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Selecting Profitable Layers
Michigan State University Extension Service
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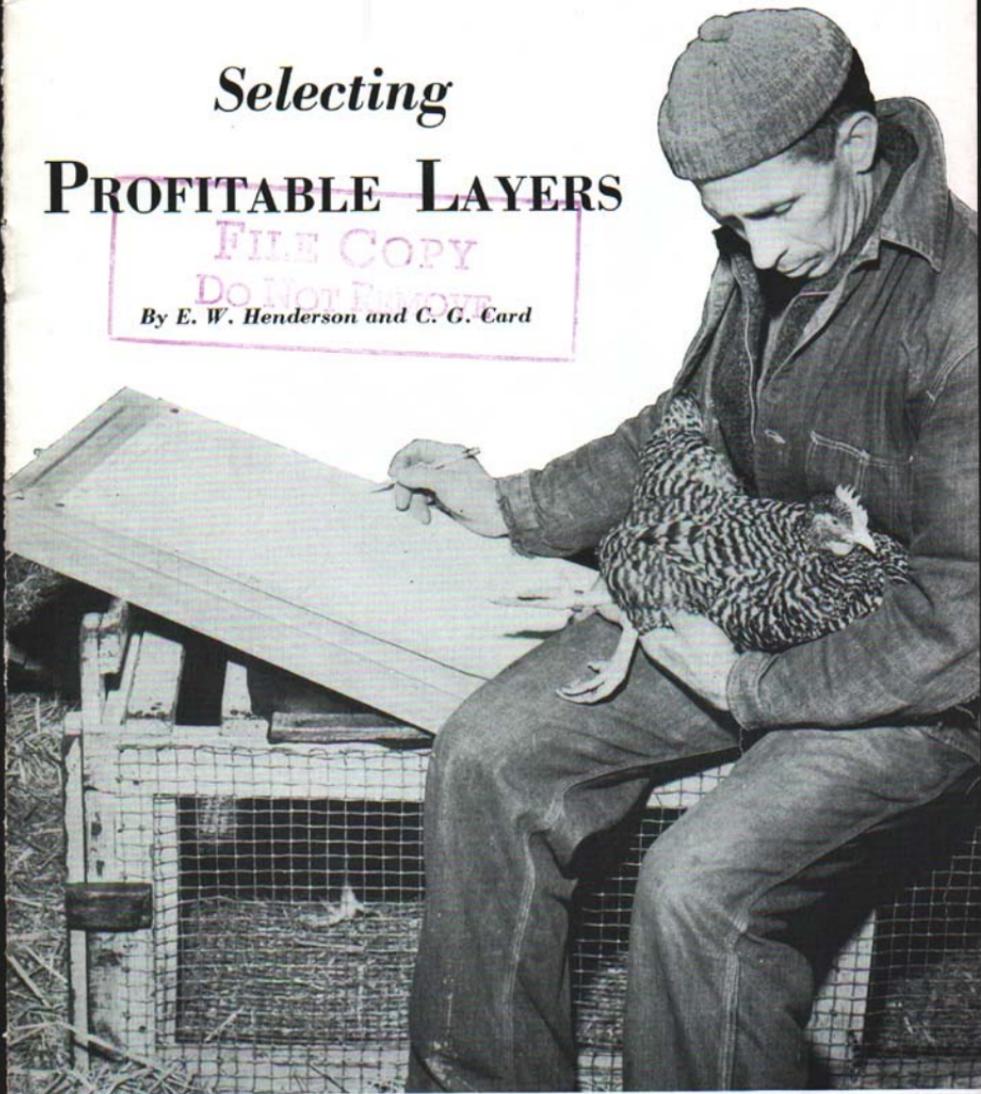
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Selecting PROFITABLE LAYERS

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By E. W. Henderson and C. G. Card



MICHIGAN STATE COLLEGE :: EXTENSION DIVISION

EAST LANSING

Cooperative Extension Work in Agriculture and Home Economics,
Extension Service, Michigan State College and the U. S.
Department of Agriculture Cooperating.



Fig. 1. Hen No. 1. "A continuous layer."

Form 108-B PEN NO.	OWNER VARIETY <i>Barred Rock</i>	ORIGINAL NO.	BRED NO. <i>1</i>	MONTHS LAYING EGGSET MONTHS		POINTS TO DATE																													
				MONTHS	PER DATE																														
DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	MONTHS	PER DATE	POINTS TO DATE	
OCT.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	15		
NOV.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
DEC.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
JAN.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
FEB.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	23		
MAR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
APR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
MAY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
JUNE	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
JULY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
AUG.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
SEPT.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27	276	362.25

NOTES

The Egg Record of Hen No. 1.

