13. NATIONAL PLANS FOR IMPROVEMENT OF DAIRY CATTLE, PIGS AND POULTRY IN JAPAN

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It is my greatest honor to have the opportunity to describe the national plans for improvement of dairy cattle, pigs and poultry, which we have been working on in recent years. Story about beef cattle improvement will be omitted here completely because you are going to have one full afternoon in the coming Saturday which will be spent largely for beef cattle, especially Japanese breeds in which you might be much interested.

Dairy Cattle

Background

Much increased importance of each one bull, brought about by rapid growth of the use of semen in frozen state and consequent big expansion of service area of each bull over different regions, aroused a new serious concern about the need of progeny testing of bulls, during the last several years, in order to secure really good bulls for dairy farmers.

The Ministry of Agriculture and Forestry moved to formulate a national plan for dairy cattle breeding, which is far more comprehensive than ever tried in this country. This plan was first put into practice in 1971. It includes building of new artificial breeding centers and bull selection scheme.

Building of New Artificial Breeding Centers

The conventional organization of artificial insemination in Japan is such as each prefecture has its own artificial insemination station and usually confines service to the farmers within the prefectural territory. This is evidently not suited to the age of frozen semen. Building of several new large-scale artificial breeding centers in different parts of the country was planned for nation-wide service with frozen semen. Four of them have already been built to date and are under the management of the Livestock Improvement Association of Japan, Inc. Bulls are kept here, of which semen is collected at a regular interval and stored in frozen state.

Bull Selection Scheme

The procedures of the bull selection program are as follows:

1) *Production of bull calves through designed mating* The Livestock Improvement Association of Japan (LIA) selects bulls and cows to be used for designed mating on the basis of analysis of computorized data and makes contract with each owner of the selected cow in such a way as he agrees to choose bulls to be mated to his cow from among the ones suggested by LIA and also as LIA will buy at a certain price the calf if it is a male. The bull calves thus produced and purchased by LIA are sent to one of National Livestock Breeding Stations to be reared together up to the breeding age.

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2) *Preliminary selection* Normally, such young bulls are 72 in number each year. Half of them will be culled on the basis of growth, type, reproductive ability and so on, and the remaining 36 young bulls are sent to different artificial breeding centers of LIA.

3) *Progeny testing and final selection* The semen of the thirty-six young bulls which newly entered the artificial breeding centers will be sent to at least twenty different prefectures, to be inseminated to appropriate females to get daughters for progeny testing of the sires. Such daughters are reared to the breeding age and then bred in the respective prefectures where they were born. When they near to calving time, they are sent to the testing station of the prefecture concerned. All the results of the performance tests of these daughters are collected and analyzed centrally by LIA to evaluate the sires.

The progeny testing is designed so that at least fifteen daughters complete their lactation for each sire and also that these fifteen daughters are tested in several different prefectures.

Twelve bulls will be selected out of the thirty-six progeny-tested each year in the final selection.

4) *Use of seected bulls* The bulls are kept alive at the artificial breeding centers at least until the results of progeny testing come out. In the meantime, nearly 50,000 doses of semen are collected from each bull. After the final selection based on the progeny tests, the semen of the selected bulls will be released for general use, and additional 10,000 doses will be collected from each of these bulls during the folowing one year before slaughter. The semen of the bulls not selected in the final selection will be discarded.

Fig. 1 gives a summary of this bull selection scheme.

