness, \$3.00; sulfate, \$8.00.

In these days of intense competition a producer can ill afford to provide low quality drinking water to turkeys and chickens. Relative to other feed nutrient costs, water is a very inexpensive nutrient. More care should be taken to see that good quality water in sufficient amounts is supplied to poultry.

### **Nordskog Receives Research Grant**

A. W. Nordskog was awarded a \$160,000 research grant from NIH, Department of Health Education and Welfare recently to continue a 3-year study of the "Histocompatibility Immune Response Genes in Poultry". Dr. Nordskog and his group have made several interesting findings already including the genetic control in chickens which make some birds more resistant to challenge by certain viruses, such as leukosis virus and Marek's disease, and that the injection of a certain type synthetic chemical compound will identify chickens of different genotypes that are resistant or susceptible to a particular virus. These discoveries may not have an immediate practical application to

poultry breeding, but they will be useful techniques for developing, in the future, resistance by a strain to a particular disease.

Dr. Nordskog is recognized worldwide as an authority in poultry breeding, and he has been a leader in the immunogenetic research field also.

### **New Poultry Letter Format**

The ISU poultry newsletter is printed for the Iowa poultry industry, which includes chicken egg producers, turkey producers, chicken meat producers, waterfowl producers and supporting allied poultry industry. The letter is published monthly. A poultry letter has been published by the poultry extension staff since 1934. This is the first issue using a new format which will emphasize research reports, reports of field studies, discussions of current field problems, suggestions or recommendations for improved management, news items and other information.

Suggestions you may have on how we can make this newsletter more informative will be appreciated. Suggestions for improvements along with names you think should be on our poultry newsletter mailing list should be sent to W. J. Owings, 201 Kildee Hall, Iowa State University, Ames, Iowa 50011.

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### **Coming Events**

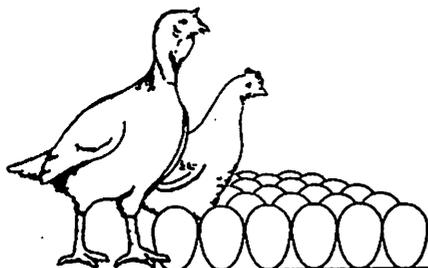
- July 23 - 25  
Iowa Turkey Federation Summer Outing, Adventureland Inn, Des Moines, IA
- August 6 - 10  
Poultry Science Association, Gainesville, FL
- August 16 - 26  
Iowa State Fair, Des Moines, IA
- September 13 - 14  
Iowa Poultry Association Egg Fall Festival, Gateway Center Ames, IA
- October 3 - 4  
Iowa-Minnesota Egg Marketing Seminar, Mason City, IA



IOWA STATE  
UNIVERSITY  
EXTENSION

Cooperative Extension Service

Poultry Science  
201 Kildee Hall  
Ames, Iowa 50011  
Telephone: 515-294-257



# poultry newsletter

Spring, 1989

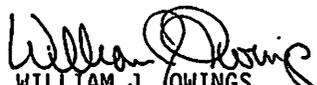
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## In This Newsletter

Poultry Nutrition Research at ISU

Iowa Poultry Symposium - June 1

Last issue of Poultry Newsletter was Winter, 1987.

  
WILLIAM J. OWINGS  
Extension Poultry Specialist

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## Poultry Nutrition Research at ISU

Jerry L. Sell  
Professor of Animal Science

It has been some time since an update of poultry nutrition research at Iowa State University has been presented in this publication. During this interval, many changes have occurred in our research program. Some changes were the result of setting new goals and others were necessitated by financial constraints. Primary emphasis for the past two years has

been focused on nutrition research with turkeys and, concurrently, laying hen nutrition research has been curtailed, at least temporarily. The turkey research program has been productive, and portions of the findings will be presented herein.

### Independent Effects of Dietary Protein and ME

A large-scale experiment was conducted over the past 2 years to obtain additional information about the interrelationships between concentrations of protein and metabolizable energy (ME) in diets of turkey toms. This work was a follow-up to the mounting evidence indicating that dietary protein and ME exert independent effects on tom performance, and that the use of ME-to-protein ratios in formulating practical diets is unnecessary. In contrast to earlier research on this subject, however, all diets used in this research were made adequate in essential amino acid concentrations regardless of protein level. This was done by selective supplementation of low-protein diets with mainly methionine and (or) lysine. Twenty diets were tested for their effects on performance, carcass yield, and carcass composition. These diets were obtained by using all combinations of five protein levels (82, 91, 100, 109, and 118% of NRC, 1984 recommendations) and four ME levels

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Iowa State University and U.S. Department of Agriculture cooperating

The Iowa Cooperative Extension Service's programs and policies are consistent with pertinent federal and state laws and regulations on nondiscrimination regarding race, color, national origin, religion, sex, age, and handicap.

