日本最新乳牛飼養導引(2017年版)用於機器人養牛場

Japanese Dairy Farming and Nutrient Requirement for Dairy Cattle to Meet Milking Robot

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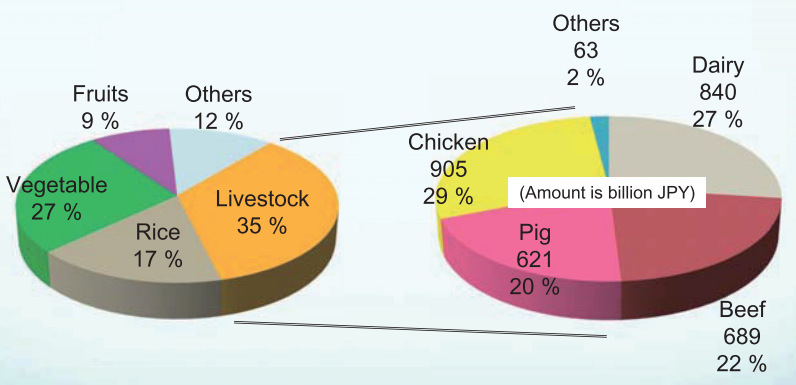
Japanese Dairy Farming

- **Situation of Japanese Dairy Farm**
  - *Dairy Farm and Dairy Cattle in Japan*
  - *Dairy Products in Japan*
- **New Version of Japanese Nutrient Requirement for Dairy Cattle (2017)**
  - *Publication of Feeding Standards in Japan*
  - *Background of the Revision*
  - *Feeding management during milking by the robot*

The Gross Production Amount of Agriculture of Japan



Total Amount of Agriculture	Total Amount of Livestock Production
8,398 billion JPY	3,118 billion JPY

Calculated based on Statistics, MAFF (2015)

Breeds of Dairy Cow in Japan


Holstein (Bull)


Holstein (Cow)
99% of Dairy Cow in Japan is Holstein

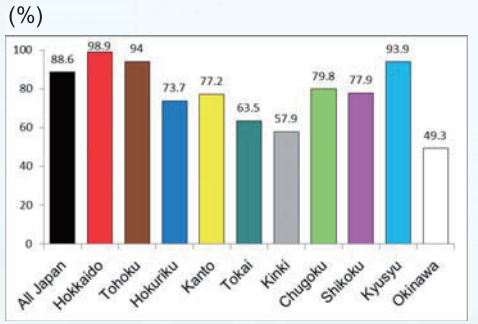

Jersey
Around 10,000

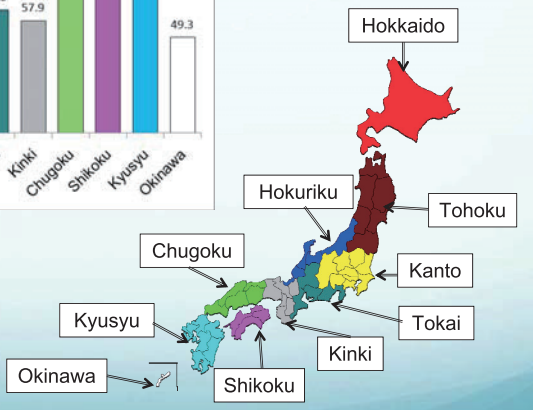

Brown Swiss
Around 1,000


Guernsey
Less than 1,000

Photos from NBAFA and JLIA

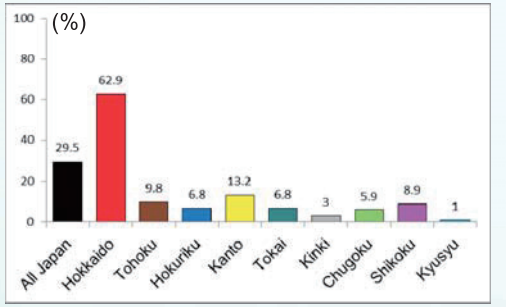
The Rate of Forage Crop Planting Farmers