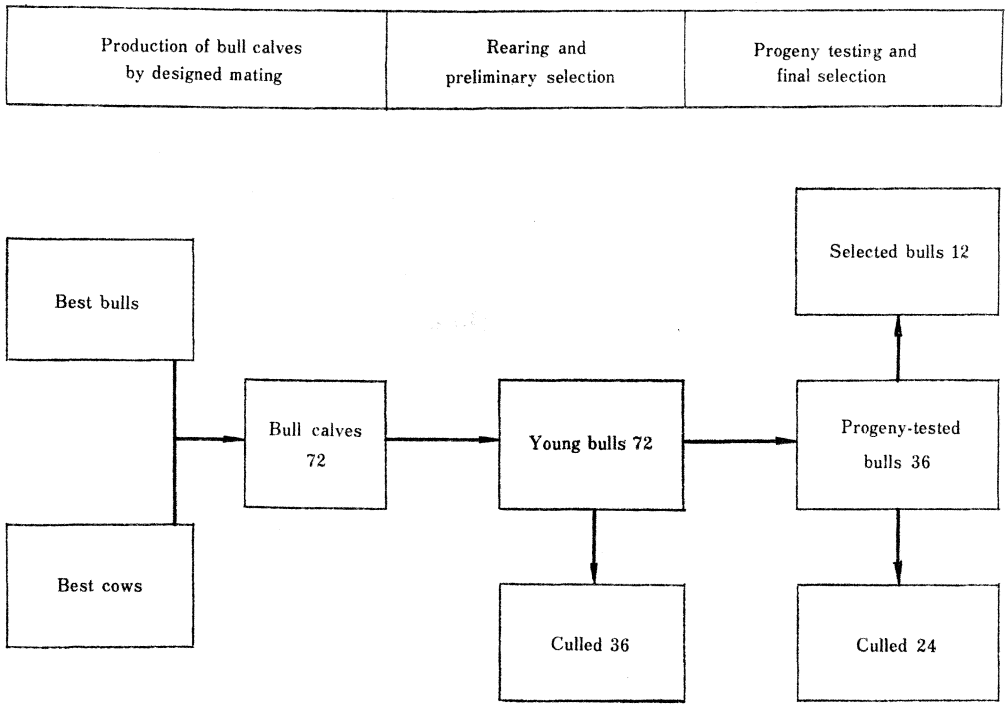


Fig. 1. Summary of bull selection program

We are now in the third year from the the start of the bull selection program. The bulls produced by the first designed mating in 1971 have just completed their rearing period and are facing the preliminary selection. We have still to wait until 1977, when the first finally selected bulls come out.

Bull Selectoin Program in National Livestock Breeding Stations

The Ministry of Agriculture and Forestry started a similar selection program also for the bulls produced by the National Livestock Breeding Stations under the management of the Ministry itself, one year earlier than the abovementioned scheme was put into practice. Detail will not be described here, but it is expected that eight bulls are selected finally on the basis of their progeny's performance tests and the semen thereof will be distributed through the artificial breeding centers of LIA.

Pig

Bacground

Until 1959, Middle Whites predominated in pig population of Japan, Berkshires coming second although the number of the latter was far much smaller than the former. Landrace was first introduced in 1960, and continued to increase in number thereafter, becoming the most dominant breed at the moment. Large Whites and Hampshires were also introduced in the following years.

Crossbreeding of pigs began with the introduction of Landrace. Pigs on the market are now largely of crossbreds. They were Landrace × Middle White and Landrace × Berkshire at first, but crossbreeding with Landrace on dam side and with Large White or Hampshire as sire is more common now as Landrace population has expanded. Three-way crossbreds ,backcrossbreds and more complicated ones are found occasionally.

Ten years' experience of crossbreeding, however, made it clear that we are not getting best results expected from well-designed crossbreeding. Essential importance of efforts in development of superior strains for successful crossbreeding was increasingly recognized among pig producers.

