

IMPLEMENTATION AND MAINTENANCE OF SELECTION
PROGRAMS WITH REFERENCE TO THE POULTRY INDUSTRY

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Once the broad design of a breeding program has been decided upon the major factors affecting rate of genetic improvement will be set. Generation interval, selection intensity, number of traits involved, population size and extent of information (individual performance with or without family averages) can only be manipulated within the broad constraints of the design. During the initial implementation of the program more constraints may be laid down, further restricting the absolute rate of improvement, leaving the aim of management being the maximisation of economic progress within these constraints by maintaining high selection intensities and realized heritabilities and using the correct economic weightings for each of the traits involved in the selection.

IMPLEMENTATION

During the initial implementation of a new breeding program certain decisions must be made which cannot be easily or cheaply changed, particularly in the choice of facilities and equipment. Possibly the most difficult of these decisions is that of environment under which the stock will be tested. Is it best to aim for safety and test under commercial conditions, or to aim for a higher rate of improvement by testing under controlled conditions designed to maximise the expression of particular traits and to risk the possibility of indirectly selecting for correlated traits which may prove undesirable in commercial conditions?

The choice of parameters to select will be made while designing the program but there will be some decisions to be made during implementation such as choice of measuring equipment and possibly also of what to measure in order to best improve a trait. Sheldon, Yoo and Podger (1979) have demonstrated a method of improving egg production by selecting for shorter oviposition intervals. While initially costly to implement, such a method may result in a greater rate of genetic gain and perhaps greater improvement per unit of cost than more traditional and cheaper selection methods. While this example is not of the usual type of implementation decisions it does emphasize the importance of deciding how to measure a trait. A more relevant example would be deciding at what age to weigh broiler stock, to what level of accuracy, and on the culling levels for physical defects. These decisions may all affect the achievable rate of economic improvement of the stock.

MANAGEMENT

Decisions having been made as to what to improve and how and where to do it, it is up to the day to day management of the program to maximise the possible economic gains. The most important ways for management to achieve this are:-

- (i) Most importantly, to achieve a high realized heritability via control of environmental effects and accurate measurement of the breeding value of the stock. This includes maintaining a high level of health in the stock so as to allow expression of the genetic components of the traits being measured.
- (ii) Secondly, to maintain a high reproductive rate and livability of the flock so as to maximise the intensity of selection.
- (iii) To monitor overall progress of the selection flock, ideally by comparison with a control flock. This will indicate the realized heritability and possibly point out problems such as lack of response due to lack of genetic variation, inadequate testing and measurement or presence of a selection plateau. It is unlikely, but possible, that an increase in an undesirable correlated trait may be detected. Such developments are usually very slow and could only be measured after many generations of selection, hence the importance of a stable control.
- (iv) Changing circumstances and new information will almost certainly warrant minor changes in the running of a breeding program, such as introducing improved techniques and equipment, or shifting selection emphasis in response to changing economic weightings or information from comparisons with controls. It should be a design aim to allow flexibility and a management aim to make full use of it by discovering and implementing improvements to keep the program running as efficiently as possible.
- (v) To monitor the rate of inbreeding, and if necessary to apply restrictions on the selection of breeders to maintain genetic variation and to increase long-term selection gains.
- (vi) And of lesser importance, to keep the program running to schedule by maintaining efficient recording and processing of data and by ensuring that the young breeders receive adequate husbandry during testing, rearing and laying. While it is of prime importance to avoid increasing the generation interval, this can usually be achieved with little managerial effort hence the relatively low importance of this aspect of management.

To achieve the most from a breeding program, managerial effort should be allocated to each of the above points in the order they are listed so that:-

- (i) whatever is measured reflects genetic differences.
- (ii) selection intensity is maintained at high levels.
- (iii) progress in overall economic value is being made.
- (iv) improvement in the program can be made.
- (v) long term genetic improvement is made possible.
- (vi) maximum gain per year is maintained.

PROBLEMS

Many of the problems associated with breeding in the extensive livestock industries are no longer problems in the poultry industry due to the high level of control we can exert over nutrition, environment and reproduction, and due to the relative ease with which we can test and keep large numbers of breeders. Intensification has brought problems of its own, notably with disease reducing the accuracy of selection, however most of the problems we are left with are more purely genetic and in the field of design rather than management. Most of the managerial problems are likely to be encountered in trying to achieve the aims of management listed above, and may include such things as sub-clinical disease, uneven feed and shed conditions and poor reproductive rates, all of which can be adequately controlled with careful management.

CONCLUSION

Inadequate design and initial implementation of a breeding program can lead to a costly waste of time and selection effort, either on unresponsive or the wrong traits, or by using inaccurate techniques. The aim of management must be to identify and correct any such faults, to attempt to improve the program as much as possible with new techniques and information and to make the highest possible gains over the long term in the overall economic value of the stock.

REFERENCE

SHELDON, B.L., B.H. YOO, R.N. PODGER (1979) *Proc. AAABG* 1:310-311.