

# FEEDING MANAGEMENT OF BEEF CATTLE IN JAPAN

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## ABSTRACT

*Improving the production efficiency of beef cattle, it is fundamental to properly satisfy the nutritional requirement of beef cattle. The nutrient requirement of beef cattle described in the feeding standard and is used as one index. When feed is fed to beef cattle, it is necessary to include the nutrient amount for feed that can be intake. Therefore, estimation of dry matter intake is important. Nutrients that must be considered in beef cattle are energy, protein, calcium, phosphorus, vitamin A and vitamin D. Protein is a major nutrient necessary for maintaining, growing, breeding and lactating livestock, along with energy. Crude protein and digestible crude protein have been used in Japanese feeding standards. However, in many countries in Europe and the United States, a system that estimates demand and supply amount of protein that can be absorbed by cattle is used. That is microbial protein (MP system). Even the Japanese feeding standards adopt the idea of the MP system. On the other hand, large amounts of cereals such as corn are imported in Japan, and self-sufficiency rate of concentrate feed is over 10%. Improving the self-sufficiency rate of feed, studies on rice for feed and by-products are under way.*

*Therefore, I will introduce the nutrition management technology of beef cattle, focusing on the contents described in the Japanese feeding standard in this seminar.*

Keywords: nutritional requirement, feeding standard, nutrients MP system

## 1.Introduction:

Livestock industry accounts for over 30% of agricultural total production in Japan. But, due to the aging of livestock farmers and market price increase of feed, the livestock production base of beef cattle is weakening. For that reason, numbers of farmer and beef cattle are decreasing year by year. On the other hand, numbers of beef cattle per farmer has increased, and large scale farm been expanding.

Advance of market price for Japanese black calf has led to press management of fattening farm. It is important to promote a better beef cattle production infrastructure.

Numbers of beef cattle in 2015 were about 2.5 million heads in Japan. Sixties six % of them are

Japanese black cattle, followed by hybrids (F1) and Holstein species. On the other hand, numbers of beef farmers in 2015 were 52,000 in Japan. Beef farmers can be divided into four types. (1) Breeding farmer who produces calves, (2) Fattening farmer who purchases calves and carries out fattening, (3) Integrated management to produce calves and fatten it. (4) Integrated management which produces and purchases calves.

The standard feeding management of Japanese black cattle is as follows.

Japanese black cow: Suckling period: Birth to 3 month of age, Breeding period: Birth to 9 to 10 month. It is often used for breeding from 13 to 14 months old.

Fattening cattle: Suckling period: Birth to 3 month of age, breeding period: After weaning, until 8 to 10 month of age, Finish period: It is fattened and shipped in 29 to 31 months after birth.

Shipment from 19 to 30 months after birth. There is also early weaning of 7 to 10 weeks old.

New findings concerning feeding management of beef cattle include protein feeding system, feed resources and environmental burden reduction. The nutrient requirement of beef cattle described in the feeding standard and is used as one index. Therefore, this seminar will introduce Japanese feeding technology of beef cattle.

## **2. Japanese Feeding Standard for Beef Cattle (2008)**

Feeding standards consist of the following chapters.

Chapter 1 : Unit of nutrients, requirement, dry matter, energy, protein, mineral(macro micro), vitamin

Chapter 2 : nutrient requirement (I) Nutritional requirements for maintenance and breeding of cows and bulls, demand for fattening of fattening cattle.

Chapter 3 : nutrient requirement (II) water requirement, mineral (macro, micro) requirement

Chapter 4 : Factors influencing nutrient demand. Issues to be cautioned on feeding.

Chapter 5 : Issues to be noted with feeding.

Chapter 6 : How to use Japanese feeding standards and issues to be noted.

Chapter 7 : Calculation formula of nutrient requirement.

Chapter 8 : Reference are described.

### **1) Dry matter intake of beef cattle.**

In general, feed intake of beef cattle falls within the range of 1.4 to 3.0% of body weight. However, it is known that feed intake of beef cattle is affected by temperature, humidity, wind and solar radiation.

Regarding feed, the ratio of concentrate and forage, energy content, and protein content are affected. Grass quality is also important for grazing cattle. When feed is fed, it is necessary to include the nutrient amount for feed that can be intake. Therefore, estimation of dry matter intake is important.

For the dry matter intake of steer is as follows.

Dry matter intake (Kg /Day )=

$$-3.481 + 32.668 \times DG + 4.548 \times 10^{-2} \times DG - 7.207 \times 10^{-5} \times W^2 + 3.867 \times 10^{-8} \times W^3$$

DG indicates dairy gain (kg/day). W indicates body weight(kg).

Dry matter intake of fattening cattle is about 10 kg at the peak of body weight 500 ~ 550 kg. As body weight further increases dry matter intake decreases. The standard dairy gain is 1.3 to 1.4 kg / day in the early stage of fattening (7 to 11 months old), 1.2 to 1.3 kg / day in the middle stage of fattening (12 to 16 months old), 0.9 to 0.9 kg / day in the later stage of fattening (17 to shipment) It is 1.0 kg / day.

