โครงการปรับปรุงโคนมที่มหาวิทยาลัยเกษตรศาสตร์

Dairy Cattle Improvement Program at Kasetsart University[1]

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Health authorities and nutritionists have long recognized milk as nature's nearly perfect food. Milk has been shown to be an efficient supplement to almost any type of a diet because it is capable of supplementing dietary inadequacies of minerals, vitamins, amino acids (protein) and fatty acids. Milk should be a part of the diet for all ages.

Thailand imports over 400 million baht (20 million dollars) worth of milk annually. Fresh milk production is very limited—perhaps around 10,000 liters (2,642 gallons) per day. Production per cow is very low—estimated by some to be about 5 liters (11.35 pounds) per day.

There is an increasing interest in developing a good fresh milk industry here in Thailand. This interest has been supported by the large number of Indian and European dairy cattle imported into Thailand for many years.

Unfortunately, the progress in deyeloping a highly profitable dairy industry has been very slow. The slow rate of progress can be attributed to many factors. These factors in which breeders are directly interested are the following: (1) The dairy animals of Indian breeds tried have not proven to be good milk producers. (2) The importation of European breeds have proven to be very costly and subject to death losses and poor performance because they have been exposed to the hazards of long distance transportation stress, changes in climate and feed, exposure to local diseases and parasites, and finally, poor local managerial practices. (3) No matter how good a quality the animals are, they cannot respond beyond the managerial level.

Dairy cattle breeders must realize that the improvement of dairy cattle must result in an increase in the economic value of the cattle and their production. Thus a breeder must pay attention to characteristics that make money. Since milk production is the primary source of dairy income, there is no point in raising dairy cows that are not high milk producers.

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1. A progress report of Kasetsart/Hawaii University Contract Project No 3, "Crossbreeding to Develop Dairy Cattle Adaptable to the Humid Tropical Region."
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In the dairy cattle breeding program the old advice "breed the best to the best" still applies but the problem is to determine what makes up the best and how to find the best.

Records of milk production in the various parts of the world have shown that the amount of milk a cow can produce in a single year's lactation period may vary among individual cows from 1,000 lbs. (454 kg.) or less to over 30,000 lbs. (13.600 kg.) of milk. The design and execution of the breeding program will determine whether the production average of the cows will stay near 1,000 pounds of milk per year or consistently improve towards 30,000 pounds.

It is understood that a successful dairy cattle improvement program must deal with the improvement of the genetic make up the cattle as well as the improvement of managerial practices.

The greatest single problem faced by dairy cattle breeders in the tropics is how to collect desirable genes for milk production to combine with the genes of heat tolerance, adaptability, disease resistance, etc. present in the local stock. Since frozen semen has been used successfully in many parts of the world in the dairy cattle breeding program, the possibility of using imported frozen semen to improve the local stock has been considered. An initial test shipment was received by the Animal Science Department of Kasetsart University in June 1962.

WHAT NEEDS TO BE DONE

If milk production in Thailand is to be increased, made less expensive, and more practical, the method of importing high quality milk production genes must be found and the animals suitable for local conditions must be developed. It is felt that the Animal Science Department of Kasetsart University can contribute materially to the health and welfare of the general public and to the agricultural industry by contributing to the major problem just stated.

OBJECTIVE OF THE STUDY

A project was designed to determine the feasibility of importing and using frozen semen from production tested bulls to cross and grade up the local animals to develop high producing dairy cows suitable for Thailand conditions. It was decided to test the feasibility of using frozen semen because if it proved to be practical, it would be possible to breed cows in Thailand with outstanding bulls found anywhere in the world without paying high prices for the bulls and without subjecting them to the harzards of long distance transportation, changes of climate and feed, exposure to local diseases, parasites and inferior management.

MATERIALS AND METHODS

This project was officially initiated under KU/UH Contract support on November 1, 1962. The work has been carried on at the Kasetsart University dairy farm at Bangkhen, Bangkok.