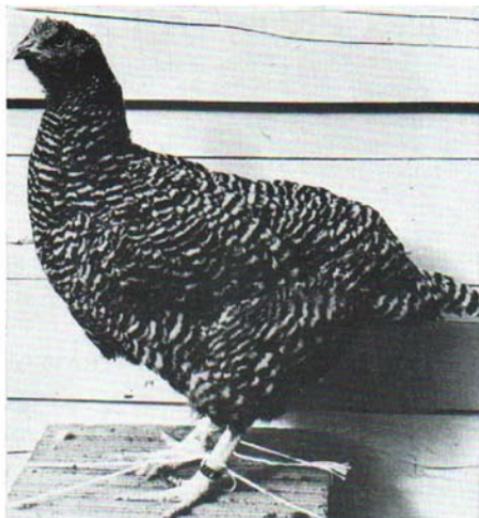


Fig. 2. Hen No. 2. A "part time" layer.

Form 88-6

OWNER		YEAR																																
PEN NO.	VARIETY	ORIGINAL NO.	BIRD NO.																															
	<i>Barred Rock</i>		<i>2</i>																															
DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	EGGS	POINTS	
																																	MONTH	TO DATE
SEP.																																		
OCT.																																		
NOV.																																		
DEC.																																		
JAN.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	1	13		
FEB.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	1	13		
MAR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	1	13		
APR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	1	13		
MAY																															0	0		
JUNE																															0	0		
JULY																															0	0		
AUG.																															2	2		
SEPT.																																60		

NETTS

A Poor Record.

SELECTING PROFITABLE LAYERS

E. W. HENDERSON AND C. G. CARD

Selecting the profitable layers in your flock is not a mysterious process. The best hens stay in production the greater part of the year and a hen in laying condition shows it as plainly as a cow shows milking condition.

Observe the appearance of the hens illustrated in Figs. 1, 3, and 5. Note the enlarged combs of these hens as compared with the shriveled combs of the hens shown in Figs. 2, 4, and 6. Now compare the egg records of the different hens.

PRODUCTION OF HENS ILLUSTRATED

The number of eggs produced in one year by the hens illustrated herein is as follows:

No. 1	296	No. 2	61
No. 3	331	No. 4	117
No. 5	334	No. 6	37

The average production of the odd-numbered hens is more than 26 dozen eggs per year, and the average production of the even-numbered hens is fewer than 6 dozen eggs per year. If the average price of eggs is assumed to be 20 cents per dozen, one hen of the odd-numbered class would yield eggs worth \$5.20, but it would take almost five hens of the even-numbered class to yield that much income.

There is little doubt about which of these hens one would keep and which he would cull. Everyone wants to keep hens that lay as well as do Numbers 1, 3 and 5. Describing how to choose the profitable layers is the purpose of this bulletin.

IT IS EASY TO LEARN SELECTION

The egg records of the birds illustrated were determined by the use of trap nests but one can do a relatively good job of selecting the best layers in a flock without trap nest records. Poultrymen who have handled trap-nested birds daily, for years have noticed certain definite natural changes in appearance or "signs" about hens as they begin to lay and when they stop. All that is necessary then is to learn to read the "signs". These signs are as easy to see as changes of the moon. If one is in doubt about whether he can cull correctly all that is necessary to verify his accuracy is to pen the "culls" separately and determine how many eggs are laid.

WHAT ARE THE "SIGNS"?

As previously mentioned, the combs of the even-numbered hens are small and shrunken whereas the combs of the odd-numbered hens are enlarged and full. If one looks at a live bird, he can see that the small combs are pale pink and the large combs are a deep red. The hens with the large combs were laying, but those with the shrunken combs were not. This is just one of the many "signs" which may be used to determine laying conditions. Very often the differences in combs are not so distinct as that. In such cases, other parts of the hens must be studied to determine whether they are laying. It is a good practice to make certain that all the "signs" agree. The different "signs" to look for are listed in Chart I, page 19 of this bulletin.