Development of Strains in Public Institutions

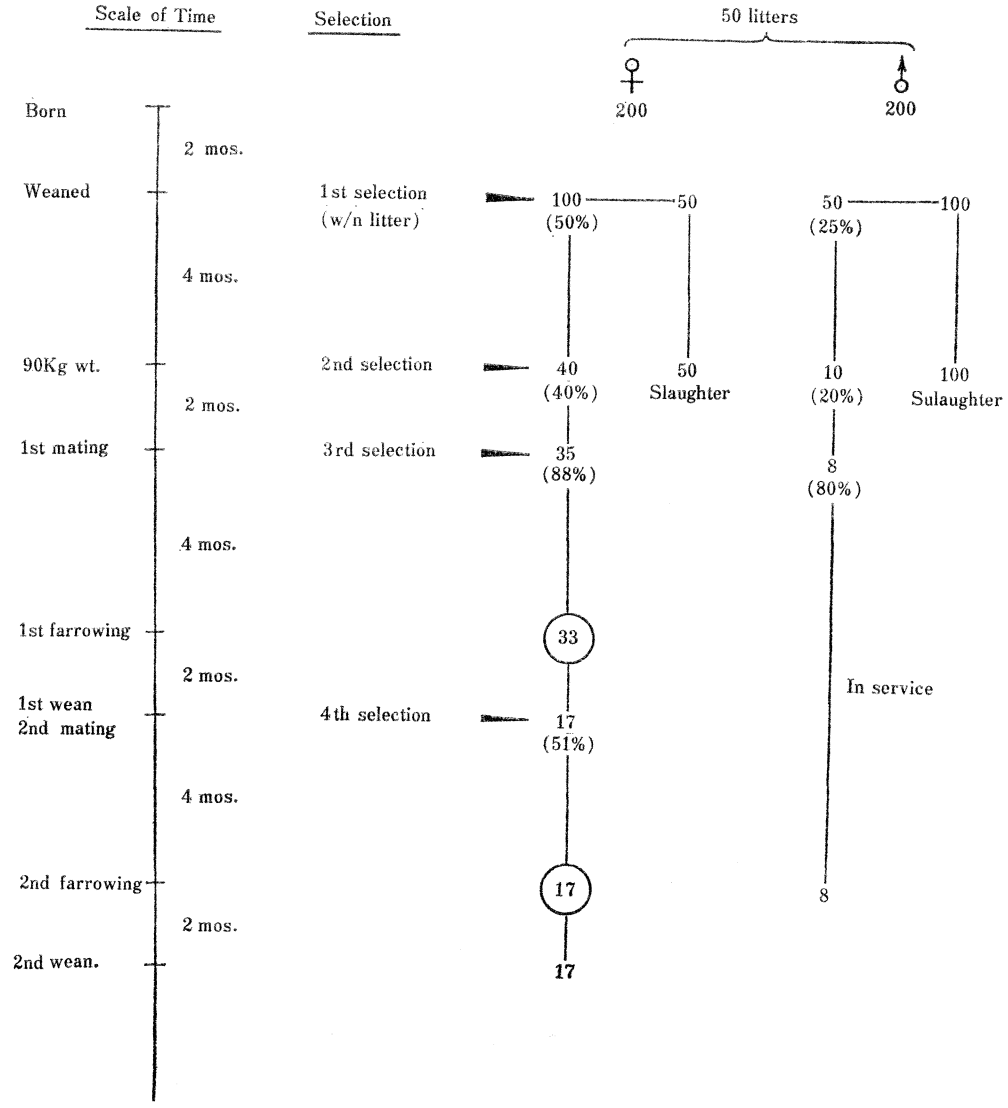
Project for developing strains by closed-herd breeding for several generations started in 1970 in some of National Livestock Breeding Stations and of prefectural livestock experiment stations, in close cooperation with the National Instiute of Animal Industry. Many of the prefectural facilities involved are subsidized by Ministry of Agriculture and Forestry.

Each herd has about fifty breeding females and ten breeding males. Intense inbreeding like sid-mating is avoided and emphasis is placed on effective selection. Inbreeding effect of selection is expected to accumulated up to a final inbreeding coefficient of 10 to 15%.

An example of selection program is given in Fig. 2.

Selection index is used in the second selection. The index utilizes informations on the individual and also from the carcasses of slaughtered full-sibs. It is noted that sows are used no longer than their second farrowing in this herd in order to keep average generation interval as short as possible.

Relative emphasis placed on different characters varies somewhat from herd to herd. But, reduction of backfat thickness and increase of eye-muscle area seem to be most important objectives of selection in all of these herds.



Note: Figures in parentheses indicate selection percentages.

Fig. 2. An example of selection program for pigs (Assuming that each litter has 4 eligible males and 4 eligible females.)

Development of Strains by Group Activity among Small Herds

Ministry of Agriculture and Forestry is encouraging also the group activities among purebred herds, which are usually very small in size, to make cooperative efforts in developing a strain under a certain selection program.

This scheme has just started this year. Forty such groups of herds are being formed in different parts of the country. The principle of the scheme is that about one hundred animals selected in the participating herds constitute the foundation stock for breeding, and young boars for replacement will be selected on the basis of the result of perform-

ance test on the prefectural boar testing station, while gilts for replacement are to be selected by farm-testing with two full-sibs slaughtered to provide carcass informations

Artificial Breeding of Pigs

Less than ten percent of gilts and sows are bred artificially at present. From the viewpoint of pig improvement, however, Ministry of Agriculture and Forestry has began to subsidize building of new prefectural centers for artificial insemination of pigs, paired with facilities for boar testing. The semen of the top-class boars selected by performance test will be distributed mainly to purebred herds.