Foundation Animals. The animals that made up the dairy when the project was initiated formed the foundation animals. Their ancestors trace back to the "Thai native" cattle and Zebu. For convenience they may be classified ac -cording to the predominanc of a breed or the amount of the desired breed that make up the animal as follows: (1) 66 cows and heifers of breeding age–32 grade Red Sindhi, 28 one-half Brown Swiss, and 6 with miscellaneous mixtures; (2) one mature Brown Swiss bull; and (3) six heifers below 15 months of age (Table 3).

Frozen Semen. The frozen semen used was imported from the Minnesota Valley Breeders Association of New Prague, Minnesota, U.S.A. It was brought into Thailand by air in a liquid nitrogen kit as needed. It looks as if a once -a-year shipment is sufficient and practical. The frozen semen is stored in an electric deep freeze in alcohol with dry ice used as a safety measure in case of an electrical failure. For further details on the use and handling of frozen semen, refer to the report on the artificial insemination program with the frozen semen.

Breeds. Breeds of bulls chosen were Brown Swiss and Holstein-Friesian. Brown Swiss was chosen because the Department had previously used Brown Swiss bulls and had made first crosses. The results of the crosses seemed promising. Holstein-Friesian was chosen because the black-and-white animals have been raised successfully under very wide climatical conditions in many parts of the world. Since there are so many high producing cows in the breed, the chances of getting semen from potentially good bulls are easier and better.

Individual bulls from which to obtain semen were selected on the production potential and the freezing and keeping quality as recommended by the bull stud. In each shipment semen from about three different bulls of each breed was imported.

Breeding System. In the beginning, half of the foundation cows was bred with Brown Swiss frozen semen and the other half with Holstein semen. In the following year the breeds of the sires were reversed. The breeds of the sires will be alternated each year as long as the foundation animals remain in the herd.

The resulting female calves will be graded up with frozen semen from respective breeds. The grading up will continue until an optimum level of European and local genes is determined. After an optimum point is reached, it is hoped that a breed or breeds suitable for Thailand conditions will be developed.

RESULTS AND DISCUSSION

Births. Table 1 shows that by the end of May 1963 there were six males and nine females added to the project. Of these two males and six females were born through the use of the initial shipment of frozen semen. During the following year ending May 1964, there were nine males and twenty females added to the projcet. Of these three males and six females were from frozen semen. During the next eleven months, by the end of April 1965,

there were 16 males and 24 females born in the project; of these, 15 males and 21 females were the result of the use of frozen semen. Thus during the period of this study there was a total of 31 males and 53 females born in the project, of which 20 males and 33 females were frozen semen calves.

Animals Sold or Slaughtered. During the past two years, five animals were sold and four animal were slaughtered for various reasons.

Death Losses. Table 2 shows that during the past two years 23 animals died. Of these 7 were over 15 months of age, 11 were between 6 and 15 months, and 5 were less than 6 months. Only one calf was less than a month old and it was crushed to death by the dam. There has been no problem with the health of the young calves. In fact, there has been no problem with the general health of the animals.

The causes of death have been rather mysterious and undetermined. Very little information was obtained on animals that died during the period of December 1963 through May 1964. Animals posted during the period of December 1964 through April 1965 showed considerable inflammation of the internal organs and almost complete destruction of the stomach linings. This would indicate possible ingestion of a poisonous material or local production of toxins. There was some indication that hemorrhagic septicemia might have been involved.

The following situation was noted. The general health of the animals was very good. The attack was very sudden and fever may or may not have been present. Death usually resulted in 24 to 48 hours after the attack. Generally, severe diarrhea, often bloody, was noted. Only a few cases recovered. The attack took between January and May.

Inventory of Animals. Table 3 shows that in 2-1/2 years the number of animals in the project has grown from one male and 72 females to 20 males and 103 females. This is a very satisfactory growth of the project.

Milk Production. The milk production ability of the foundation cows varied considerably. More than half the cows did not produe enough milk to make it worthwhile milking and were allowed to nurse their calves. Therefore only about 15 to 20 cows were in milk at any one time.

Of the cows in milk they averaged around 14 to 17 lbs. (6.4. to 7.7 kg. per cow.) The production range of the cows has been around 5 to 28 lbs. (2.3. to 12.7 kg.) of milk per cow per day.