LAYING CONDITION IS A TEMPORARY SIGN

Suppose one is able to tell when a hen is in laying condition, what help is this ability in selecting the best layers? The best layers must remain in laying condition a greater part of the year, therefore, if observations of laying condition are made at the right times and often enough, the best layers are found. Laying condition at any one time of the year is not a permanent sign. One realizes that a hen may be laying one day and stop the next. In fact, there are few, if any signs that are indications of permanent high production. The success of the selection system depends on one's choosing the most critical times of the year to make the observations. Observations may be made as often as once per month, if desired, but a quarterly system will yield reasonably good results.

CHOOSING THE RIGHT TIMES FOR OBSERVATION

In order to choose the best times of the year for culling, let us consider again the actual records of the first two hens, numbers 1 and 2 on pages 2 and 3. Number 2 was selected, in October from a pen of hens, without knowledge of her record until after she was photographed. Her record was found to be as follows: She *matured late*, i.e. she did not begin to lay until December 10. She had a vacation (*winter pause*) each month; laid off entirely in May, was *broody* in June and lacked *persistence*, for she stopped in August. One who becomes familiar with the appearance of hens when they are not in production would not need to trapnest a hen like No. 2 to get information about her. Every time she stopped laying it registered in her appearance. If one inspects the flock four or five times per year, he would discover hens like No. 2. In examining the record of the good-producing hen No. 1, one finds that she *matured early* for she began to lay in October, and had no *winter* or *broody pauses* and had good *persistence*—laying up until the end of the year. The same is true of hens number 3 and 5.

The reader may wonder why the words *early maturity*, *no winter* or *broody pauses* and *persistence* are emphasized. The reason for the emphasis



Fig. 3. Rhode Island Red Hen No. 3.
She took no "vacations".

Farm Book		OWNER		YEAR		MICHIGAN LAYING CONTEST RECORD																											
PEN NO.		VARIETY <i>R.I. Red</i>		ORIGINAL NO.		BIRD NO. <i>3</i>																											
DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	MONTH	RECORD	POINTS TO DATE
DEC	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
NOV	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
OCT	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	37		
SEP	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	37		
AUG	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
JULY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
JUNE	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	37		
MAY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	37		
APR	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
MAR	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
FEB	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
JAN	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
NOV	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
OCT	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
SEP	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	22	337	333.70

Record of Hen No. 3.

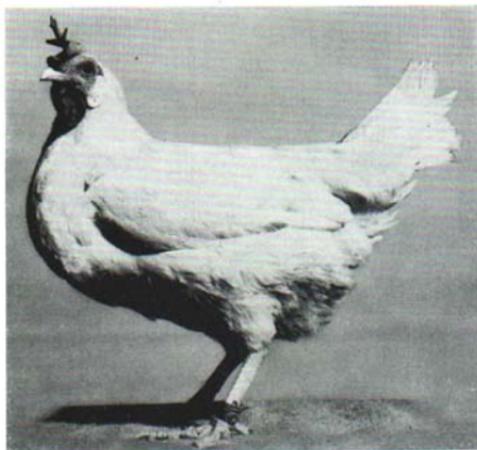


Fig. 5. Hen No. 5. She didn't miss often.

PEN NO.	OWNER		YEAR		REGULAR LAYING FOURTEEN RECORD																												
	VARIETY	SCULL	ORIGINAL NO.	BIRD NO.	5																												
DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	EGG COUNT	PER DATE	MONTH TO DATE
OCT.	✓	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
NOV.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
DEC.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
JAN.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
FEB.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	25		
MAR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	31		
APR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
MAY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	31		
JUNE	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
JULY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	27		
AUG.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	30		
SEPT.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	17	334	2750

NOTES

Record of Hen No. 5.

is that these have been found to be inherited characteristics. With the ability to identify hens in laying condition one can determine the pullets which mature early and do not take vacations until after they have laid for a year. This is the first step in the selection program.