Progeny Testing and Board Testing

First progeny testing stations were built as early as 1959. And now, most of the prefectures have their own stations. However, the testing capaicty of station is small in most cases, consequently the number of boars progeny-tested annually being too small to make an effective selection.

Boar testing, with or without litter-mates to be slaughtered, started several years later, but has been expanding steadily.

For the future, we plan that the prefectures concentrate on the boar testing, and some organization with financial support from Ministry of Agriculture and Forestry takes over the progeny testing, building several new stations, which would provide big enough capacity to make progeny test to be really effective and useful for selection.

Poultry

Background

Although the foreign commercial chicks dominate our market, best efforts are being made by domestic breeders and governmental organizations in breeding of chicken to produce crosses competitive enough or even superior to the foreign brands.

During the last several years a national program of testing two-, three-, and four-way crosses made from available conventional strains maintained by National Livestock Breeding Stations and prefectural poultry experiment stations was undertaken in cooperation of Ministry of Agriculture and Forestry and prefectural governments. More than 1,800 crosses have been tested so far, and the best ones are now in commercial production.

There is, however, an urgent need for development of new superior strains for the future.

Layers

Ministry of Agriculture and Forestry has three National Livestock Breeding Stations for poultry breeding, two of which are for layers and the other one for meat type chickens.

As for layers, development of purebred as well as synthetic strains and preliminary combining ability test among them are made in Livestock Breeding Station at Okazaki. Livestock Breeding Station at Shirakawa undertakes crossing tests among the collected strains, including ones developed at Okazaki, first to find good two-way crosses and then to proceed to find most efficient three-way and double crosses. The crosses thus considered promissing are then tested for local adaptability in some twenty prefectural testing facilities. The grandparents of the crosses finally selected are sent to certain multiplication centers in some parts of the country. The progeny of them first appeared on the market this year as commercial chicks.

Meat Type Chicken

We did not have any meat type breeds of chicken until relatively late. The breeds we have at present all originated from U.S.A., Britain, France and so on.

Improvement of meat type strains is made in Livestock Breeding Station at Hyogo and progeny testing in cooperating prefectural poultry experiment stations.

Objectives and Methods of Selection

Selection index is used for selection within strains. Each strain is to be improved to a certain satisfactory level in such economic traits as egg number, egg weight, body weight, age of sexual maturity, livability in both growing and laying periods, and so forth, before they are put to test for crossing ability. The reason for this is that the performance of the original stock is evidently most important even in three-or four-way crosses.

Little attention is paid to egg quality characters, except for shell quality and meat and blood spot incidence.

In considering crosses, especially the three- or four-way ones, emphasis is placed also on the egg production and hatchability of the female parent stock.

Breeding for Disease Resistance

Special reference should be made to the breeding of chicken for resistance to Marek's Disease (MD), under way in Livestock Breeding Station at Shirakawa. This program started in 1968, and now we have the biggest breeding facilities for disease resistance in the world, where at least 20,000 birds are tested and autopsied each year.

There was a serious discussion about which should be more emphasized, genetic breeding for resistance or development of a vaccine. Decision was made that efforts should be made on both. MD vaccine was released for general use last year, and chicks produced in Japan are largely vaccinated with MD vaccine (herpes virus of turkey) at the present time. But since the cost of the vaccine camp up to nearly 10% of the chick price and the preventive effect was not always perfect, much attention was drawn again to the breeding for resistance.

Since 1968, breeding work for MD resistance has been going on an isolate farm specifically set up for this purpose in Livestock Breeding Station at Shirakawa. In the first two years, basic investigations were made to design effective breeding plans. Artificial infection was made by injecting the blood of infected birds to all day-old chicks, and incidence of the disease was checked up to 120 days old with autopsy of all the survivors at this age. All the chicks were pedigree-hatched and MD incidence was recorded for each family, for each strain difference in resistance was observed. Inter-family difference in MD incidence within strains was also evident. The heritability of MD resistance turned out to be 25–30%. In no strain, association of MD resistance with other economic characters was found.

Up to the present time, all the purebred strains maintained by National Livestock Breeding Stations, whether layer or broiler, have been screened by MD resistance test, and important two-, three-, and four-way crosses have also been tested. MD resistance shows poligenic inheritance and F_1 between resistant and susceptible strains seems to be somewhat more resistant than intermediate.