Weight of Foundation Cows.[5] Average weight of 22 one-half Brown Swiss foundation cows over 2 years of age averaged 935 lbs. (524 kg) ranging from 705 to 1,248 lbs. (320 to 566kg.) The 30 grade Red Sindhi average 785 lbs.(356 kg.) ranging from 498 to 1,030 lbs. (226 to 467 kg.).

5. The authors express their appreciation to Mr. Sanoh Umrod for obtaining and making available the current weight of all the animals.

Growth Rate of Calves. Growth rate of the calves along with the body temperature, respiration rate, and hemoglobin determination were made by two students (Weerapon Thummanoon and Nitut Aornvarn).

Figures 1 and 2 [6] show the growth rate of the calves as compared with the Ragsdale standard for Holstein heifers as published in Missouri Agricultural Experiment Station Bulletin 336, 1935.

Figure 1 shows that the average growth rate of the 35 male and female calves included in this study was surprisingly close to the Ragsdale standard for Holstein heifers. This does not, however, represent the weight of all the calves for a total of 48 weeks because the study is still in progress.

Figure 2 shows the comparison of various local crosses with that of the Ragsdale standard for Holstein heifers. Calves with 50% Holstein genes (18 calves) were remarkably close to the Ragsdale standard.

The 75% Brown Swiss (10 calves) showed a much slower growth rate.

These growth rate comparisons are only preliminary and must not be used as conclusive proofs of what to expect because the numbers involved unfortunately had to be limited. It is an indication, however, that these crossbred calves are growing remarkably well although some of the dams are relatively small.

If growth rate is any indication at all, these animals seem to be well adapted to the local conditions.

Calf Feeding Practices. If the dams were milked, the calves were left with the dams for 3 to 7 days and then placed in individual wooden cages with slatted floors. They were fed whole milk for 60 days and then fed skim milk till 6 months of age. If the dams did not give enough milk to make it worthwhile milking, the calves were allowed to nurse for 6 months. All the calves were given access to all the green grass (mostly para, *Panicum purpurascens* Raddi) and all the concentrate they could eat from about one week of age.

SUMMARY AND CONCLUSIONS

The dairy improvement project at Kasetsart University has grown in 2-1/2 years from 72 to 123 animals. There were 48 calves born. Nearly all were Holstein and Brown Swiss crosses. Fifty-three were born as the result of artificial insemination with imported frozen semen. The study of the growth rate of the crossbred calves during the first year of life shows that it is nearly equal to that of the Ragsdale standard for Holstein heifers.

This project has shown that it is possible to breed our local animals to very high quality bulls located thousands of miles away by using frozen semen. Thus it opens up a tremendous source of dairy production genes for a relatively rapid dairy cattle improvement program.

6. Authors express appreciation to Mr. Nitut Aornvarn who has deligently collected the information and made it available for this report.

Table 1. *Births*

Periods	12-1-62 to 5-31-63				6-1-53 to 5-31-64				6-1-64 to 4-30-65				Total			
Sex	Male		Female		Male		Female		Male		Female		Male		Female	
Semen Used / Breeds	FS*	Other**	FS	Other	FS	Other	FS	Other	FS	Other	FS	Other	FS	Other	FS	Other
3/4 Brown Swiss	1	2	6		1	1	3		4		7	2	6	3	16	2
1/2 Brown Swiss	1			1			2		4		1	1	5		3	2
1/2 Holstein					2	5	1	12	6		13		8	5	14	12
Miscellaneous		2		2				2	1	2			1	3		4
Total	2	4	6	3	3	6	6	14	15	1	21	3	20	11	33	20
Grand Total	6		9		9		20		16		24		31		53	