## **2)Nutrient requirement of beef cattle**

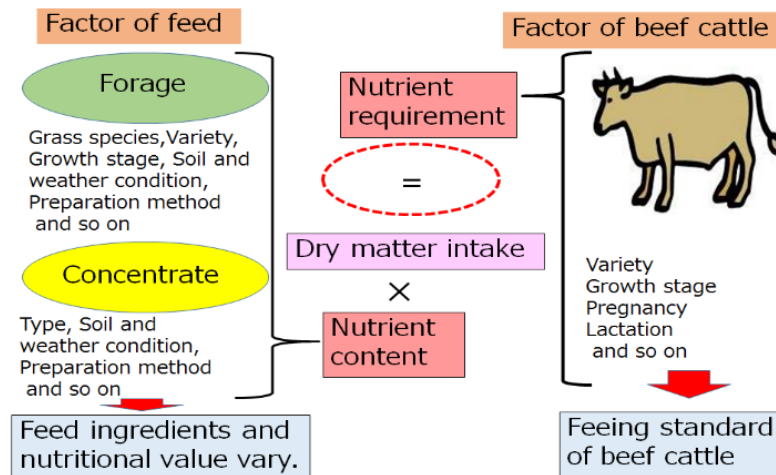
Nutrients that must be considered in beef cattle are energy, protein, calcium, phosphorus, vitamin A and vitamin D. In addition, it is shown that recommended micromineral content of diets and maximum tolerable level for beef cattle other than calcium and phosphorus such as Sodium, Chloride, Magnesium and Sulfur. It is also shown that recommended trace mineral content of diets and maximum tolerable dietary level for beef cattle such as Iron, copper, cobalt, zinc, manganese, iodine, molybdenum, selenium. It is shown that approximate total dairy water intake at different temperatures and body weight. The nutritional requirement for breeding cattle and bulls is indicated by weight and dairy gain. In addition, nutrient requirement of adult beef cattle is shown. Also, nutritional requirement for late pregnancy and nursing is indicated. Nutrient requirements of fattening cattle are indicated by weight and body weight gain. The nutritional requirement of fattening cattle is shown up to 800 kg weight as cattle become larger.

Protein is a major nutrient necessary for maintaining, growing, breeding and lactating livestock, along with energy. The protein of the feed is decomposed into amino acid and peptides in the rumen, and it becomes ammonia further. Ammonia is used for the growth of microorganisms in the rumen. Microorganisms flowing out of the rumen are digested and absorbed in the small intestine. Feed protein can be divided as follows depending on solubility and degradability in the rumen. The soluble protein is a protein that rapidly dissolves in the rumen. It contains a lot of nonprotein nitrogen. The term is CPs. Proteins that degrade in the rumen are called degradable proteins. The term is CPd. On the other hand, a protein not degraded in the rumen is called a undegradable protein. Undegradable proteins are also called bypass proteins. The term is CPu. Proteins required at maintenance level can be satisfied from CPd. However, if the protein requirement is high, undegradable proteins also need to be considered.

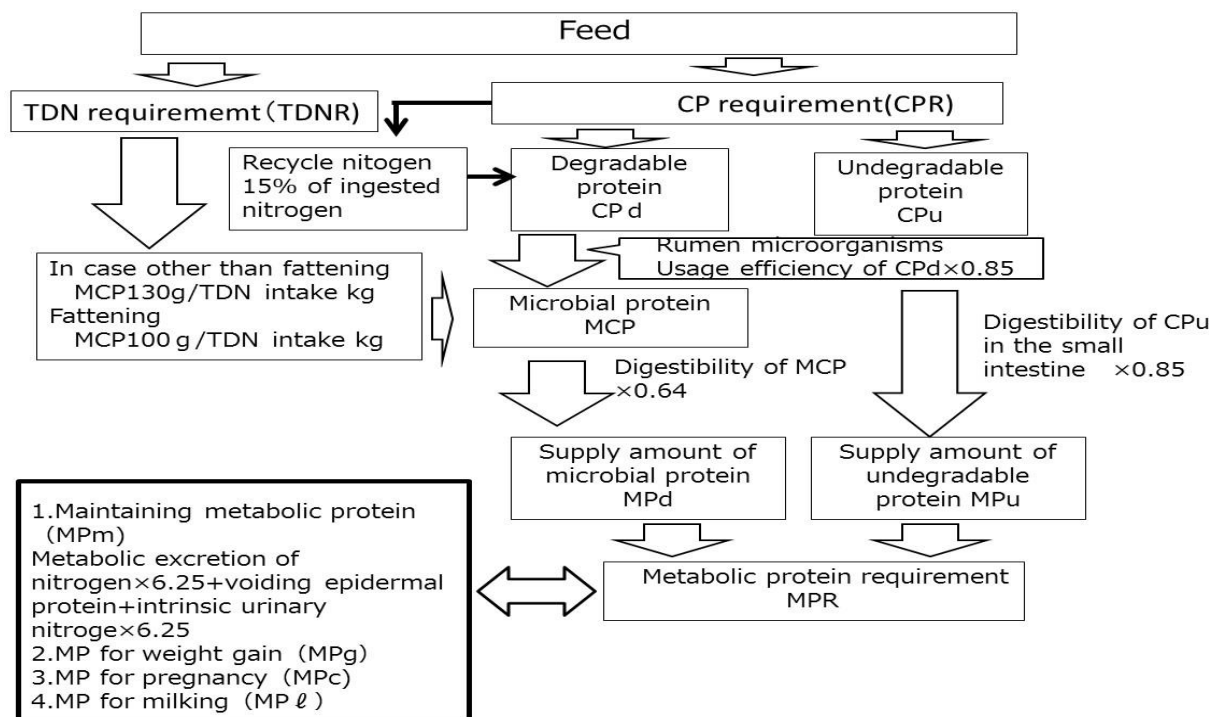
Crude protein and digestible crude protein have been used in Japanese feeding standards. However, in many countries in Europe and the United States, a system that estimates demand and supply amount of protein that can be absorbed by cattle is used. Even the Japanese feeding standards adopt the idea of the MP system. The outline is as shown in Fig1.

