Dairy Herd Improvement (DHI) Program In Taiwan(1)

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Abstract

The Dairy Herd Improvement (DHI) is one of the most important projects for dairy industry in Taiwan. It provides reports for dairy farmers to make selection and management decisions. Reports of milk constituents, cows' performance information and farm management efficiency are published monthly for dairymen. In 2000, There were 217 dairy herds, 13,989 milking cows enrolled. The average herd size for milking cows was 64 heads per herd with average parities of 2.57; the average 305-2X-ME milk yield was 6,623 kg and the average daily milk yield was 21 kg. The average percentage of fat, protein and lactose in milk were 3.57, 3.11 and 4.55, respectively. The average somatic cell count in milk was 523,000/ml. Reproduction data of 9,712 cows in 1999 reveal that the interval from calving to first service was 117 days and the days open was 178 days. Because internet is gradually becoming popular, the DHI program in Taiwan is furnishing internet (http://www.angrin.tlri.gov.tw) with the Microsoft IE5.0 browser. Active Server Pages (ASP), VB Script and Microsoft SQL have applied in developing dynamic homepage. Each dairyman has their own farmer code and password to input his dairy herd performance data and print out the management reports with different color remarkings to illustrate the importance of information via internet. These reports can be used as to improve farm management practices and milk quality.

Key words: Dairy Herd Improvement, Performance, Internet.

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Introduction

The Dairy Herd Improvement (DHI) is one of the most important projects for dairy

industry in Taiwan and in all dairy developed countries (Mao, 1987). It is a project of dairy herd data collecting and processing and provide the uniform, accurate, and essential reports for farmers to make precise management decisions and increase net profit for farmers. It is also a kind of test practice for individual dairy cattle performance which includes weighing and sampling and/or analyzing of milk sample so that the farmer knows the performance of all individual cows in his herd. The assembled DHI records will form into a national dairy database for the use of management improvement program, extension, research, and education. Because this project has been conducted since 1977, the dairy herd performance in Taiwan were improved year by year (Chang et al., 1997). Chang(1988) used DHI database and analyzed the causes of culling and herd life of cows. Cows sold for breeding purpose made up 0.75% of the total, culled for old age accounted for 5.15%, and the others were all culled for particular reason. The most important culling reason were diseases, 28.29% reproductive problem, 24.98% udder problem, 11.31% calving trouble problem. The mean of the herd life was 2.76 lactations. Because the herd life of the cows was very short, the dairy farm management was influenced directly.

Materials and Methods

Structure of DHI in Taiwan

Farmers, technicians, milk laboratory and records processing center are the main component of DHI program. Each component plays an important role in determining if each record is appropriate for its intended use and assures quality records that can serve farmers' needs. The farmers' responsibility is to keep the updated recording in his herd. DHI technicians are the persons approved and employed by the DHI program to certify the performance data collected at the farm. Now there are 11 technicians employed by Dairy Development Association of R.O.C. (DDAC) DDAC is an association constituted of dairy farmers, dairy processing plants, scholars and specialists in dairy area. Milk Laboratory is approved by government, through quality certification to analyze components of milk samples. Dairy Records Processing Center (DRPC) is an organization approved by the government to electronically process records and comply with approved procedures for records calculations. Both Milk laboratory and dairy records processing center are located in Hsin-chu branch, Taiwan Livestock Research Institute. This institute belongs the Council of Agriculture(COA), Executive Yuan. Forage testing laboratory at this institute is cooperated with DHI to test and to provide dairy farmers with fast, accurate results on forage nutrients.

Procedures of DHI

All essential data from dairy farm are with a uniform records format folder. DHI technicians visit farm once a month routinely with a minimum of interference. They will collect farm's data and write down the barn sheets printed by the DRPC.

