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THE DEVELOPMENT OF BEEF CATTLE PRODUCTION IN KOREA

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FOREWORD

The demand for beef and other animal products has been growing rapidly in Korea, as rising incomes enable consumers to buy more high-value foods. Most of the beef cattle raised in Korea are the Hanwoo, the traditional brown breed. Because in the past this breed was mainly used for draft, it has the powerful shoulders typical of the draft animal. This Bulletin describes how Korean native cattle are being improved and crossed with breeds such as the Charolais to improve the dressing percentage and weight. Since most modern commercial livestock production in Asia is based on imported breeds, it is particularly interesting to see successful livestock enterprises based on an improved indigenous breed.

The Bulletin describes the systems of production and marketing, and the breeding program for Korean native cattle run by the Ministry of Agriculture, Forestry and Fisheries. It also discusses how productivity and beef quality can be improved, and production costs lowered, so as to make Korean beef more competitive in a free market situation. It is based on a paper first presented at an international workshop on *“Development Approaches for Livestock Based Rural Enterprises”*. This meeting was held in the Philippines in May 1994, and co-sponsored by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), and the Department of Agriculture of the Philippines.

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(Chinese Abstract)

摘 要

自1970年以來韓國經濟成長相當迅速，家畜生產例如1992年豬肉、牛乳、蛋的消費量二倍於1970年的消費量。

大多數韓國的肉牛是地方性土牛，稱為Hanwoo，大部份農家只有飼養幾頭，牛肉生產量很低，無法與外國肉牛相比較。土牛的飼養設備及飼料沒有良好發展，因此，韓國肉牛生產的費用較一些開發國家為高。

韓國肉牛生產主要目標是增加產量，改善牛肉品質，減少生產成本，提升飼養管理，改善市場銷售制度及有效利用牲畜廢肥。

(Japanese Abstract)

摘 要

韓國の國家經濟は1970年以後急成長した。肉、ミルク、卵の消費は1992年には1970年の2-4倍にもなった。

大部分の肉は朝鮮土着の Hanwoo 牛である。外国に比べて農家あたりの肥育頭数は少なく、また生産性も著しく低い。また設備、粗飼料生産法も遅れている。そのため先進国に比べ生産費が高い。

したがって韓國の肉生産は将来に向けて、生産性の向上、肉質の改善、生産費の削減を計らなくてはならない。そのためには新技術の開発と普及、飼料管理と設備の改善、市場システムの改善、厩肥の活用の拡大を計る必要がある。

(Korean Abstract)

초 록

1970년대 이래 한국경제는 매우 급속한 속도로 발전하였다. 이에 따라 육류, 우유, 계란 등의 축산물 소비도 1970- 1992년 기간동안 약 2-4배의 증가가 있었다. 대부분의 한국양축농가는 '한우'를 기르고 있으나 규모가 매우 영세하다. 축산선진국에 비해 두당 비육율이 매우 낮은 편이며 생산비도 높아 축사시설, 조사료개발등에서 아직 개발의 여지가 많다. 이러한 관점에서 한국은 생산비절감과 품질향상에 중점을 두고 있는 바 선진기술도입, 경영개선, 사료개선, 유통개선, 가축분뇨의 이용등의 여러분야에 대한 연구와 지도가 있어야 할 것이다.

THE DEVELOPMENT OF BEEF CATTLE PRODUCTION IN KOREA

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ABSTRACT

The Korean national economy has grown very rapidly since 1970. The consumption of livestock products such as meat, milk and eggs in 1992 was two to four times greater than in 1970.

Most Korean beef cattle are Korean Native Cattle, the Hanwoo. Most farms raise very small numbers, and meat productivity is quite low compared with that of foreign beef breeds. The facilities, and roughage production for raising Korean native cattle are not highly developed. Therefore, the production costs of Korean beef enterprises are higher than in more advanced countries.

Important aims in Korean beef production are to increase productivity, improve beef quality, and reduce production costs through the development and extension of improved technology, better feed management and facilities, improved marketing systems, and greater utilization of livestock manure.

