

## Technology and Management Index Model in 2000 for the Development of Animal Industry in Japan

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### Abstract

An official report entitled "A long-term perspective of demand for and production of agricultural products" was approved by the Cabinet Council of the Japanese Government in 1990 and publicized by the Ministry of Agriculture, Forestry and Fisheries. In the course of preparation of that report, the following two papers were annexed to it: one was "Technology and Management Index Model in 2000" and the other was "Prospects of Technology Development and its Extension". The present paper specifically reviews three issues pertaining to the animal production in Japan as follows: a dairy cattle farming model in Hokkaido; a beef cattle fattening farming model in the western region of Japan; and new technologies in prospect for the development of animal industry that is expected to be developed by the year 2000. The report indicates that in 2000, labor requirement per head of milking cow, milk yield, crop yield and total cost of raw milk production in the dairy cattle farming in Hokkaido are expected to be 34, 142, 120-129 and 47% as compared with the present levels. It also indicates that labor requirement per head of cattle, body weight gain per day and total fattening cost in the beef cattle fattening farming in the western region of Japan in 2000 are expected to be 19, 139 and 46% as compared with the present levels. These expectations could be achieved through the full adoption of new technologies to be developed by 2000.

**Discipline:** Animal industry

**Additional key words:** agricultural policy, animal husbandry, new technology

### Introduction

Various types of endeavors are now being made in Japan for the purpose of stably supplying quality and safety foods at prices acceptable to producers as well as consumers. In order to attain this objective, it is important for Japan's agriculture to establish an adequate structure so that it can compete with other countries in international agricultural markets. In reality, however, there are great differences in prices between domestic and overseas agricultural products. Among the various measures to alleviate this situation, one of the effective solutions may be to produce high quality agricultural and animal products at a low cost with advanced technologies.

Toward this end, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan recently published a report entitled "A long-term perspective of demand for and production of agricultural products", which was prepared according to the provision of the Agricultural Fundamental Law. Its draft was subjected to consideration of Agricultural Policy Council, an advisory body of the Government, followed by the formal approval by the Cabinet Council in January 1990. The report includes future demand for and production of agricultural products in 2000. The production level and the related technologies for achieving that level presented in the report show an expected status to be realized in 2000.

In the course of preparation of the above report, the following two papers were annexed to it: one

was "Technology and Management Index Model in 2000" and the other was "Prospects of Technology Development and its Extension". These annexed papers elaborate the new technologies which would possibly be available in the year 2000, and the implications of their application for Japanese agriculture. The present paper summarizes those two papers with special reference to animal science and technology.

### Technology and management index model in 2000

Five models of management in 2000 for farming in Japan were proposed in the annexed paper as mentioned above, which was publicized in January 1990. These models included two types of paddy farming, one type of upland farming and two types of animal-based farming. In 1991, additional 25 models were proposed by MAFF, covering various types of farming based on vegetable, flower, or fruit production, and the other types of paddy and upland farming which were not included earlier. These models are proposed as a guidance for encouraging the farmers to introduce advanced technologies well-suited to local conditions. As far as the animal-based farming is concerned, the following two types of model are presented: one is for dairy cattle farming in Hokkaido, and the other is for beef cattle fattening farming in the western region of Japan.

#### 1) Dairy cattle farming

The basic factors premised, and the technology and management index model for dairy farming are shown in Table 1. The premises include the area concerned, a feeding and management system, field conditions, farm work and main technologies. The management index model proposed shows labor requirements, number of cattle, cropping area, milk and crop yields, milk quality and total cost.

The other related matters such as land-use, major equipment and relevant technologies to be employed are as follows:

##### (1) Land utilization system:

###### a) Grassland

- Pasture renovation at 6-year intervals,
- 15 ha for grazing and 33 ha for roll bale silage preparation,
- Corn cropping for 2 years before reno-

vation.

##### b) Upland fields

- Corn cropping for the whole crop silage preparation.

##### (2) Major equipment:

- Milking parlor for 80 head 1
- Bulk cooler 4,000 liter 1
- Tower silos 350 m<sup>3</sup> 3
- Roll baler 1
- Feeder for total mixed ration (TMR) 1
- Tractors 75 ps, 55 ps 2
- Silo unloader 1

##### (3) Advanced technologies, in addition to those listed in Table 1:

- a) Shortening of calving interval by hastening postpartum initial estrus,
- b) All-the-year-round silage feeding for labor-saving and milk yield stabilization,
- c) Rapid culling of low performance cattle by performance tests for improved productivity,
- d) Renovation of pasture with an adequate interval to maintain its high productivity,
- e) Maintenance of adequate field conditions, drainage in particular, for high working efficiency of farm machines,
- f) Production of heifer having a well-functional rumen in grazing.

#### 2) Beef cattle fattening farming

The basic factors premised, and technology and management index model for beef cattle fattening are shown in Table 2. The premises include the area concerned, a feeding and management system, field conditions, farm work and main technologies. The management index model proposed shows labor requirements, number of cattle, cropping area, body weight, crop yield, carcass quality and total fattening cost.