HOW TO PRACTICE THE IMPROVEMENT PROGRAM

One should first make sure of his ability to distinguish pullets or hens in laying condition from those not laying by studying Chart I. From this chart he can learn to determine how long a hen has been laying by the extent of pigment loss. One can determine how long she may have been "laying off" by the extent of the return of yellow pigment after laying stops. In case of hens which do not have yellow pigment naturally, such as Minorcas or Orpingtons, one may not determine how long they have been laying but vacations can be estimated by the extent and order of molt. After studying the chart and

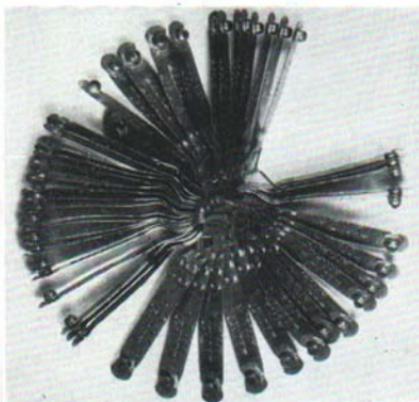
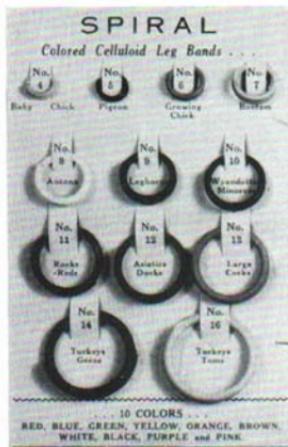


Fig. 7. Equipment for catching and marking.

handling a few hens one will find that he can recognize differences easily and he is then ready to begin the improvement program.

Certain articles of equipment will be needed, similar to those illustrated in Fig. 7 on page 10. A catching hook will be useful to catch stray birds but most of the catching should be done by means of the catching crate. Crates for marketing cull birds will be needed and a set of numbered bands to mark the good birds.

We can begin the program of improvement without trap nests* at any time of the year but it is probably most convenient to start with the pullets because they mature in the fall and continue laying throughout the year.



Fig. 8. Abdominal capacity. The bird on the left has barely two fingers spread between the pelvic and keel bones. The one on the right has more than four fingers spread. The hen on the left stopped laying in May.

SCHEDULE FOR SELECTION

Fall

Round up all the hens and close them in the house some night before the first frost. The following morning the selection process may begin.

In the fall the farmer has at least two jobs of selection: (1) selecting and culling hens which are stopping production; (2) selecting and culling pullets which are beginning production. Where the birds are all in one flock it is easy to mistake a hen which has stopped laying for a pullet which has not started. This is one of the reasons why it is a good plan to keep the birds

* Trap nests are necessary of course in official R.O.P., contest work and pedigree breeding programs.

of different ages in different flocks, or mark them. The old birds should be sorted first so as to make more room for good pullets.

Selecting the Best of the Old Birds

The best of the old hens probably will be laying and the poorest will not. The hens which are not laying probably should be marketed and those which are laying may be kept. In case the entire flock is not laying, about all that can be done to determine which hens are the best is to select those which stopped laying early and sell the rest. The amount of molt and intensity of return of yellow skin and shank pigment are the principal aids in deciding this question. For example, a hen which has a complete new set of feathers and deep orange-colored shanks has been out of production for 6 to 8 weeks at least. One which has less intense pigment in the shanks and some immature feathers probably stopped more recently and was perhaps a month more *persistent* than the hen with orange-colored shanks. Other criteria which will aid are the "handling quality" of hens and their size and appearance of health and activity.

Selecting Pullets

It is highly desirable that the pullets be separated from the old hens. The selection of pullets is based largely on the length of time they require to develop their full size and begin laying. No particular time limit should be set because flocks and breeds differ in rate of maturity. If pullets are selected as fast as they mature, the chances are that the average production of the selected half will be greater than that of the remaining half. It is probably best to sell the slower maturing portion of the flock of pullets and the "runts".

Winter (January)

Observe the *pullets* for the number and duration of *winter pauses* and any *hens* for sickness. Mark the pullets which show no evidence of pauses and cull or mark the rest if not in production. Remove and kill diseased birds. Even the best hens may take a vacation, for a part of the winter, at the end of their laying year. If feeding and housing are right the hens should start production by February 1. The best pullets should continue to lay through January and February.

Spring

Observe both pullets and hens for *broodiness* and *pauses*, mark or cull. Observe hens for slowness in returning to production.

Summer

Observe both pullets and hens for non-production or broodiness. Cull as soon as they stop laying until the best portion of the flock is left. Mark the desirable birds. Remove and kill diseased birds.

Fall

Make the final observation of the pullets or yearling hens for *persistence*. Select the needed breeding and laying hens from the most persistent part of the flock; move them to a separate breeding pen. Clean and disinfect the laying house and equipment; put in fresh litter before moving in the earliest

maturing of the year's crop of pullets as before. It is probable that all of the hens that are two years old and over will be removed for lack of persistence, or number and duration of pauses. If not, they may be retained until they do fail in some respect if they are known to be healthy.