*FS = A.I. with Frozen Semen

**Other =Natural service or A.I. with chilled semen

Table 2 *Death losses*

Breeds	3/4 Brown Swiss			1/2 Brown Swiss			1/2 Holstein			Total		
Ages / Periods	Under 6 mo.	6 to 15mo.	15mo. &over	Under 6 mo.	6 to 15mo.	15mo. &over	Under 6 mo.	6 to 15mo.	15mo. &over	Under 6 mo.	6 to 15mo.	15 mo. &over
6-1-63- to 11-30-63			1									1
12-1-63 to 5-31-64	1	6				2	1	2		2	8	2
6-1-64 to 11-30-64												
12-1-64 to 4-30-65	2	2	1	1		1		1	2	3	3	4
Total	3	8	2	1		3	1	3	2	5	11	7
Grand Total	13			4			6			23		

Table 3. *Inventory of animals classified according to breed, age, period and sex*

Breeds		Red Sindhi	3/4 Brown Swiss			1/2 Brown Swiss			1/2 Holstein			Misc.			Total			Grand Total
Period	Age Mo. / Sex	> 15	< 6	6–15	> 15	< 6	6–15	> 15	< 6	6–15	> 15	< 6	6–15	> 15	< 6	6–15	> 15	
11-30-62	M													1			1	1
	F	32		3	1	1	1	28				1		5	2	4	66	72
5-31-63	M		3			1								1	4	3	1	5
	F	32	6	1	3		1	27				1	1	5	7	5	67	77
5-31-64	M			2			1		2	2				1	2	14	1	8
	F	31	2		4		2	28	1	11		1	1	6	4	14	69	87
4-30-65	M		3		1	1	2	1	2	5	2		2	1	6	9	5	20
	F	31	6		4	1	1	28	6	8	9			8	13	10	80	103
Grand Total 4-30-65		31	15			34			32			11			123			123