I. Cows to be identified

All cows in the herd enrolled on DHI record plan are with the same herd code and must be identified with a permanent identification number or a herd number. If the metal ear-tag is not on the ear, the number must be cross-referred to herd number. Herd number

can be frozen branded herd number or ear-tag or electronic identification system. All identification system is visible from several feet so that the technician can identify the cow quickly and accurately during milking. A cow calved or bred or dried or left the herd in the period between test days will be recorded. The actual birth date, the identification number and the parent of calf, the complete code number of mated sire and breeding date, the dry date and the main reasons of cow leaving herd will also be recorded.

II. Milk weighing and sampling

Cows calved for over six or more days will have her first milk weighed and sampled beginning at the evening milking, then the morning milking, counting the day of calving as the first day. Weighing and sampling devices are carried and supplied by technician according to the manufacturer's written instructions. To ensure the highest quality of milk samples and to prevent the infection of disease, it is strongly recommended that the farmer owns his own weighing devices. Milk sample should be representative of the milk yield of the cow at any one milking. Test day data along with milk samples will be shipped by private freight transportation company. If farmers do data collection and milk sampling by themselves because technicians are not available, they are on unsupervised tests. The farmer will have the responsibility for accurate data collection in accordance with these uniform procedures.

III. Milk components test

Milk components such as fat, protein, lactose, and somatic cell count (SCC) are determined from milk sample by the assigned milk laboratory. Solids-not-fat (SNF) is calculated directly based on milk components. Milk laboratory then passed the results to the DRPC and combines with other data collected.

IV. Records processing

DRPC organizes all data collected and generate reports for farmers. DRPC's most important work is to calculate the lactation milk yield totals and standardize the milk yields to 305-2X-ME yield so that yield of different cows can be compared (Chyr, 1977) and culling decision can be made.

Reports for the farmer

DHI program provides information to both dairy farmers and dairy industry. There are four kinds of reports from DHI service for the farmers:

I. Monthly reports include Dairy herd performance and the results of milk component tests. The milk yield information for the farmer includes the daily milk yield and SCCS in the previous 9 test day and current test day, calving date, days in milk, the yield and percentage of fat and protein in the test day, and yield totals, projected 305-2X-ME milk, fat, and protein in current lactation. Other information includes in the report are days dry, breeding date, sire code mated, breeding interval, days open and service times as well as abnormal data code. The second main report provides information on the daily milk yield, the percentage of fat, protein, lactose, total solid and Somatic Cell Count

per ml of all individual cows as well as the average of the herd for the above components.

II. Management reports are sorted and derived by computer from the main data file and printed out for a specific purpose. These types of optional reports add value to the basic DHI records and aid in making farm man-agement decisions. The Management reports in-clude:

- somatic cell count (mastitis monitoring) programs
- action reports for cows to breed, pregnancy check, dry off, freshen, cull.
- individual cow lifetime summary
- multi-year herd summary
- group analysis report
- persistency analysis
- lactation curve

III. Operation efficiency reports are herd summary reports which summarized the herd's general status for the past 12 month. It includes rolling herd average, somatic cell summaries, reproductive statistics and many other useful information.

IV. Other statistics reports are published on Dairy Farming Newsletter bimonthly issued by Hsin-chu branch, TLRI. These reports include the top 50 individual cows on milk yield, fat yield, and protein yield, the top 50 farms on lowest SCC in milk, the top 50 farms on herds average of milk yield, and the top 3 farms on the average of milk yield within each of 11 counties in Taiwan.

Results and Discussion

Enrollment of DHI

DHI project in Taiwan was originated in 1977. Table 1 shows 344 herds, 3250 cows participated in DHI program in 1981. From 1981 through 1984, the enrollment percentages were over 30% for herds and over 20% for milking cows. Originally, there were 23 technicians working for data collection. They used portable scale to measure milk yields and went to the milk collecting station near by to test the fat percentages by simple fat test equipment. In 1986, many farmers replaced their milking equipment with pipeline machines but without purchasing milk test meters along with machine. Due to inconvenience in milk weighing, the number of herds and cows in DHI decreased dramatically and only 13 technicians remained in DHI program. From 1987 through 1990, enrollment in DHI increased again, but the percentage was still low. Before 1989, only monthly DHI report was available to the farmer. In 1989, Hsin-chu branch, TLRI established a milk test laboratory with advanced equipment, all DHI milk samples were analyzed thereafter. Since the DHI program was a government project, the farmer needs not to pay, but from 1991, the program started to charge farmers NT$20 for each milk sample tested, however, the enrollments decreased again. But after the monthly DHI reports and SCC information are available for the farmers, the enrollment increased again. Owner sampling program started in 1992. From June, 1999, the milk pricing system included milk SCC, many farmers enrolled in order to obtain the SCC information to cull the trouble cows. The number of enrollment increased dramatically and 22% of cows in Taiwan were enrolled in 2000. The expected enrollment in next 5 years will reach 40%.