INTRODUCTION

The Korean economy has grown very fast since 1970, which has brought about a change in the Korean life-style. Since 1970, consumption of livestock products such as meat has increased by 4.6 times, and of eggs by 2.3 times. The per capita consumption of rice in 1992 was 17% lower than in 1970 (Table 1).

Most Korean beef cattle are the traditional brown Korean Native Cattle, the Hanwoo. In 1975, the number of cattle raised was 1.56 million head, but this fell in 1985. In 1993, Korean farmers raised 2.26 million head of Korean native cattle.

The number of farms on which these cattle were raised fell from 1.27 million in 1975 to 0.57 million in 1993 (Table 2). The average number of Korean cattle per household increased from 1.2 head in 1975 to 3.9 in 1993. The number of farms which raised more than 3.9 head per household also

increased, from 2% in 1975 to 43% in 1993.

Until the mid 1970s, Korea was completely self-sufficient in beef. However, as a result of increased beef consumption in 1983, 49.4 thousand mt of beef were imported from foreign countries. In 1984, beef prices and beef consumption fell sharply and so the importation of beef decreased, but the level of self-sufficiency in beef still declined from 100% in 1975 to 44% in 1992 (Table 3). Beef consumption per capita was 2.0 kg in 1975, compared to 5.2 kg in 1992, and was about 20-24% of total meat consumption.

The total number of cattle slaughtered increased from 0.53 million head in 1980 to 1 million head in 1987 (Table 4). Thereafter, the number of slaughtered cattle fell sharply. Today, it is fairly stable at 0.54 million head. In 1987, 75% to 80% of the slaughtered beef cattle were Korean native cattle, and 16-17% Holstein Friesians, but from 1990-1992, only 56-64% were Korean native cattle while Holsteins had increased to 34-42%.

Keywords: beef cattle, carcass quality, Charolais, daily weight gain, Korean native cattle, progeny testing

Table 1. Trend of livestock products consumed per capita in Korea

Item	Year				Ratio (B/A,%)
	1970(A)	1980	1990	1992 (B)	
G.N.P. (US\$)	252	1,592	5,659	6,749	126.8
Consumption per capita, kg					
- Rice	136.4	132.4	119.6	112.9	83
- Livestock products					
Meat, kg	5.2	11.3	19.9	23.9	460
Milk, kg	1.6	10.8	42.8	44.0	275
Eggs	77.0	119.0	167.0	183.0	238

Source: Ministry of Agriculture, Forestry and Fishery, Korea (1992).

Table 2. No. of Korean native cattle raised, and herd size

Year	No. of Korean native cattle	No. of households	Av. no. of KNC per household	Household (%)		
				1-2 head	3-9	>10
1975	1,556 (1,086)	1,277	1.2	98	2	-
1980	1,427 (898)	997	1.4	94	6	-
1983	1,940 (1,412)	971	2.0	81	18	1
1985	2,553 (1,775)	1,048	2.4	74	24	2
1989	1,536 (1,052)	654	2.4	80	17	3
1993	2,260 (1,555)	570	3.9	57	35	8

Source: Ministry of Agriculture, Forestry and Fishery, Korea 1975-93
 () Korean native cow

Table 3. Production and consumption of beef in Korea

Year	Production (1,000 mt)				Consumption per capita (kg)		
	Domestic production (A)	Imports (B)	Total (C)	A/C (%)	Beef (A)	Total meat (B)	A/B (%)
1975	70.0	-	70.0	100.0	2.0	6.4	31
1980	93.1	6.9	100.0	93.1	2.6	11.3	23
1985	115.7	4.9	120.4	96.0	2.9	14.4	20
1989	90.0	54.5	145.5	62.3	3.4	18.2	19
1991	98.0	125.0	223.0	44.0	5.1	21.7	24
1992	100.0	127.0	227.0	44.0	5.2	23.8	22

Source: Ministry of Agriculture, Forestry and Fishery, Korea 1975-93

Table 4. No. of head slaughtered and body weight of Korean native cattle

Item	Year				
	1980	1985	1987	1990	1992
Total no. of cattle slaughtered, (x1000)	531	746	1,005	554	537
- Korea native cattle	-	556	830	311	345
- Holstein	-	123	172	234	182
- Beef cattle crossbreeds	-	67	30	10	10
Ratio of breeds at slaughter, %					
Korea native cattle	-	75	80	56	64
Holstein	-	16	17	42	34
Average body weight, at slaughter kg					
- Korea native cattle	-	397	374	412	448
- Holstein	-	458	460	465	505