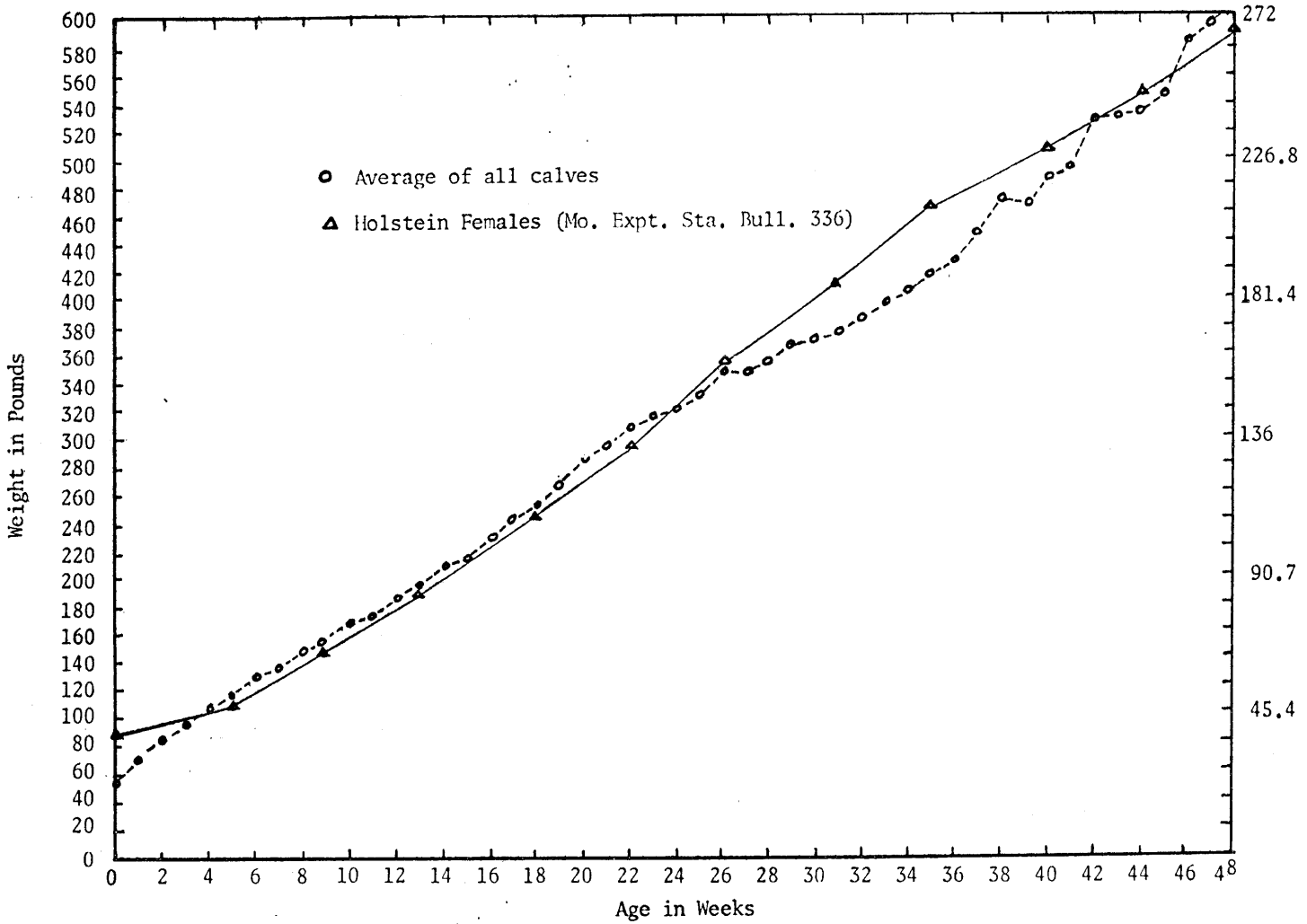

Fig. 1. Comparison of average growth rate of 35 calves with Ragsdale standard for Holstein heifers (Mo. Agr. Expt. Sta. Bull. 336)