(99, 103, 107, and 111% of NRC, 1984). Protein and ME concentrations used in this experimental design during each of six age intervals are shown in Table 1. Corn-soybean meal diets and varying concentrations of supplemental animal-vegetable fat (A-V fat) were used in all instances. Diets were fed to toms from 1 day to 20 weeks of age. The results showed that there were no protein X ME interaction effects on performance traits or carcass composition through 20 weeks of age. Therefore, main effect means demonstrating the effects or lack of effects of dietary protein and ME are presented.

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Data of Table 2 illustrate that neither protein nor ME significantly affected 20-week body weight, although slightly lighter weight toms were obtained when either the lowest protein (82% of NRC) or the lowest ME (99% of NRC) diets were fed. Feed efficiency and efficiency of ME use for gain were improved linearly as either dietary protein or ME were increased. Improvements in feed efficiency with increasing ME were particularly striking, indicating that turkeys are quite dependent on dietary ME for efficient conversion of feed to gain. The improvements in feed and ME utilization for gain with increasing dietary protein are noteworthy because, in all instances, the diets contained NRC (1984) recommended levels of essential amino acids. This observation is not surprising, however, because researchers working with broiler chickens also reported that increasing the protein levels in diets deemed adequate in essential amino acids improved feed efficiency.

By using the performance data and feed ingredient prices prevailing at the time of the

research, feed ingredient costs per lb of gain were calculated. These data (Table 2) show definite independent effects of dietary protein and ME. As protein level increased from 82 to 91% of NRC, feed cost/gain decreased. Feed cost then increased as further increments of dietary protein were used; a reflection of the relatively high cost of supplying extra protein versus the extent of improved performance of the toms. In the instance of dietary ME, feed ingredient costs/gain decreased with each increment of ME. This was because of the relatively low cost of the main ME sources, corn and fat, and the consistent improvements in feed efficiency. Most noteworthy, however, was the absence of protein x ME interaction effects on feed ingredient cost/gain, lending further support to the concept that the use of ME: protein ratios as restrictions in diet formulation is a questionable economic practice. On the basis of individual diets tested (data not shown here), the lowest feed cost/gain was obtained with the diet containing 91% of NRC protein (with supplemental methionine and lysine) and 107% of NRC ME, and obviously this would change according to shifts in the relative costs of protein, amino acids, and ME.

Overall mortality during the experiment was relatively low, 8.5%. Morbidity, as related to leg weakness, however, was appreciable, especially with toms fed high protein diets. Significant and nearly linear increases in incidence of moderate (some difficulty in walking) and severe (greatly impaired mobility) leg weakness occurred as dietary protein increased from 82 to 118% of NRC recommendations (Table 3). Increasing dietary ME also significantly increased incidence of leg weakness, especially moderate

leg weakness. No protein x ME interaction effects on incidence of leg weakness were observed.

No clear-cut explanation for effects of dietary protein and ME on leg weakness are evident. Often, rapid early growth of toms has been blamed for leg weakness. In the current study, however, essentially no effects of diet treatments on growth were observed. Thus, other factors must have been involved. One possibility is litter condition. Litter of pens in which toms were fed higher protein diets tended to be more wet after 3 to 4 weeks of age than those of toms fed low protein diets. Another possibility, however, is that high protein diets result in metabolic stresses (i.e., increased calcium excretion in urine, high blood uric acid levels) that lead to inferior leg development.

Growth, feed efficiency, and mortality-morbidity are very important determinants of diet adequacy for growing turkeys. However, the impact of diet composition on carcass characteristics has become of increasing importance because of the way turkey meat is marketed today. The twenty diets tested in this research had little effect on the yields of most carcass parts (thighs, drums, wings, and back) of 20-week-old toms. Exceptions were the yield of breast (weight and % of carcass) and amount of breast meat per carcass (Table 4). As dietary protein increased from 82 to 91% of NRC, weights of breast and of breast meat increased significantly. No further change in these traits was seen with additional dietary protein, and neither ME level nor protein x ME interactions affected breast weight or breast meat. The breast weight and breast meat data illustrate that hazards may exist when diets of unusual low protein

are fed, even when dietary levels of essential amino acids are supposedly adequate.