Table 1. Dairy cows enrollment in DHI from 1981 to 2000

* From agricultural statistics yearbook(1990,2000).

Milk yield and components in milk

Table 2 shows the averages of daily milk yield and 305-2X-ME yield as well as herd size enrolled in DHI since 1981. The milk production was increasing from 1981 with a stable rate. Though the number of dairy cows in Taiwan increased over the past two decades, the average amount of milk produced per cow has also increased steadily. But from 1995 through current, the improvement of milk yield was very small. There must be some bottleneck that needs to be solved, may be the hot and humid environment.

Table 3 shows the distribution of parity of milking cows in DHI with the average parities 2.57 in 2000. Cows with parity less 3 counted 75%. It indicated that one third of cows were culling before parity 3 and farmers need to keep at least 33% of yearling heifers to replace the cows each year. It also indicated that farmers need to raise much more young heifers that no incomes from them. The more the farmers raise young heifers, the more the cost of milk production per kilogram and the less the farmers benefit.

Table 2. The averages of daily and 305-2X-ME milk and herd size from 1981 to 2000

Table 3 . The distribution of parity of milking cows in DHI

Table 4 indicates the average component of milk sample and SCC from 1996 to 2000. Milk component was stable but the percentage was lower than milk sampled in US (Cassell,1990). SCC in milk was high at the beginning, over 605 thousand. Since 1998, the government conducted a project that subsidized farmers to cull cows with lower production and higher SCC, then the average of SCC lowered.

Table 4. The summary of components of milk sample in
DHI program in the recent 5 years

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Table 5. The distribution of SCCS in DHI herds by months from July, 1999 to June, 2000

SCC calculation ranges from several thousand to several ten million. Instead, in DHI reports, the SCCS with a range from 0 to 9 were used. The results for SCCS and SCC are shown in Table 5. These figures are higher than that of DHI reports in US. (Heuven et al., 1988; Schutz et al.,1990). In 1988, when Dr. R. E. McDowell visited Taiwan and went through the SCC in DHI files, he suggested that an ideal percentage for each SCCS as the goal for DHI herd in Taiwan. Form Jun to Oct, the percentages of SCCS over 4 were higher than the goal suggested by McDowell (1988). How to lower SCC in hot months is an urgent problem to be solved. Figure 1 shows the relationship of the average of daily milk yield

and SCC in milk in different months from 1996 to 2000. It apparently shows a negative effect of SCC on daily milk yield.

Reproductive efficiency of DHI herds

The reproductive status also plays a large impact on production and profitability. Reproductive problems result in excessively long lactation or long dry periods or both. Both are costly to the dairy producers. Table 6 shows a summary of reproduction efficiency of DHI herds in 1998 and 1999. The average days open was 178 days. Compared with ideal figure, 110 days, it lasted 68 more days. The average services per conception was 2.7. It is higher than ideal figure by 0.5 service (Grusenmeyer and Hillers, 1989). Reproductive problem is another important issue in Taiwan.

Dairy Farming Newsletter is a bimonthly magazine issued by Hsin-chu branch, TLRI for all dairy farmers, dairy extension people, researchers and students in Taiwan. This magazine started to issue in February 1994 and now 41 issues has been published. The DHI reports which included the top 50 individual cows in milk yield, fat yield, and protein yield, the top 50 farms with the lowest SCC in milk, the top 50 farms in herds average of milk yield, and the top 3 farms in the average of milk yield within each of 11 counties in Taiwan are the most important content on each issue of the newsletter.