Source: Ministry of Agriculture, Forestry and Fishery, 1992

Table 5. Changes in body weight of Korean native cattle with age

Sex	Year	3 mo.	6 mo.	12 mo.	18 mo.	Ratio
Male	1974 (A)	87.9	133.1	214	289.6	100
	1980	92.0	147.1	244.1	331.4	114
	1992 (B)	103.6	178.9	366.1	477.0	165
	B/A	118	134	171	165	
Female	1974 (A)	83.2	127.8	190.7	245.9	100
	1980	85.5	138.2	203.1	265.2	108
	1992 (B)	89.2	144.2	242.3	308.7	126
	B/A	107	113	127	126	

Source: Reports on the trends in Korea native cattle improvement (National Livestock Cooperative Federation), 1974-1992

Table 6. Growth performance of selected bulls (1975-1990)

Classification	At birth	Bodyweight, kg			Ratio
		6 mo.	12 mo.	18 mo.	
Population	27	152	348	450	100
Selected group	27	154	346	495	110

Source: Alpine Experiment Station

Table 7. Daily milk yield of cows per lactation

Postpartum period	Daily milk yield after parturition (kg/day)						Total
	1	2	3	4	5	6	
1st parturition	4.96	3.93	3.96	3.80	3.58	2.66	660.6
2nd parturition	4.80	4.63	3.48	3.78	3.72	3.00	700.2
Ave.	4.58	4.32	3.68	3.79	3.65	2.83	680.2

Source: Annual Research Report of Alpine Experiment Station, 1985

BEEF PRODUCTION IN KOREA

Historical Background

Korean native cattle originated from crossbreeds of *Bos indicus* and *Bos primigenius*. They migrated to the Korean peninsula through the northern part of China and Manchuria in about 2000 BC. Traditionally, Koreans raised these cattle only for draft purposes. Korean native cattle are relatively small compared to foreign beef breeds, weighing 23-25 kg at birth. The bodyweight of bulls fed under farm conditions in 1992 was 178.9 kg at 6 months and 477.1 kg at 18 months (Table 5). Females were 144.2 kg at 6 months and 308.7 kg at 18 months. Bulls selected according to performance tests weigh 10% more than the average population (Table 6).

The average milk yield of the cows was 680 kg per lactation. This is quite low compared with foreign beef breeds, and is not even enough to suckle the calves (Table 7).

CURRENT TRENDS IN BEEF PRODUCTION

Breeding System for Korean Native Cattle

The Ministry of Agriculture, Forestry and Fishery (MAFF) controls the breeding system for improving the productivity of Korean native cattle. Since the early 1960s, there has been a program for improvement through purebreeding and crossbreeding. In the purebreeding system, superior bulls are selected by means of performance tests, and the semen from them is given to farmers. Performance tests are carried out in national

and provincial breeding centers (Fig. 1). The proven sires are selected from among the young bulls through progeny tests based on the meat productivity and quality (Fig. 2). About 89.5% of Korean native cattle are artificially inseminated with semen of selected bulls (Table 8).

The Korean Animal Improvement Association was established in 1969, mainly for registration, and by 1992 nearly 380,000 Korean cattle had been registered (Table 9).

Since Korean cattle have been raised for centuries as a working animal, their growth performance is inferior compared to other breeds. From 1909 to 1919 they were crossed with Simmental. The body weight of crossbreeds at 18 months was 257 kg, 22% more than that of Korean cattle (Table 10). From 1955 to 1965, Korean cattle were crossed with beef breeds such as Angus, Hereford, and Brown Swiss to improve the body weight. From 1971 to 1975, crosses of Korean cattle and Angus or Charolais were crossed with Holstein, which resulted in an improvement of both body weight and dressing percentage. (Table 11).