Primary constituents of ready-to-cook carcasses of interest to processors and consumers are protein and fat, and the concentrations of these carcass constituents can be influenced by diet composition. In our study, dietary protein did not affect percentage of protein in carcasses, but, as ME increased, percentage of carcass protein decreased (Table 4). Conversely, as dietary ME increased, carcass fat increased, partly at the expense of carcass protein, but mostly in place of carcass water. Increasing dietary protein caused only a slight decline in carcass fat. Neither carcass fat nor protein were affected by a dietary protein x ME interaction.

These data illustrate that, even when live weights and ready-to-cook carcass weights were similar for toms fed diets of different protein and ME contents, percentages of carcass protein and fat were changed. Most notable changes occurred in relation to different dietary ME concentrations, especially with regard to percentage of fat in carcasses. Feeding diets of different protein levels had less impact on carcass composition than observed in many other studies, probably because in this study essential amino acids met or exceeded NRC recommendations, irrespective of protein level.

Results of our research and those of others make one conclusion inescapable. Within the limits of practical feed formulation, the use of "optimum ME-to-protein ratios" places an unnecessary restriction on economical turkey feeding programs. Also, it seems obvious that economical diet formulation will depend on the integration of ME and

protein (amino acid) costs with the information available on the independent effects of ME and protein on turkey performance.

#### Changes in Carcass Composition with Age

As the experiment described here progressed, toms were taken from each treatment group at 3, 6, 9, 12, 16, and 20 weeks of age. The toms were processed at the ISU Meats Laboratory. Yields of carcass parts and proximate composition of eviscerated carcasses were determined.

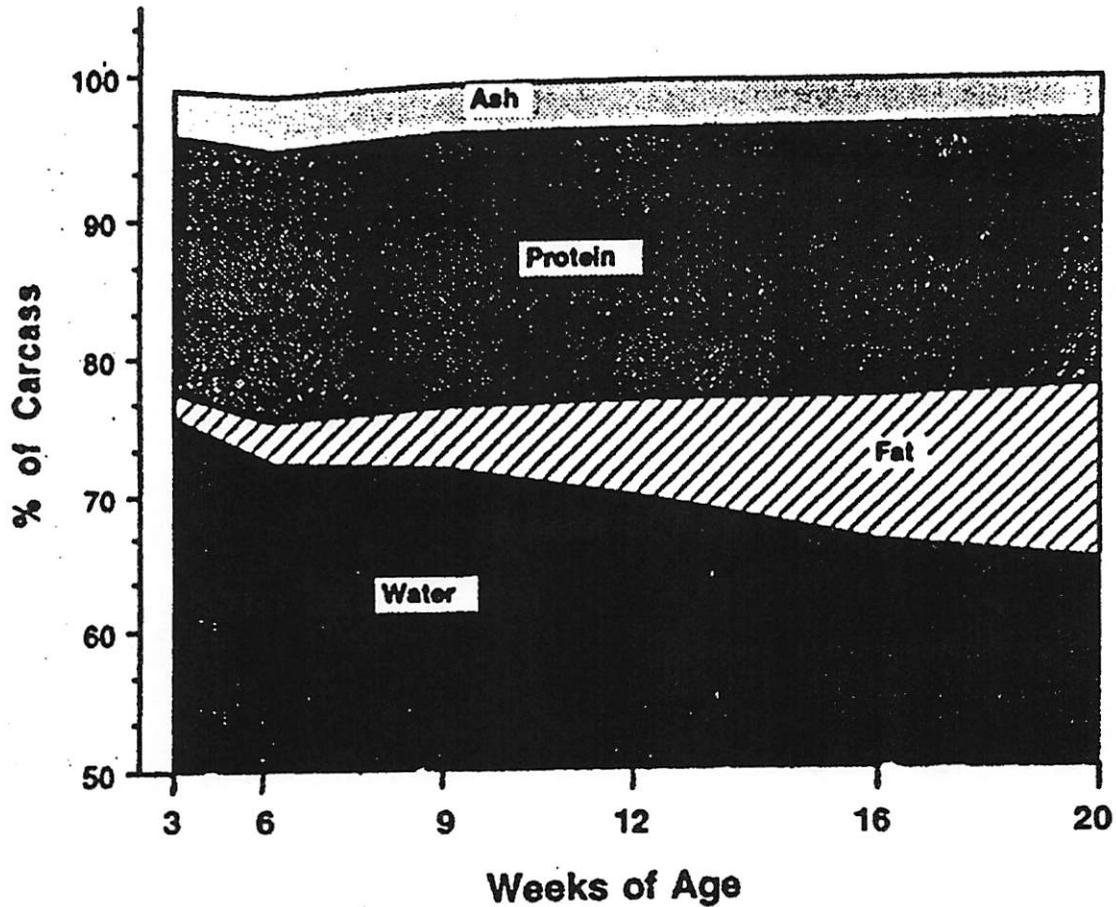
202 The data presented in Table 5 represent toms taken from all diet treatment groups. This seemed justified on the basis that, as described for 20-week-old toms in the previous section, diet treatments affected only the yield of breast and breast meat. Therefore, the composite of all data was used to provide a more soundly based overview. Definite patterns of development of carcass parts with increasing age (and increasing body size) were evident. For example, breast constituted a relatively constant portion of the carcass through 9 weeks of age and then increased linearly through 20 weeks. The yield of thighs plateaued at 12 weeks while yields of drums and wings decreased from 12 to 20 weeks of age. The meat yield of breast (as a % of breast weight) stayed fairly constant from 6 weeks onward, but the proportion of meat on thighs increased through 20 weeks of age.