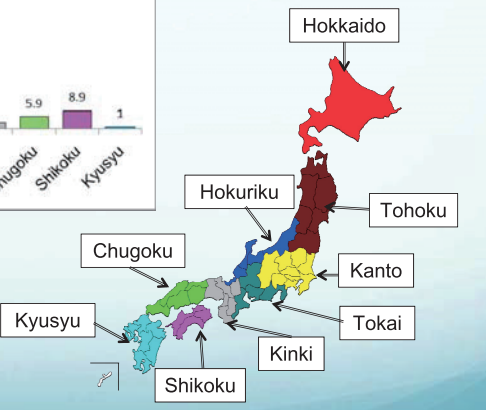




From MAFF Web-site (2016)

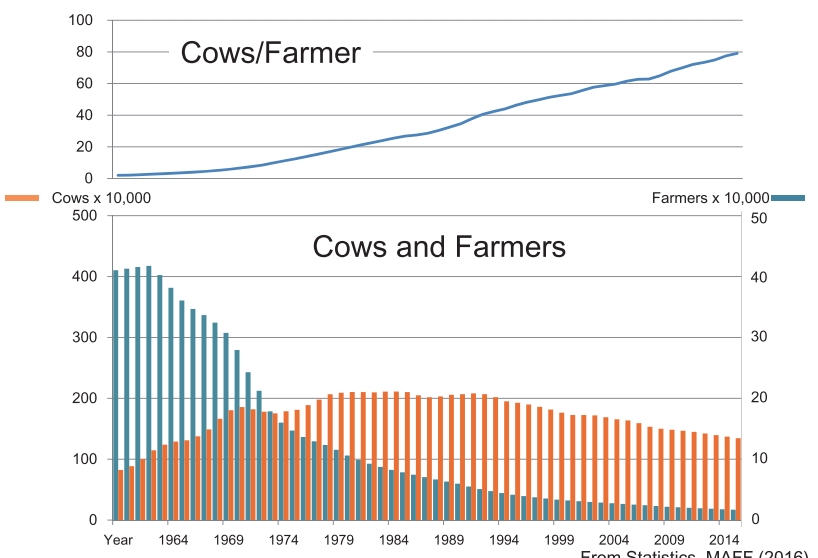
The Rate of Grazing Dairy Cows





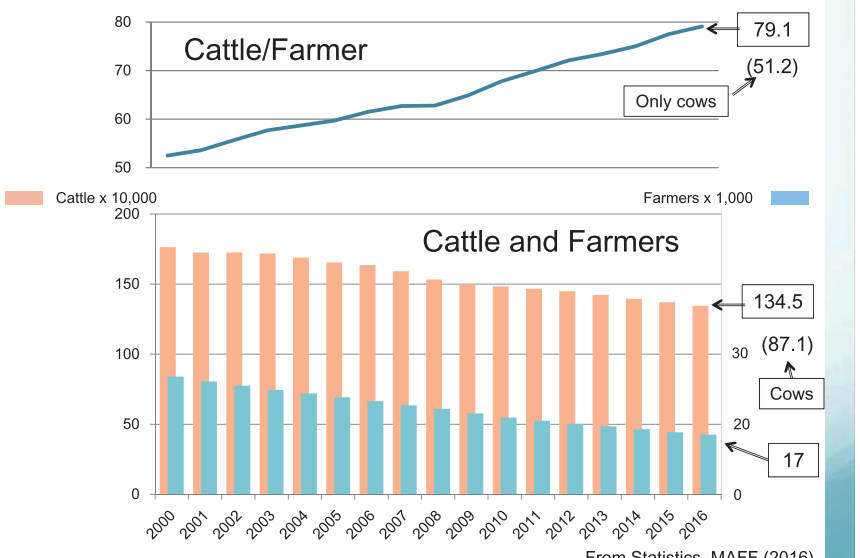
From MAFF Web-site (2016)