The other relevant matters are as follows:

##### (1) Land utilization system:

###### a) Upland fields

- Main-season cropping; mixed-seeding of corn and sorghum (8:2),
- Off-season cropping; barley for feed.

##### (2) Major equipment:

- Pen barn for 200 head 1
- Feeder for complete feed 5 m<sup>3</sup> 1
- Tractors 45 ps, 35 ps 2

Table 1. Model of dairy cattle farming

<p>(1) Premises</p> <p>a) Area: Hokkaido</p> <p>b) Feeding and management system: Free stall system Milking with milking parlor system:</p> <p>c) Field conditions: Improved farmlots</p> <p>d) Farm work: Two full-time workers Family farming</p> <p>e) Main advanced technology: Improvement of milk yield and quality of herd through embryo transfer techniques</p> <p>Improvement of milk quality (decrease in bacteria, somatic cell count) with an automatic somatic cell counter</p> <p>Rational feeding system based on forage test</p> <p>Intensive use of total mixed rations of roughage and concentrate (TMR)</p> <p>Individual cattle management with a personal computer system</p> <p>Selection of high yielding grass cultivars</p> <p>Adequate fertilizer application based on soil checking</p>	<p>(2) Management index model based on advanced technology in 2000</p> <p>a) Labor requirement: Labor required; 40 hr/head (34%)* Full-time workers for farm management; 2</p> <p>b) Number of cattle and cropping area: Number of cattle; 142 Milking cow; 80 Cropping; Upland fields — 16 ha Grassland — 48 ha</p> <p>c) Milk and crop yields: Milk yield; 9,000 kg/head (142%)* Crop yield; Corn — 61 t/ha (120%)* Mixed grass — 45 t/ha (129%)*</p> <p>d) Milk quality produced: Milk fat; 3.7% Solids-not-fat percentage; 8.8% Milk protein percentage; 3.2%</p> <p>e) Total cost**: 3,800 yen/100 kg raw milk (47%)*</p>
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\* Figures in parentheses are percentages as compared with the present levels.

\*\* In 1990 value.

(3) Advanced technologies, in addition to those listed in Table 2:

- a) All-the-year-round silage feeding for labor-saving,
- b) Effective use of ammonia treated rice straw,
- c) Maintenance of adequate field conditions, drainage in particular, for high working efficiency of farm machines.

### Prospects of technology development and its extension

In the field of animal production, new technologies are expected to be developed as follows:

- (1) Highly productive cattle production with embryo transfer techniques,
- (2) Effective breeding system with early stage selection using computers,
- (3) Effective stock cattle production through stable mass-production of embryos with *in vitro* fertilization techniques,
- (4) Accurate diagnosis of infectious diseases using a monoclonal antibody,
- (5) Recombinant-derived efficacious vaccines for livestock,
- (6) Automatic feeding system for cattle,
- (7) Highly systematized cattle barn, piggery and poultry house for labor-saving,

Table 2. Model of beef cattle fattening farming

<p>(1) Premises</p> <p>a) Area: Western region of Japan</p> <p>b) Feeding and management system: Beef cattle fattening system with pen barn</p> <p>c) Field conditions: Improved farmlots</p> <p>d) Farm work: Two full-time workers Family farming</p> <p>e) Main advanced technology: Improvement of rate of weight gain with short-term fattening for 14 months</p> <p>Fattening for an appropriate period based on evaluation of meat quality of a live animal with CT scanning scope</p> <p>Feeding system based on forage test</p> <p>Intensive use of mixed rations of roughage and concentrate</p> <p>Herd management with personal computer</p> <p>Effective use of whole crop silage made from summer crops</p> <p>Putting single-component feed in most effective use</p>	<p>(2) Management index model based on advanced technology in 2000</p> <p>a) Labor requirement: Labor required; 16 hr/head (19%)* Full-time workers for farm management; 2</p> <p>b) Number of cattle and cropping area: Number of cattle; 200 Number of cattle marketed a year; 170 Upland fields; 5.8 ha (including main- and off-season cropping)</p> <p>c) Body weight and crop yield: Body weight gain per day; 0.86 kg/head (139%) Crop yield; Corn/sorghum mix-seeding — 120 t/ha Barley — 48 t/ha</p> <p>d) Carcass quality produced: Carcass with high dressed carcass percentage and high uniformity</p> <p>e) Total cost**: Fattening cost; 23,200 yen/100 kg live weight (46%)</p>
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\* Figures in parentheses are percentages as compared with the present levels.

\*\* In 1990 value.

- (8) Intensive feeding under a combined system of time-controlled grazing with movable electric fence on a high-nutrient grassland,
- (9) Fattening for an adequate period of time by meat surveys in live animals with a color scanning scope,
- (10) Breeding and development of high quality and high yielding grass cultivars with heat tolerance and disease resistance,
- (11) Development of high-efficient seeders, transplanters, and harvesting machines,
- (12) Simple and accurate techniques for evaluating quality of animal products by means of near infrared rays and other methods,
- (13) A system to supply precise data on new agricultural technologies,
- (14) Construction of an appropriate data processing system incorporating experts' judgement, e.g. management system and disease diagnosis system.

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