Major changes in the proximate composition of eviscerated carcasses were also observed. As illustrated in Figure 1, the proportion of fat in carcasses increased while water decreased as toms increased in age and in body weight. These changes were most marked after 12 weeks of

age. The protein and ash components of carcasses did not change noticeably with age.

Information about carcass characteristics of very young toms (3 to 12 weeks of age), as presented herein, may be of little practical value, but it provides some insight into "how" turkeys develop. Data obtained during the 12 to 20 week period, however, should be useful as additional information that could be used to determine most opportune stages of growth at which toms should be processed to obtain the desired carcass yields and composition.

**FIG 1. PROXIMATE COMPOSITION OF RTC CARCASSES OF TOMS AT DIFFERENT STAGES OF GROWTH**



**IOWA POULTRY SYMPOSIUM  
June 1, 1989**

8:30 - 8:35 a.m.

Welcome and Announcements  
Dr. William J. Owings

**PROGRAM**

8:35 - 9:15 a.m.

Morning Session

U. S. Agricultural Outlook and  
Prospects for the 1990 Farm Bill  
Dr. Stanley R. Johnson

8:00 - 8:30 a.m.

Registration - Second Floor Desk,  
Scheman Building

9:15 - 9:45 a.m.

Morning Plenary Session

Animal Rights: An Update  
Dr. Hugh Johnson

Dr. Darrell W. Trampel, Moderator  
Rooms 230-240

9:45 - 10:05 a.m.

Legislative Issue Affecting the Iowa  
Poultry Industry  
Mr. Mark Truesdell

10:05 - 10:20 a.m.

Break

10:20 - 10:50 a.m.

Choosing and Using Tetracyclines  
Dr. Jeffrey A. Kula

10:50 - 11:20 a.m.

Organic Contaminants in Iowa  
Groundwater  
Dr. Keith L. Cherryholmes

11:20 - 11:50 a.m.

Broiler Business in the Midwest  
Dr. Preston Hayse

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11:50 - 1:00 p.m.

Lunch (on your own)

#### Afternoon Session

(Separate workshops for turkey and  
chicken industry people)

#### Chicken Workshop

Dr. William J. Owings, Moderator -  
Room 230

1:00 - 1:30 p.m.

A Novel Method to Produce Low  
Cholesterol Foods  
Dr. Donald C. Beitz

1:30 - 2:00 p.m.

Pullet Management  
Dr. Chuck Howe

2:00 - 2:15 p.m.

Break

2:15 - 2:45 p.m.

Liposome (Novasome™) Adjuvanted  
Poultry Vaccines  
Drs. S. Kumar, Y. Costas, Wayne  
Boclair, and Donald Wallach

2:45 - 3:15 p.m.