The Number of Dairy Cows and Farmers (Long Term)



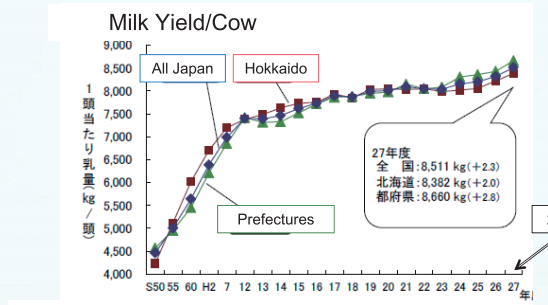
From Statistics, MAFF (2016)

The Number of Dairy Cattle and Farmers (2000～)

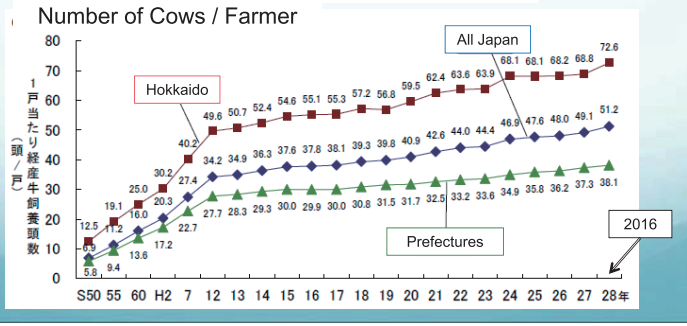


From Statistics, MAFF (2016)

Milk Yield and the Number of Cows/Farmer



From Statistics, MAFF (2016)



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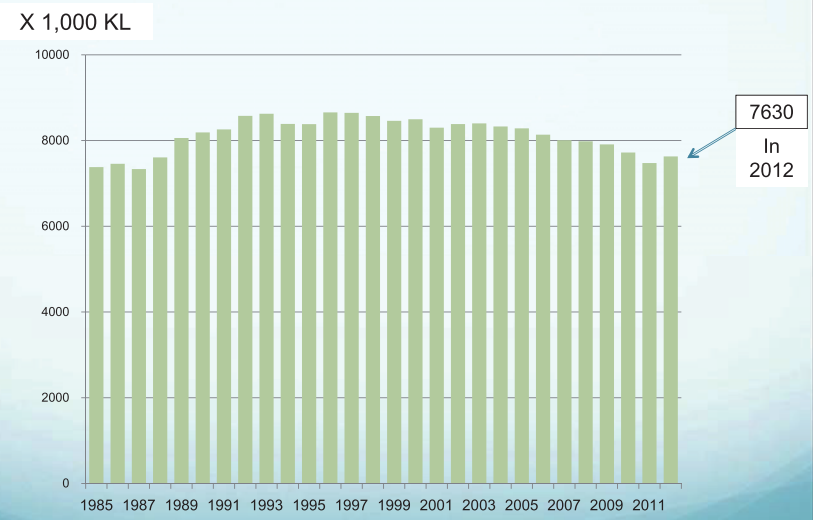
Total Milk Production



From Statistics, MAFF (2015)