Hens vs. Pullets

Some poultrymen prefer to remove all hens at the end of their first laying season because the average rate of decline of egg production with age is about 12 to 20 per cent per year. Light breeds decline somewhat less than heavy breeds from the first to second year. There seems to be at least two schools of thought with respect to keeping hens; one maintains that because hens always take a rest from egg production and molt in the fall, they should be replaced each year with pullets. Without devoting too much space to that question it may be said that replacing with pullets is expensive and that a hen which has proven her ability to live and lay is more valuable as a breeder than an unproven pullet. Hens lay larger eggs, which bring a premium on the market and larger chicks may be hatched from the larger eggs.

Marking

Some plan of marking the various classes of pullets and hens should be followed if they are not removed from the flock. A metal, numbered band may be placed on the leg of all birds and a record kept of the behavior of the birds during the year or different colored leg bands may be used to signify *early maturity, no winter pause, non-broodiness* and *persistence*.

Meaning of the Signs

In studying the natural signs or physical characteristics of hens one should remember their meaning and limitations. For the most part, the signs are related to the laying condition of the hen *at the time of handling*. There are very few, if any, physical characteristics of hens which are stable enough to be relied on as permanent indications of total producing ability. The only sure way to determine a hen's producing ability is to give her the opportunity to lay for a year and then make observations often enough to learn whether she stays in production the greater part of the year. The daily trap nest record is about the most accurate method of learning the facts, but observations each month or quarterly, yield fairly reliable results.

SIGNS OF LAYING VACATIONS

Molt—The molting process is considered an important indication of laying vacations. The significance of molt as an indication of laying ability is limited to certain times of the year, mainly summer and fall.

Before considering the relation of molt to laying ability perhaps one should explain what is meant by molt. Many people have believed that the term molt applied only to the shedding of feathers. As used herein, molt refers to both the shedding of old feathers and the growing of new feathers. The different phases of the molt have a different relation to the laying performance of a hen.

The following facts should be kept in mind when considering the relation of molt to the laying process.

1. Molt may be partial (neck or wing). "Neck molt" in winter is common in the case of pullets which have laid heavily in the late summer and fall, if they are not provided with artificial light. Wing molt occurs mainly in the case of hens in summer and fall.

2. It is perfectly normal for all hens to molt completely at least once each year. A hen, therefore, should not be blamed for molting and taking a laying vacation. If she molts early and takes a *long vacation* she cannot produce so many eggs as her more "persistent" sister.

3. Hens seldom lay while they are shedding a large quantity of feathers but they may or may not lay during a partial molt or while feathers are returning.

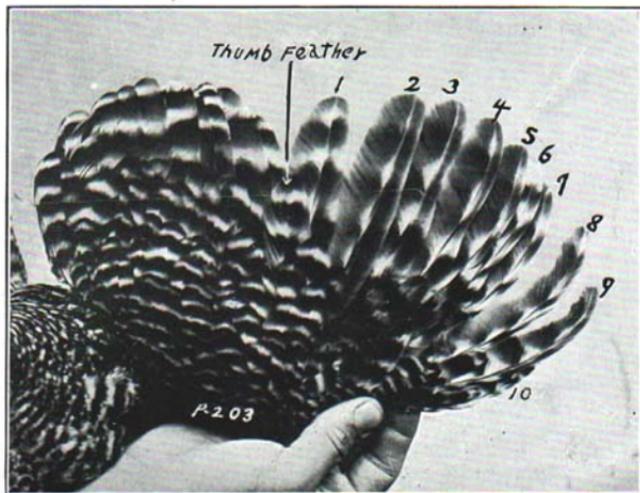


Fig. 9. Primary wing feathers.

4. The "natural molting season" is in summer.

5. If a hen stops laying in summer for a week or more she is likely to undergo a partial if not a complete molt.

6. Severe discomfort, such as that which results from disease, shortage of feed, water or light will force a hen out of production and very possibly into a molt.

7. If a hen is forced out of production in the summer or fall she may take a long vacation if conditions are not improved.

8. If a hen stops laying of her own accord and molts in summer or early fall she is almost certain to take a longer vacation than a hen which continues production until late fall.

9. Partial molt of pullets may occur in winter after or during a winter pause in egg production. It is thought that a short period of daylight is usually responsible for winter pause but inheritance is a factor also.