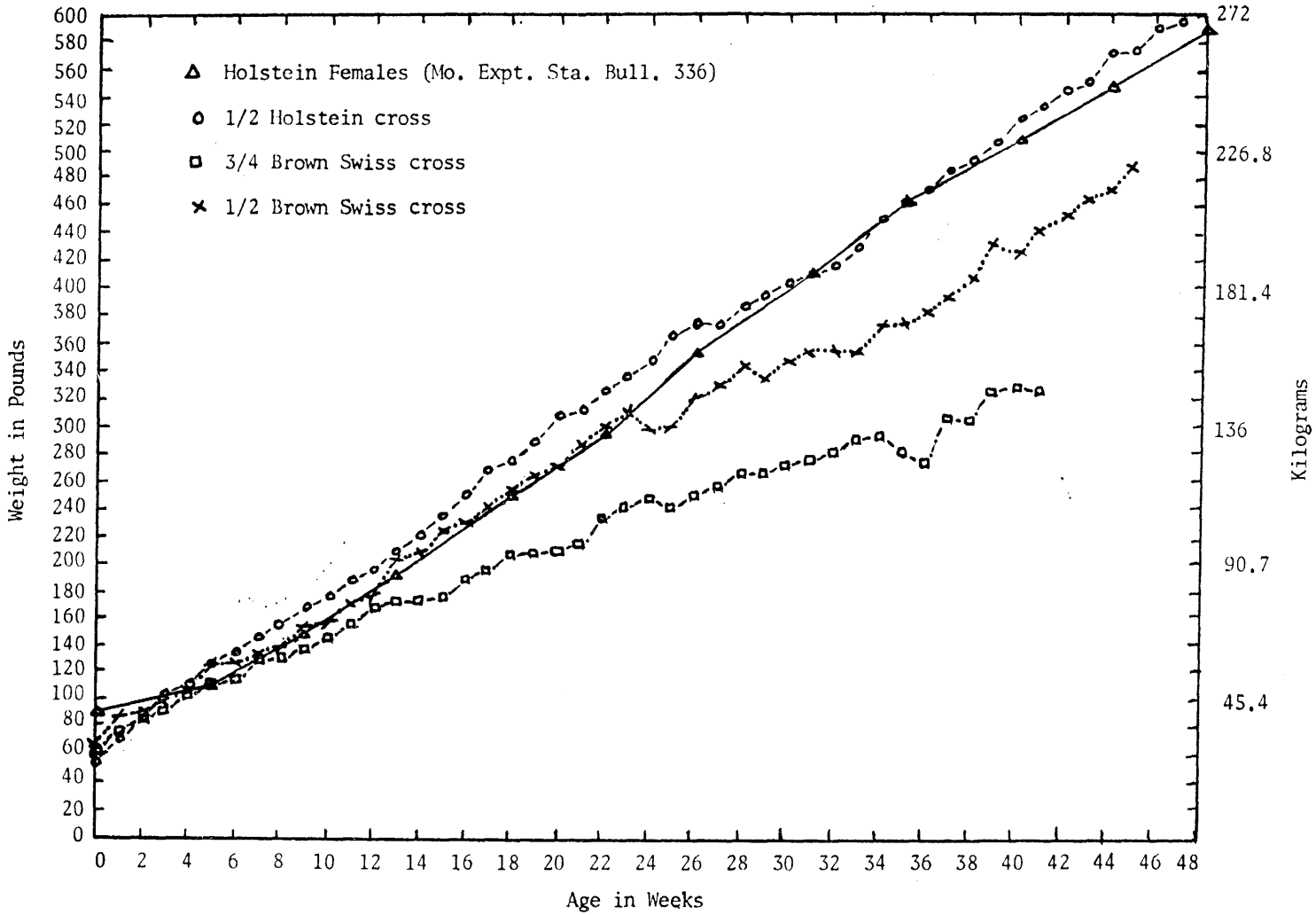

Fig. 2. Comparison of growth rate of calves of various crosses with Ragsdale standard for Holstein heifers (Mo. Agr. Expt. Sta. Bull. 336)

Smaller local cows can be bred to large European breeds such as Brown Swiss and Holstein with no increase in calving problems.

FUTURE PLANS

It is hoped that this project, which has an excellent start, will be carried on by Kasetsart University for many years as planned so that a breed or breeds of dairy cattle can be developed for Thailand, thus making a lasting contribution to the dairy industry of Thailand.

สรุป

โครงการปรับปรุงพันธุ์โคนมที่มหาวิทยาลัยเกษตรศาสตร์ได้ดำเนินงานมาแล้ว 2 ปีครึ่ง จำนวนสัตว์ในฝูงทดลองเพิ่มจาก 72 เป็น 123 ตัว มีลูกโคเกิดใหม่ 84 ตัว ในจำนวนนี้ เกือบทั้งหมดเป็นลูกผสมจากพ่อโฮลสไตน์ และบราวน์สวิส และลูกโค ๕๓ ตัว ถือกำเนิดด้วยการผสมเทียม โดยใช้น้ำเชื้อแช่แข็งของพ่อโคพันธุ์ดีซึ่งสั่งเข้ามาจากสหรัฐอเมริกา การศึกษาในแง่การเจริญเติบโตของลูกโคเหล่านี้แสดงให้ทราบว่าการเติบโตนั้นทัดเทียมกับมาตรฐานของ "แรกสเดล" สำหรับลูกโคเมียพันธุ์โฮลสไตน์

งานเท่าที่ทำมาแล้วบ่งว่าการผสมแม่โคพื้นเมืองกับพ่อโคพันธุ์ดี ซึ่งอยู่ต่างประเทศห่างไปนับหมื่นกิโลเมตร โดยการสั่งน้ำเชื้อแช่-แข็งมาใช้ผสมเทียมนั้นสามารถทำได้สำเร็จ ดังนั้นจึงเปิดทางให้ได้ใช้ยีนที่ดีเพื่อปรับปรุงการผลิตนมโคแหล่งใหญ่มหาศาลอันจะช่วยส่งเสริมโครงการปรับปรุงโคนมได้อย่างค่อนข้างเร็ว

แม่วัวพื้นเมืองขนาดตัวจัดว่าเล็กนั้นจะ-ผสมกับพ่อวัวยุโรปขนาดใหญ่ เช่นพันธุ์บราวน์สวิส และ โฮลสไตน์ได้โดยไม่เกิดปัญหาเพิ่มเติมเรื่องการคลอดลูก