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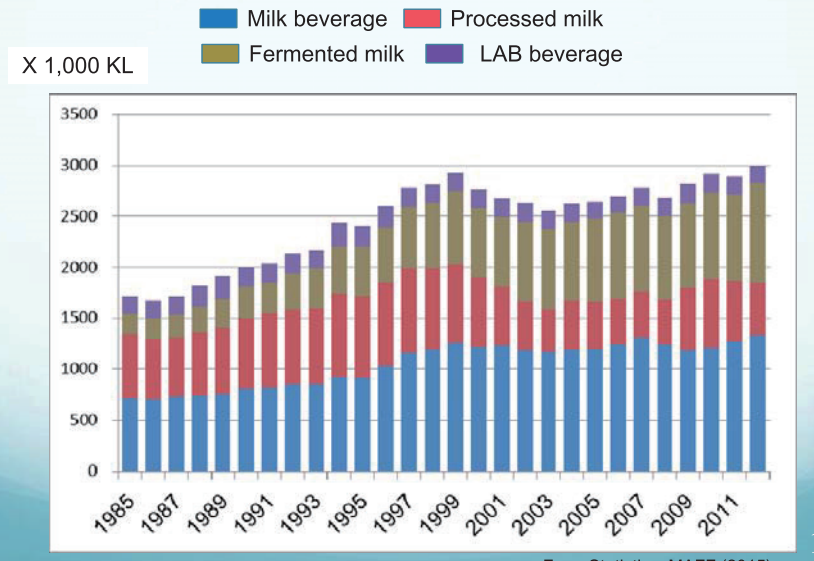
Dairy Products



From Statistics, MAFF (2015)

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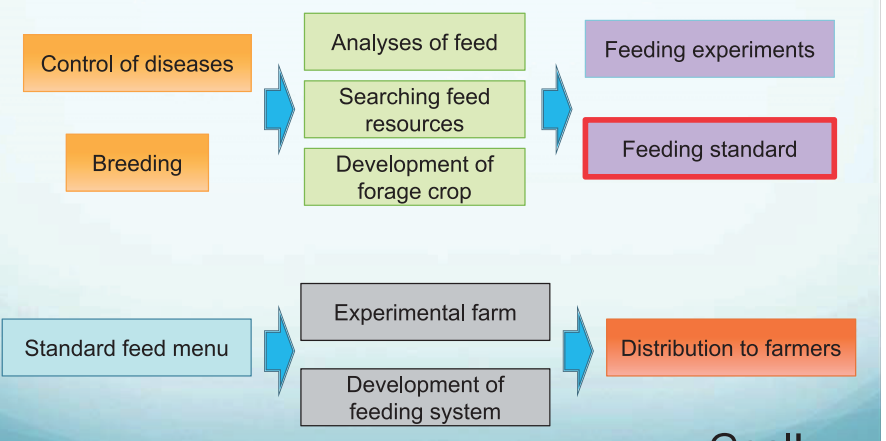
Development scheme of livestock production



Council for Japanese Feeding Standards

Main body

- Sub-committee
  - Dairy cattle
  - Beef cattle
  - Swine
  - Poultry
  - Feed composition tables

Secretariat; NIAI (National Institute of Animal Industry

➡ NILGS(National Institute of Livestock and Grassland Science) under NARO

Publication of Feeding Standards in Japan

	Dairy Cattle	Beef Cattle	Swine	Poultry	Sheep	Feed Composition	Equine
1965	○						
1970		○					
1974	○			○			
1975		○	○			○	
1980						○	
1984				○			
1987	○	○	○			○	
1992				○			
1993			◎				
1994	○						
1995		○				○	
1996					○		
1997				◎			
1998			○				●
1999	○						
2000		○					
2001						○	
2004				○			
2005			○				
2007	○						
2008		○					
2009						○	
2011				○			
2013			○				
2017	○						

◎ : Both Japanese and English editions were published. English editions were made with the expectation that these would be used by researchers in Asia and certain organizations, such as the Japan International Cooperation Agency (JICA). But this demand is not strong,

● : The standard for horses was prepared by Japan Racing Association, not by MAFF.

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Latest Feeding Standards

Japanese beef cattle(2008), feed composition(2009), swine (2011), poultry (2013) and dairy cattle (2017)

Future works advised

- Revised version of feeding standard and feed data base every 5 to 10 years.
  - Who and how will do it?
  - New feed resources, revised analytical methods…
- Make standard menu recommendation.
  - Depending on the site and environment…
- Demonstration at the experimental farm.
  - Distribution to the farmers.
- Communication using ICT technology.
  - Feed back from farmers, not one way.