Fig. 3 shows distribution of MD incidence for each family of two strains for three years from 1970 to 1972. It would be observed that distribution tended to move toward low incidence during the three years.

Even resistant strains, when injected with MD virus, show incidence of 10–15%. But the incidence for such strains under natural infection in the field is negligible.

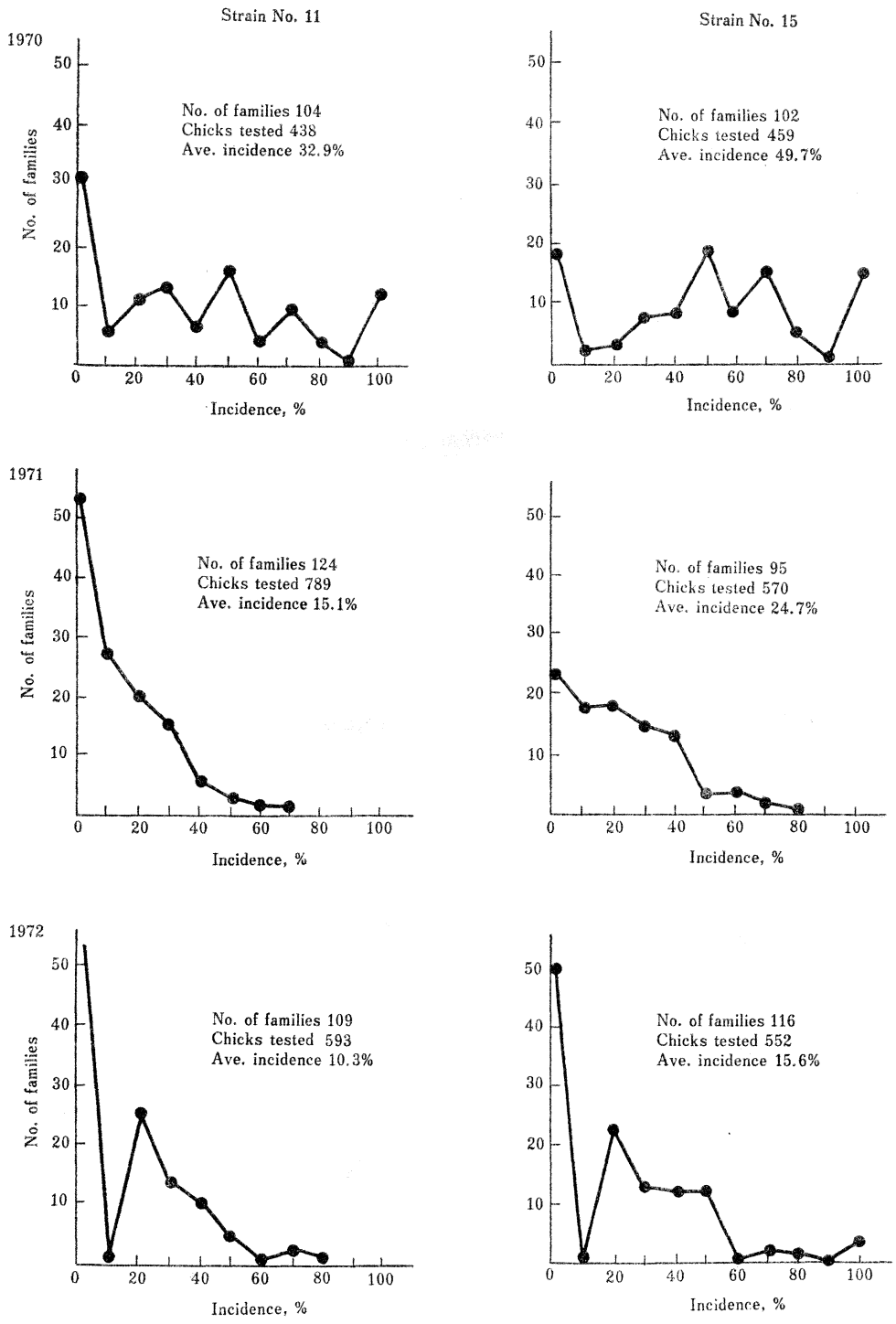


Fig. 3. Selection effect for incidence of MD
—The distribution of familial MD incidences by strains for three years—

It is also observed that some crosses we are ready to produce would, without vaccination, be more resistant to MD in the field than common vaccinated birds.