Since 1978, Korean cattle have been crossed with Charolais bulls to make a new composite breed which is 5/8 Charolais and 3/8 Korean cattle. The breeding system and the consequent improvement of the breeds are shown in Tables 12 and 13, respectively.

Feeding and Management of Korean Native Cattle

Growing period

As described above, since the milk production of Korean cattle is very low,

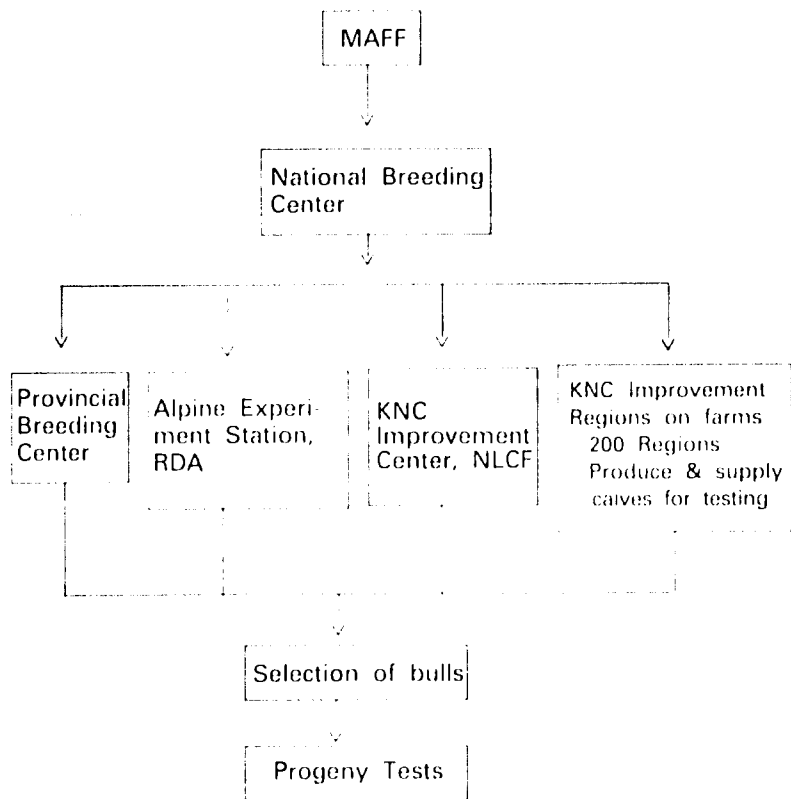


Fig. 1. System of performance tests for candidate bulls

KNC: Korea native cattle

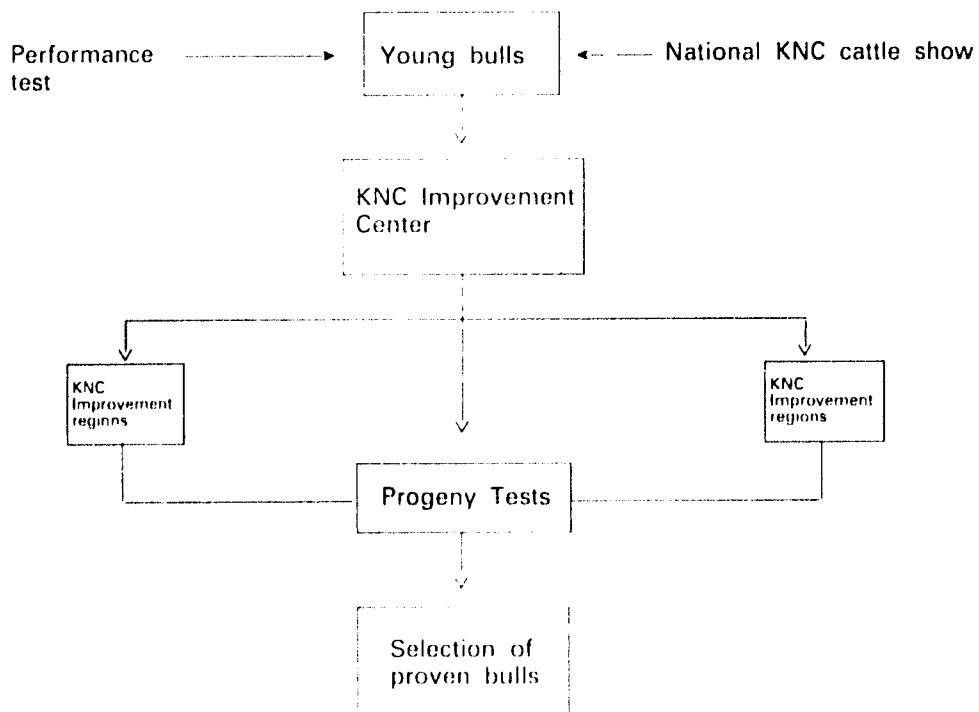


Fig. 2. System of progeny tests for proven sires

KNC: Korea native cattle

Table 8. Rate of breeding by artificial insemination

Item	Year				
	1975	1980	1985	1990	1992
No. head	186.3	304.2	981.7	840.0	1,105.5
%			60.6	82.9	89.5

Source: Ministry of Forestry and Fisheries, 1992

Table 9. No. of registered Korean native cattle

Registration	Year							Total
	1966-86	1987	1988	1989	1990	1991	1992	
Basic	115,470	23,786	33,728	16,742	15,047	13,343	31,838	249,954
Pedigree	19,781	3,344	3,929	16,462	14,298	18,467	18,223	94,504
Advanced	2,338	424	472	522	935	1,670	3,463	9,924
Total	137,589	27,554	38,129	33,826	30,280	33,480	53,524	354,382

Source: Korean Animal Improvement Association, 1992

Table 10. Growth performance of crossbred bulls under a conventional feeding system

Breeding cross	At birth	6 mo.	Weight (kg)		Ratio*
			12 mo.	18 mo.	
K x K	24.0	115.0	160.0	210.0	100
S x K	25.0	114.0	179.0	257.0	122
H x K	25.0	117.0	176.0	230.0	110
A x K	27.0	130.0	199.0	252.0	120

K: Korean native cattle; S: Simmental; H: Hereford; A: Angus