10. The molt of the primary wing feathers is a partial molt which may or may not occur at the same time as the general molt.

11. About six weeks' time is required to grow new feathers whether they are wing or body feathers. Therefore, the length of a new feather may be used to estimate the time when shedding occurred.

Partial Wing Molt Indicates Short Vacations

The molt of the primary wing feathers has been studied in detail inasmuch as it occurs somewhat gradually and may be taken as a moderate indication of vacations. The primary feathers are shed in a definite order beginning on the inside next to the axial or thumb feather, as illustrated in Fig. 9. A hen may drop one or more feathers at one time but each time feathers are dropped, it indicates a vacation of about two weeks. The number of vacations can be estimated by the number of groups of new feathers of different lengths growing in. The approximate time the vacation began can be estimated from the length of the first group of new feathers. One or more fully developed new feathers indicate a vacation which may have started at least six weeks previously because 6 weeks' time is required to grow new feathers.

YELLOW PIGMENT CHANGES AND VACATION

With breeds which normally have yellow skin the amount of vacation may be estimated by the extent of the return of yellow pigment after a period of several months of laying. The length of the vacation time required for the return of yellow pigment is indicated in Chart I.

The yellow pigment comes from green feed and yellow corn.* If a pullet is grown on range where there is plenty of green feed and yellow corn she should have yellow skin, beak and shanks. As soon as the ovary of the pullet begins to produce yolks virtually all of the yellow pigment in the feed is diverted to the ovary and egg yolks. As a result, the pigment in the skin, beak and shanks wears off or fades out in time. It fades faster in some regions than in others but by the end of five to seven months of laying, the yellow pigment will disappear from the thick scales of the shank. The fading takes place in a definite order, i.e. vent, eye ring, ear lobe, beak and shanks. When a vacation occurs the pigment in the feed is again returned to the regions mentioned, and in the same order but at a much faster rate. For the estimated time of pigment change, see Chart I. It should be remembered that the pigment will fade from the hen if a supply is not present in the feed regardless of laying and it will not return when a vacation occurs, unless it is present in the feed.

Factors Which Influence a Hens Egg Laying Performance

If one uses the percentage of time during a year that a hen remains in production as a measure of her inherent laying ability it is well to keep in mind other factors which affect performance. The principal factors are: (1) rate of maturity, (2) feed, (3) length of light day, (4) temperature, (5) health.

Rate of maturity has a direct effect on the first year's egg record and is believed to be an index of inherent ability also. A slow-maturing pullet will not have so good an opportunity to get in a full 12 months of laying as a

*How to feed for egg production is explained in Extension Bulletin 51.

fast-maturing pullet. Slowness of maturity may indicate general lack of ability to utilize feed and produce eggs rapidly.

It is well known that the quantity and quality of the feed of a hen has a decided effect on laying performance. A long period of daylight is also a definite stimulus to laying. It is thought that at least some of the winter pauses in production may be prevented by the provision of a light-day equal to the natural light-day in spring of about 14 hours. Sudden changes in feeding or temperature have a definite detrimental effect on production and may be responsible for some of the winter pauses in production. The assumption is that environmental conditions are identical for any one flock and that selection can be based on comparisons. In selecting birds from different flocks the possible influence of environmental factors should be given careful consideration.

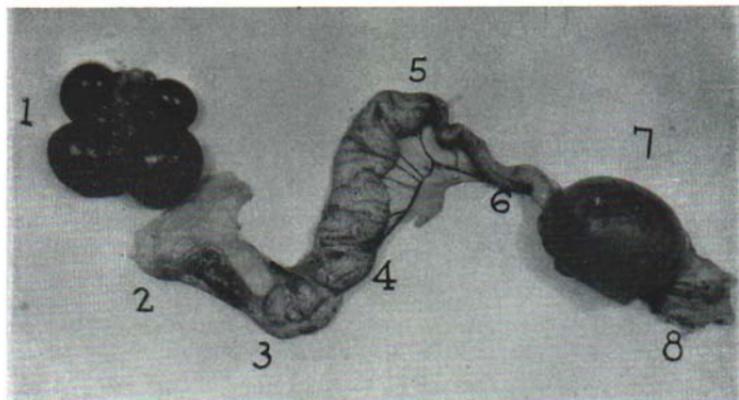


Fig. 10. The egg producing organs of a hen.