In the MP system, the amount of protein to be supplied is determined by the degradability of the feed protein, the amount synthesized of the microbial protein in the rumen and the digestibility of the protein in the small intestine.

The MP required amount of beef cattle is obtained by obtaining the net protein demands of maintenance, weight gain, pregnancy and lactation, dividing them by the utilization efficiency of the metabolic protein, and summing up.



**Fig. Basic concept of feed design.**



**Fig. Microbial protein system of beef cattle.**

### **3)An example of feeding management of beef cattle**

#### Suckling period (birth to 3 month of age)

Approximately 1 month after birth: Milk or diluted powder milk → 4kg/day

Increase artificial milk

Good quality hay, ad libitum

It is importance of forage feeding during suckling to early fattening to improve rumen function. By adequate feeding volume allows to keep dry matter intake in latter fattening period. Also, it is important to feed good quality forage.

#### Growing period (birth to 6 month of age)

Good quality hay, from 1.2kg to 1.9kg/day

Concentrate, from 4kg to 6kg/day

To keep good quality forage intake while restrict concentrate feeding.

#### Fattening period, early

To keep good quality forage intake so that cattle continues higher weight gain.

#### Fattening period, middle and later

20-25% of forage in whole feeds is recommended during early fattening period. In later period, the ration of forage is lowered. To improve marbling, control of vitamin A is carried out from 14-16 month.

Neutral detergent fiber content → 20-30%

Total digestible nutrient contents → 70-80%

Starch content → 32-47%

### **4)Food resources**

Many cereals such as corn are imported in Japan, and self-sufficiency rate of concentrate feed is over 10%. Research on rice utilization for feed has been advanced to improve self-sufficiency rate. In recent years, varieties of rice exclusively for feed have been cultivated. Since rice is covered with rice hulls, most of them are excreted into feces when they are fed without processing. For that reason, processing is necessary when feeding brown rice for cattle. It is also known that starch of brown rice was quickly degraded in the rumen rather than that of corn. There is a possibility of causing acidosis when feeding brown rice excessively. Therefore, it has been studied how much brown rice can be mixed with beef cattle feed. Consequently, it has become clear that productivity does not decrease even if brown rice is mixed up to 30% in commercially formulated feed. Regarding the feeding of brown rice, it is necessary to avoid rapid change of feed and to adjust the amount by observing the beef cattle.

Also, the use of by-products as feed have received a lot of attention through it before. Major by-products include beer cake, tofu cake and rice bran. Research on green tea residue and shochu

residue for beef cattle have been practiced for many years. It has been pointed out that there is no problem in productivity even if 10% of by-products are mixed into feed. However, it should pay attention to the possibility of chemical composition and nutritional value of by-products may differ depending on production lot. Also, since some by-products contain a lot of crude fat, there is a possibility that fat may affect microorganisms in the rumen. It is necessary to ensure that the crude fat content of the feed does not exceed 5-6%.

### **3.Conclusions**

In Japan, the production base of beef cattle is weakened due to the decrease in the number of farmers and the number of beef cattle. However, beef is a good protein and indispensable to people's lives. With regarding to beef cattle, reduction of production cost and light labor is an urgent issue. For that purpose, it is necessary to shorten the fattening period and develop a feeding management technique using a robot. In addition, precise feeding management is also important for reduction of feed costs and reduction of environmental burden by excretion of manure. Further research is necessary to improve productivity.

### **4.References**

- National Agriculture and Food Research Organization (NARO) Japanese Feeding Standard for Beef Cattle (2008)
- Ministry of Agriculture, Forestry and Fisheries Situation over dairy and animal husbandry.(2017)