Table 6. Summary of reproduction efficiency of DHI herds

The future of DHI in Taiwan

Taiwan is applying for membership of WTO. Milk production efficiency must be continuously improved in order to compete with the global marketplace. Farmers should apply the available management information to their specific farm situations. DHI records and reports should assist farmers in making daily management decisions.

Because Internet is getting popular and popular in Taiwan in recent years. DHI is going to use Internet with the Microsoft IE5.0 browser as a tool for dairymen to input and to get herd information from the plan. A team of researchers in TLRI is doing efforts in updating DHI data processing system with Active Server Pages (ASP), VB Script and Microsoft SQL to develop dynamic software. The website is http://www.angrin.tlri.gov.tw. This website provides an information delivery system to disseminate dairy farming management information which include newsletter, extension bulletins, and the reports of meeting and seminars as well as the related dairy organization. Each farmer will have his own farmer code and password. He can access easily and routinely to update his monthly herd and cow test day data to the DRPC database and print out with color marking on his management reports to illustrate the importance of information via internet. Updated systems will provide the farmer with a comprehensive, well-organized record-keeping system. Rather than having several sets of records, i.e., one set for production information, one for breeding and health records, new system will put it all together in an easy-to-use, powerful system. Any of reports can be modified and even be designed by

the farmer on his PC computer via Internet to meet his specific needs. Reports are in pocket form. Farmer can carry them all of the time when he need information on a particular cow so that he can make better decisions immediately and might get more profits. Another feature of the reports via internet will be turned the dairy records into ease to use and understandable graphs, help farmer to see the trends and relationships which may go unnoticed and how well the farmer is doing immediately. Such kind of graphs may include the followings. Individual cow graph can show the milk production, fat, protein, somatic cells, breeding and health information for a cow's current lactation. Lactation curve comparison graphs will show how an individual cow compares to the other cows in the herd. Past 25 month graphs are herd summary statistic reports. The information of AI frozen semen will also be included in DHI files to help the farmer to maintain a current list of all available sires on hand through internet and the number of units for each sires can be purchased, as well as their current breeding values and pedigrees can easily acquire via hyper-link. When farmer input breeding data, the units of semen are automatically deducted from the semen inventory. Yet, the most important for the successful DHI internet is that the farmer has to record herd's data accurate, keep data currently, update them into the DHI database promptly so that every report is accurate and useful.

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台 灣 乳 牛 群 性 能 改 良 計 畫 (1)

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摘 要

乳牛群性能改良(DHI)為國內乳業重要計畫之一，提供酪農個別牛隻牛乳品質檢驗及性能檢定月報表及相關的經營效率報表作為選育牛隻及改善牛群管理之參考。2000年有217戶，13,989頭泌乳牛隻參加本計畫，每戶參檢泌乳牛平均64 頭，平均胎次2.6 胎，平均305-2X-ME乳量6,623公斤。每頭牛之每日產乳量平均 21公斤，乳脂率3.57%；乳蛋白質率3.11% ，乳糖率4.55%，體細胞數每毫升52.3萬個。分析9,712頭乳牛繁殖性狀資料，分娩後第一次配種日數平均為 117天，空胎日數平均為 178天。近年網際網路逐漸普遍，各行業均用之經營其事業，國內DHI計畫已用IE 5.0為操作環境，HTML配合Active Server Pages (ASP)及用VB Script為主要開發語言，配合微軟公司的Microsoft SQL Server 7.0資料庫軟體，架構DHI資料庫網際網路系統，網址為http://www.angrin.tlri.gov.tw/。酪農戶進入網站，由單一視窗輸入代號及密碼後，就能輸入自已牛群資料，列印管理報表。而管理報表配合顏色分類，酪農可列印報表，及時有效地運用報表改善牛群管理，提升生乳品質。

關鍵詞：乳牛群性能改良、性能、網際網路。

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