General Appearance Standards for Selection

While the ability to mature early and live and lay throughout a 12 months' period is the most important evidence of vigor, vitality and general production worth, it has been traditional to require conformity to certain standards for shape and size of body, type of head and temperament. While some of these characteristics are of doubtful significance in relation to egg records they may be selected for if desired. Some of the accepted standards which may be listed are: (1) normal size for the breed, (2) normal feather development, (3) normal conformation, (4) normal health, (5) normal shape and type of head, (6) normal active temperament.

Size of body is important because there is a general but imperfect correlation between the size of the hen and the size of the egg she lays. There is probably little advantage in maintaining either runts or giants of any particular breed.

Feather development seems to be inherited; therefore, poorly feathered birds should be eliminated before they reach maturity. High-producing hens

frequently have feathers broken after long periods of laying, but this should not be confused with inherently poor feathering which is distinguishable in immature fowls.

There is little experimental evidence of a true correlation between the three dimensions of fowls, i.e. width, depth and thickness and their producing ability, but there is no reason to maintain extremely unsymmetrical or odd-shaped birds.

Health is essential to good production, and unhealthy birds should be eliminated at all times but there is no known relationship between conformation and susceptibility to disease.

The question of whether there is a definite relationship between the shape of the head and producing ability is somewhat controversial. Careful measurements taken in some flocks have not demonstrated any relationship, but there is a possibility that selection for certain head characteristics and production simultaneously, over a period of years, may have established a relationship in other flocks. Because there is some doubt about the relationship of head shape and production there is at least no good reason at present for selecting birds with abnormally shaped heads.

It is well to remember that the general appearance of a hen is affected by her laying condition.

INTERNAL RELATION TO EXTERNAL APPEARANCE

One of the most decided changes when production begins is the enlargement of the abdomen. This is readily understood from observation of Fig. 10 in which the egg production organs of the hen are illustrated. The ovary enlarges as the ova begin to grow to form the yolks of eggs. About 9 days to two weeks' time is required for an ovum to grow from a minute body smaller in size than a pin head to the fully developed yolk which is familiar to most persons. By the time the first mature yolk is shed and started on its way down the oviduct there are a large number of ova in various stages of development. Therefore, an expansion of the abdomen is imperative, prior to and during egg production. Along with the abdominal expansion the ends of the pubic bones spread apart and the distance between the ends of the pubic bones and the keel bone increases.* Another factor in the ova development and abdominal expansion is the increased quantity of feed eaten beyond that required for mere maintenance. In addition every time a yolk is shed and picked up by the oviduct the albumen and shell are laid on around it, during one 24-hour period, and this process requires additional space.

As laying progresses, changes in the "temperament" of the hen are observed. Because more food is required, more time must be occupied in eating it and the hen becomes a busy, preoccupied individual, less flighty and nervous.

The amount of surplus fat in various sections decreases with heavy production so that the hen assumes a lean appearance in various sections, especially about the head and face and over the back. The loss of surplus abdominal fat results in a soft pliable condition in that region. The loss of fat over the head of the hen results in a flat appearance and the eyes become more prominent. When the head of a hen becomes lean and free from surplus fat and wrinkles as a result of production, the head is said to possess more "quality" or "femininity" or "refinement." In times past the temporary char-

*See Fig. 8.

acter of a number of the previously mentioned conditions has been overlooked and too much significance attached to them as evidence of total producing ability. The real criterion of laying ability is not that a hen has certain "quality" characteristics at some particular time but how much of the time during the year that she lays and therefore retains the quality characteristics. In brief, the hen's "laying appearance" indicates producing ability only to the extent that it persists throughout the year. When a hen stops laying at any time, her abdomen will shrink, the ends of her pubic bones will come closer together and her comb will shrink. She may or may not accumulate a surplus of fat but if she does her face will become coarser and less "refined." Even the best producing hens may appear to be culls when they stop laying at the end of their laying year in the fall, and the poorest layers may appear to have all the good "points" of 300-egg hens when they are laying in the spring. When a hen stops laying, her temperament may change. She may become sluggish and lazy because she doesn't need much of the day for getting food for maintenance or she may become nervous.