* Fat weight at 18 mo.

Source: Livestock Experiment Station, 1963

Table 11. Growth performance of crossbred bulls during the growing-fattening period

Breeding cross	At birth	6 mo.	Weight (kg)		Ratio (%)	Dressing (%)
			12 mo.	18 mo.		
K x K	21.4	125.0	261.7	424.7	100	58.1
C x K	31.8	181.5	406.4	636.4	150	62.6
S x K	32.4	165.5	351.9	580.3	137	62.0
B x K	33.3	191.0	381.1	575.1	136	61.1
M x K	32.2	169.5	404.3	649.0	153	61.6

K: Korean native cattle; C: Charolais; S: Simmental; B: Brown Swiss; M: Maine-Anjou

Source: Livestock Experiment Station, 1978-83

Table 12. System for crossbreeds

Generation	Mating system			Ratio of genes		Remarks
	Male	x	Female	Charolais (C)	KNC	
Parent	C	x	KNC	100	100	Began in 1978
CK	C	x	CK	50	50	
CCK	CCK	x	CK, CK x CCK	75	25	
Composite breed	5/8C, 3/8KNC	x	5/8C, 3/8KNC	62.5	27.5	

C: Charolais, KNC: Korean native cattle

Table 13. Body weight of Charolais crossbreeds raised on farm

Item	Body weight, kg			Ratio of Genes		
	3 mo.	6 mo.	12 mo.	Ratio	Charolais	KNC
K	86.5	151.8	296.0	100		100.0
CK	119.7	208.6	405.7	137	50.0	50.0
CCK	126.7	216.8	406.4	137	75.0	25.0
5/8C, 3/8K	123.1	222.0	438.9	148	62.5	37.5

Source: Livestock Experiment Station, 1993

sucking calves are usually fed a supplement (called a calf starter) containing 15.7% of digestible crude protein (DCP) and 36.6% of total digestible nutrients (TDN), to promote development of the rumen and better growth. Calves given a calf starter and hay during their 90 days suckling period were 19% heavier than calves given only hay during the same period.