Salmonella Enteritidis Control  
Programs in the United States  
Dr. M. A. Mixson

#### Turkey Workshop

Dr. Robert J. Hasiak, Moderator -  
Room 240

1:00 - 1:30 p.m.

Effects of Environment on  
Performance of Commercial Turkey  
Flocks  
Mr. Maris Naber

1:30 - 2:00 p.m.

Vaccination Programs for Market  
Turkeys  
Dr. James Sandstrom

2:00 - 2:15 p.m.

Break

2:15 - 3:15 p.m.

Turkey Roundtable Discussion

Discussion Leaders:

Health-----Glen Schultz  
Nutrition-----Steve Shupp  
Management-----Dave Wiggins  
Processing----Tim Weaver

3:45 - 4:45 p.m.

Poultry Necropsy Laboratory  
Dr. Darrell Trampel

Hands-on instruction in postmortem examination of chickens and turkeys. Space available for 20 people in Room 1694, College of Veterinary Medicine. Call Dr. Trampel (515-294-0710) by May 25 to enroll.

3:45 - 4:45 p.m.

Poultry Science Tour  
Dr. William J. Owings

Tour of Poultry Science facilities in Kildee Hall on the Iowa State University Campus. Call Dr. Owings (515-294-4303) by May 25 to enroll.



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# Appendix C

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The partial program of the first meeting of the International Conference of Instructors and Investigators in Poultry Husbandry that follows was obtained from file of the Poultry Science Association, Special Collection Department, ISU Library.

## Article 1

### International Conference of Instructors and Investigators in Poultry Husbandry

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TIME :

Thursday, Friday and Saturday, July 23,  
24 and 25, 1908

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PLACE :

All Sessions will be held in the Poultry Laboratory, Dairy  
Building, New York State College of Agriculture

At Cornell University

Ithaca, N. Y.

- - Program - -

**Afternoon Session**

THURSDAY, JULY 23, 2 P. M.

*H. C. Pierce, Assistant Professor of Animal Husbandry in charge of Poultry, Iowa State College, Ames, Iowa, Presiding.*

Address of Welcome, - - - *Dr. L. H. Bailey*  
Director of New York State College of Agriculture at Cornell University.

Greeting, - - - - - *Dr. A. C. True*  
Dean of the Graduate School of Agriculture and Director of the Office of Experiment Stations, Washington, D. C.

Response, - - - - - *W. R. Graham*  
Professor of Poultry Husbandry, Ontario Agricultural College, Guelph, Canada.

"Methods of Instruction in Poultry Husbandry,"  
- - - - - *James E. Rice*  
Professor of Poultry Husbandry, Cornell University.

General Discussion, led by - - - *C. K. Graham*  
Professor of Poultry Culture, Connecticut Agricultural College, Storrs, Conn.

Demonstrations: "Judging Eggs," and "Study of the Anatomy of the Egg," - *C. A. Rogers*  
Assistant Professor of Poultry Husbandry, Cornell University.

General Discussion, led by - - - *W. R. Graham*

**Evening Session**

THURSDAY, JULY 23, 8 P. M.

*James P. Kerr, in charge of Poultry Department, Mississippi State Experiment Station and Agricultural and Mechanical College, Agricultural College, Miss. Presiding.*

Question box.

Demonstration: "Anatomy of Poultry." - *H. C. Pierce*

General Discussion, led by - - - *Dr. Geo. B. Morse*  
Biologist, Bureau of Animal Industry, Washington, D. C.

Demonstration: "Study of Feeds" and "Methods of Instruction in Feeding," - *W. G. Krum*  
Superintendent Poultry Plant, Cornell University.

General Discussion, led by - - - *Alfred G. Lunn*  
Assistant in Poultry Husbandry, Oregon Agricultural College and Experiment Station, Corvallis, Oregon.

"Methods of Instruction in Incubation and Brooding"  
- - - - - *W. A. Brown*  
In charge of Instruction in Poultry Husbandry, Maine Agricultural College, Orono, Maine.

General Discussion, led by - - - *C. L. Opperman*  
Poultryman, Maryland Agricultural College, College Park, Md.

## Article 2

### Selected Examples of Contributions to the Scientific Literature by Poultry Husbandry/Science Faculty

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