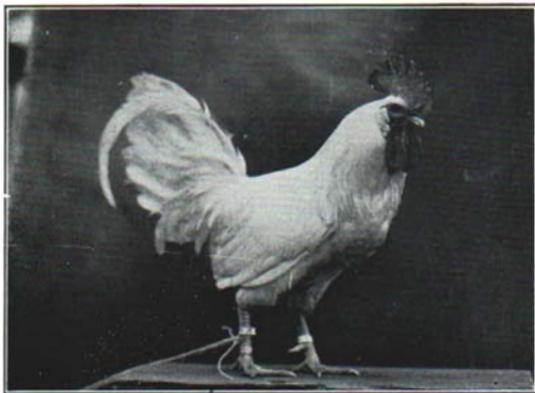


Fig. 11. Vigorous male bird. Deep-bodied, straight-legged, full-breasted.

SELECTION OF MALES

The best method of selecting males for breeding purposes is to choose those which are pedigreed from ancestors with progeny of known production performance. For flocks where such records are not kept it is advisable to buy males from specialized breeders who maintain production and pedigree records. It is a good plan to choose birds from ancestors whose female progeny are known to (1) mature early (i.e. in less than 210 days), (2) have no winter pause, (3) be non-broody, (4) have a persistence of more than 11 months, (5) have a rate of production of at least 20 eggs per month, (6) lay eggs which weigh more than 2 ounces, have good shell color, and a record of high hatching power. In addition the progeny should have a low mortality

CHART I.
Characteristics Which Indicate Laying Condition

Part of Hen	Physical conditions of Hens	
	Laying	Not Laying
Comb	Enlarged, red	Shrunken, pale
Pubic spread	More than 2 fingers width	Less than 2 fingers width
Pinbone to keel spread	Spread more than 3 fingers	Spread less than 3 fingers
Abdomen	Soft, full, pliable	Hard, shrunken or thick fleshed
Vent	Widespread, moist and crescent shaped White or pale blue in color	Small, dry, round, yellow in color
Feathers and Molt ..	Seldom ever shedding feathers May be growing new feathers Feathers may be frayed, dry or broken off near skin, especially on head and back	May be shedding or growing new feathers. Feathers may be fresh, fully grown, webbed and oily

Yellow Pigment Changes.* Laying Time Required to Lose or Gain Yellow Pigment

Part of Hen	Approximate Laying time to Lose	Approximate Vacation time to Gain
Vent	0-3 days	0-1 day
Eye ring	5-7 days	3-5 days
Beak and Ear Lobes**	4-6 weeks	10-14 days
Shanks	5-7 months	4-8 weeks

Groups of Batches of Feathers Shed	Relation of Molt of Primary Wing Feathers to Vacations from Laying
	Vacation
1	Usually 2 weeks (sometimes none)
2	" 4 weeks
3	" 6 weeks
4	" 8 weeks

*Does not apply to naturally white-skinned breeds or birds not fed green feed or yellow corn.

**Applies to white ear lobed breeds.

rate and be free from pullorum disease. Long productive life is another desirable characteristic.

Individual males should be normal in size and shape for the breed, healthy and active. In the absence of ancestral records of performance, rate of maturity, size, apparent health, and vigor make up about the only reliable criteria for selection of males from a production standpoint.

SUMMARY

One of the most reliable systems of selection or culling of hens for egg production is based on the practice of giving the hens the best feed, care and opportunity to lay and choosing the ones which lay the greater part of the year. There are at least two ways to determine whether a hen is in production throughout the year. One method is to use trap nests, the other is to learn how to distinguish the hens in laying condition by certain natural physical changes or signs, and observing them quarterly for vacations from egg production.

To make a good egg record, a hen should *mature early* as a pullet, have no *winter vacations*, no *broody vacations*, and good *persistence*—that is, to continue laying late in the fall. Breeding from hens which have those qualities will improve the productivity of the flock. The ability to distinguish hens in production from those which are not, is easy to acquire. The principal changes which take place when a hen takes a vacation from egg production are: (1) a shrinkage of comb and of the abdomen, (2) reduced pubic bone and pubic bone-keel spread, (3) return of yellow pigment, and (4) molt. Observations of pullets and hens for these signs of production and vacations made quarterly, will provide a reliable, practical measure of a hen's laying ability.

Hens may be retained in the flock for as many years as they continue to meet the requirements. It may be expected that hens will decline in annual egg production at the rate of 12 to 20 per cent per year, depending on whether they are a small or large breed of hen.

Unhealthy hens should be discarded as soon as detected.

Males should be selected for apparent health, maturity and vigor from hens which have exhibited the above-mentioned laying characteristics.