Fattening period

The nutritional level of Korean cattle during the growing/fattening period is very important, not only for growth but also for reproduction. During this period, the cattle are fed only roughage, hay, grass and silage until they are 15 months old, and then fed concentrates for 5.5 months. However, in order to market the animals at a heavier weight and an earlier age, weaned calves are

usually fed concentrates containing 12% of DCP and 71% TDN for four months after weaning. For the next 11 months, young cattle are fed concentrates containing 7.4% DCP and 63.9% TDN. When this feeding system is used, animals are ready for market sooner, and their ADG and feed efficiency is improved (Table 14).

During the fattening period, as the body weight increases, the feed intake and nutrient requirements, including CP and TDN, increase while the ADG decreases (Table 15). Experimental results showed that the optimal marketing weight of KNC was about 550 kg.

Rice straw is a common crop residue, and is often fed to Korean native cattle as roughage, but it is low in nutrients. Treating it with NH₃ improves the quality of the straw, and has a marked effect on cattle weight gain during the fattening period (Table 16).

The pattern of beef consumption in

Korea is changing, from an emphasis on beef quantity to one on beef quality. Beef quality needs to be evaluated according to the carcass grade. Korea has now developed a beef grading system and has been using it in large cities since 1992. There are three grades, based on the level of marbling, the color of the meat and fat, tenderness, and maturity. Results of experiments on extending the

fattening period showed that the carcass grade improves with an increase in the fattening period (Table 17), while steers also produce better quality beef (Table 18).

A restricted feeding regime for steers improved the feed/gain ratio and produced better quality beef than feeding them *ad libitum*.

Table 14. Comparison of feed efficiency of two methods of fattening bulls

Item	Early fattening method ^a	Conventional method ^b
Market weight (kg)	517.8	412.0
ADG (kg)	0.95	0.57
Nutrient requirements ^c		
Concentrates	4.95	6.30
Roughage	1.93	4.64
D C P	0.59	0.67
T D N	4.36	7.27
Dressing (%)	60.0	55.5

a Marketing age = 18 mo.

b Marketing age = 24 mo.

c Per 1kg gain

Source: Livestock Experiment Station 1974

Table 15. Feed efficiency of Korea bulls during the growing-fattening period

Item	Final fattening weight (kg)			
	350	450	550	650
A D G	1.04	1.03	1.01	0.98
Feed intake (kg)	5.9	6.4	7.0	7.7
Concentrate				
Roughage	1.0	1.1	1.3	1.6
Nutrient intake (kg) ^b				
C P	1.09	1.13	1.14	1.19
T D N	4.5	5.0	5.6	6.2
Dressing (%)	57.2	59.5	61.3	63.7
Fat (%)	9.6	9.4	12.0	17.0

a Initial weight was approximately 150 kg.

b Per 1kg gain

Source: Livestock Experiment Station 1985

FUTURE OUTLOOK FOR BEEF PRODUCTION

Improved Productivity and Reduced Production Costs

Most farmers raise very small numbers of Korean cattle. The average number of cattle per household is only 4.0, while 78% of

beef cattle farms raise only five head. It is very difficult to introduce new technology for improving beef productivity and quality, and reducing the production costs, when production is on such a small scale. The government projects that the number of Korean cattle raised will increase from 2,019,000 head in 1992 to 2,537,000 head in 2001, but the average number of Korean cattle per

Table 16. Effect of rice straw treated with NH_3 on Korean cattle when fed during the fattening period

	Rice straw (Control) (A)	NH_3 -treated rice straw (B)	B/A (%)
A D G (kg)	0.89	1.01	113
Daily intake (kg)			
Concentrates	5.33	5.56	117
Rice straw	4.97	5.81	
Feed/gain ratio			
Concentrates	5.99	5.50	92
Rice straw	5.58	5.75	103

Source: Livestock Experiment Station, 1984

Table 17. Changes in carcass quality according to body weight of slaughtered cattle

