



AIPL RESEARCH REPORT
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Enhancing genetic improvement for milk yield by reducing generation interval

H.D. Norman and S.M. Hubbard

*Animal Improvement Programs Laboratory, ARS-USDA, Beltsville, MD
20705-2350*

*301-504-8334 (voice) ~ 301-504-8092 (fax) ~ inquiry@aipl.arsusda.gov ~
<http://aipl.arsusda.gov>*

For dairy cattle, breeding decisions by U.S. dairy farmers are based largely on genetic evaluations calculated and released by the Animal Improvement Programs Laboratory (AIPL). Those evaluations are the primary source of information for determining which animals will be selected to be the parents of the next generation of the U.S. milking herd of 9.2 million cows.

The interval between breeding generations is one factor that influences the rate of genetic improvement in selection programs. Providing genetic evaluations to farmers more rapidly allows selection decisions to be based on more accurate information. Quicker turnaround allows earlier identification of those animals with the highest genetic merit. Thus, farmers can better decide which cows to retain and which semen or embryos to purchase.

A project was begun by AIPL in April 1995 to shorten the interval between breeding generations by decreasing the time needed to process and to deliver genetic evaluations. Computer processing of records from the nation's dairy herd requires the analysis of over 60 million milk records, solving over 40 million equations simultaneously, and preparing evaluations and associated information for release to 40,000 breeders, 100 artificial insemination organizations, 65 extension specialists, 6 dairy records processing centers, 7 breed registry societies, and hundreds of researchers as well as to counterpart groups worldwide.

Processing and release of genetic information were converted from a mainframe computer to a UNIX workstation to capitalize on the improved processing speed and memory size available with new computer technology. The distribution system was redesigned to improve the efficiency of information delivery, including the development of an extensive web site so that all genetic information supplied by AIPL can be distributed electronically through the Internet.

The AIPL web site makes genetic information on the U.S. dairy population instantaneously and directly available to the industry. Electronic file transfer allows earlier, simpler, and more equitable access to information by all users than is possible through traditional delivery systems while reducing labor, space, and financial needs. Simultaneous delivery of genetic evaluation information, which had been a U.S. dairy industry concern when using traditional mail and express delivery services, is now possible regardless of time zones. A system with unique passwords also was developed to ensure that access to organization-specific files is limited to authorized organizations only.

The elapsed time for producing national genetic evaluations for dairy cattle was reduced by 5 weeks. The increased efficiency of updating the database and subsequent processing allowed AIPL to release genetic information on U.S. dairy animals quarterly instead of semiannually. Quarterly release reduced the average wait from data collection to genetic evaluation by an additional 6 weeks. Because of the reduced computer processing time and more frequent delivery of genetic evaluations, the U.S. dairy

industry can now select semen, embryos, and animals of higher genetic merit more quickly for breeding.

The additional annual economic value of the genetic merit of dairy cattle that has resulted from breedings since the processing and distribution systems were enhanced is estimated to be over \$60 million annually to U.S. dairy producers and U.S. consumers. Because genetic improvement is permanent, those gains are perpetuated and will compound over the years. The resulting gains in production efficiency are expected to increase U.S. producer income, which, because of competition, will quickly be transformed into reduced cost of dairy products for consumers. Gains in production efficiency also help keep U.S. cattle, semen, and embryos in demand internationally.

In recognition of AIPL's project for "enhancing genetic improvement for milk yield by reducing generation interval," Government Executive magazine presented AIPL with 1 of its 19 Government Technology Leadership Awards in December 1998 at the Reagan International Trade Center in Washington, DC. The AIPL project was selected from nearly 200 nominations. This factsheet was extracted from the handout for the award ceremony.