Item	Body weight (kg)			
	450	550	600	650
Body weight (kg)				
Initial	150.8	150.8	150.8	150.8
Final	452.4	550.7	603.4	651.9
Average daily gain	0.98	0.96	0.95	0.91
Carcass traits				
Carcass (%)	60.0	61.9	61.1	62.3
Eye muscle area (cm^2)	73.2	82.9	92.9	96.2
Fat depth (cm)	0.26	0.83	0.44	0.70
Marbling score	1.4	2.2	2.9	3.0
Meat color	4.1	3.7	3.6	3.3
Fat color	3.6	3.2	3.1	3.4
Meat recovery, kg/cm^2	9.2	9.4	8.7	7.5

Source: Livestock Experiment Station, 1992

Table 18. Comparison of carcass quality of bulls and steers

Item	Bull (A)	Steer (B)	Ratio (B/A)
Body weight (kg)			
Initial	157.4	148.1	
Final	550.7	551.3	
Daily gain	0.96	0.78	81
Feed:gain ratio	7.30	9.07	124
Carcass traits			
Carcass (%)	61.9	63.1	102
Fat (%)	12.7	20.3	160
Panel test (1-6)			
Juiciness	4.3	5.0	116
Tenderness	3.6	4.6	128
Meat recovery, kg/cm ²	9.4	6.2	66

Source: Livestock Experiment Station, 1992

Table 19. Carcass quality of cattle fed *ad libitum* compared to those with restricted feed intake

Item	Fed <i>ad libitum</i>	Restricted feeding
Body weight (kg)		
Initial	119.9	122.6
Final	551.4	551.0
Daily gain	0.74	0.75
Feed gain ratio	8.64	7.78
Carcass traits		
Carcass (%)	62.2	60.3
Marbling score	4.7	4.2
Fat (%)	20.3	16.0
Eye muscle area, cm ²	76.3	78.2
Back fat depth, cm	1.43	0.84
Carcass grade		
Quantity (A B C)	0:1:0	0:5:1
Quality (1 2 3)	7:0:0	4:2:0

Source: Livestock Experiment Station, 1992

household is estimated to increase from 3.5 head to 12.6 head and large scale farms will also increase from 4,000 to 20,000. At the same time, the number of farms raising Korean cattle is expected to fall from 585,000 to around 200,000.

The productivity of Korean cattle will be improved using new techniques such as multiple ovulation and embryo transfer, and selection will be based on more scientific procedures.

Management Techniques

It is very important to reduce the production cost of Korean beef production by improved management, for example by raising the optimal number of animals, improving reproductive efficiency, and using better facilities and machinery. Korean farms are very weak with regard to roughage production, and raise their beef cattle mainly on concentrates. This makes beef production costly, and in any case, too much grain and other concentrates are not suited to beef cattle physiology.

Older farmers do not usually want to adopt new techniques to improve cattle production. The Korean government plans to establish groups of young farmers who want to carry out beef production in rural areas. Marketing will also have to be improved. The live stock marketing system is not well developed, and the government has so far failed to control the price, demand, and supply of live stock products.

Conserving the Environment by Better Utilization of Livestock Manure

Livestock manure pollutes the environment. It is necessary to establish facilities to compost the manure, to stabilize it

and make it pleasant to handle. It can then be used as a soil amendment and nutrient source for crops.

Some Successful Beef Enterprises

Some Korean farmers have organized themselves to produce high quality beef using techniques developed by research institutes. By forming groups to buy feedstuffs and other inputs they reduce production costs, because they can purchase them at a lower price.

In some places, they have opened their own shops to sell the beef they produce, thus reducing marketing margins, and getting more control over prices. They obtain higher profits than farmers who follow the conventional practice of selling live beef cattle to merchants who send them to the slaughterhouse. Some farmers sell their beef direct to large supermarkets.

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DISCUSSION

Dr. Wang pointed out that if a farmer has only a small herd of cattle, it is difficult for him to improve his stock. He asked Dr. Na if there were any plans to set up a breeding farm to produce Korean native cattle and extend animals to farmers. Dr. Na replied that there are already 200 special farming areas¹ in Korea which keep Korean native cattle for breeding purposes, and function in much the same way as a breeding farm. There are also 200 special farms for breeding Korean native cattle, each with a herd of around 100 head.

¹A farming area is made up of a number of local farms. Farm = farm, the farm, specifically, (44)