History of Japanese Nutrient Requirement for Dairy Cattle

First edition (1965): Feeding standard for Japanese dairy cattle was published depending on the results of project

First revised edition (1974): Explanation of basic matters about feed contents and feeding system

Second revised edition (1987): Improvement of explanation and adaptation to computing system

Third revised edition (1994): DMI estimation formula for high performance cows, introduced ME, present energy and mineral requirement at high temperature, explanation on non-degradable crude protein, NDF, and ADF

Fourth revised edition (1999): Improvement of dry matter intake equation to correspond to early and first lactation of high performance cows. Review nutrient requirements and growth rate of growing calves and pregnant cows. Presented a new protein requirements considering degradation rate in the rumen. Explanation about the environmental road reduction. Provide nutrient requirement calculation sheets and feed composition tables by CD

Fifth revised edition (2006):

(1) Review of dry matter intake estimate equation
(2) Degradable protein to effectively degradable protein
(3) Review of growth curve
(4) Review of manure volume and nitrogen excretion amount

Background of the Revision (1)

From the basic policy for modernization of dairy and beef cattle production (2015)

1. Recent situation on dairy farming ⇒ Weak on production base

- •Decreasing of breeding cattle in breeder farm ⇒ Decrease in milk production
- •Changes in global supply and demand of grain ⇒ Feed prices are keeping at a high level

2. Increase competitiveness of dairy production

- •Lack of manpower ⇒ Labor saving by utilizing robots, ICT, etc.
- •Utilizing external support organizations such as contractors
- •Utilization of grazing

3. Establishment of domestic feed production system

- •Increase production and usage of high-quality and low-cost domestic roughage
- •Expansion feed rice
- •Promotion of eco-feed

5. Extend milking period of dairy cattle

- • Improve productivity by improving feed efficiency etc.

Promote the use of livestock manure, odor prevention and drainage measures

Background of the Revision (2)

From the Livestock Improvement Target (2015) by MAFF（家畜改良増殖目標）

***Milk Yield*：**

Continually promote increase in milk yield per head in order to improve the productivity of dairy farming.

***Milk Composition*：**

Continually promote to maintain the current milk composition to meet the consumer needs and can be applied to various uses of milk and dairy products.

***Keeping High Milk Yield in One Lactation Period*：**

Continually improvement of high performance dairy caw that has a longer milking period
Minimize the changes in energy requirement during one milking period⇒
Decreasing the total amount of grain feed and improvement of antiseptic properties by reducing metabolic abnormality
Easy maintenance dairy cow and improving lifetime productivity

***Feed Efficiency*：**

Increase the feed efficiency through collecting data from dairy herd performance test
Also increase the feed efficiency in farm through cow management using body condition score

Background of the Revision (3)

Basic Plan for Food, Agriculture, and Rural Development by MAFF (2015)
（食料・農業・農村基本計画）

***Promotion of rice for feeding livestock*：**

Promotion of innovative development for agricultural production and marketing using robot or IC technology

Act on Promotion of Recycling of Food Resources (from 2001, final revision in 2007)

Promote recycling and utilization of food resources by food-related businesses (manufacturing, distribution, restaurant etc.) for large quantities of food wastes during the manufacturing process of food, unsold food or food left to reduce the amount ultimately disposed of by suppressing occurrence and reduction of weight and also as raw materials for feed and fertilizer.

Environment regulation on animal production

Water Pollution Control Act, Basic Environment Law, Waste Treatment Law, Odor Control Act, Act on Promotion of Use of Livestock Manure

Basic Concept for the Revision

- Verify current feeding standards based on the latest domestic data, and revise and improve reliability.
- Verify latest overseas information based on domestic data and present a new viewpoint for the revision.
- Enrich explanation on current and new matters and aim for revision that can respond to changes in the situation surrounding dairy farming.

Comparison of the contents in current and revised version

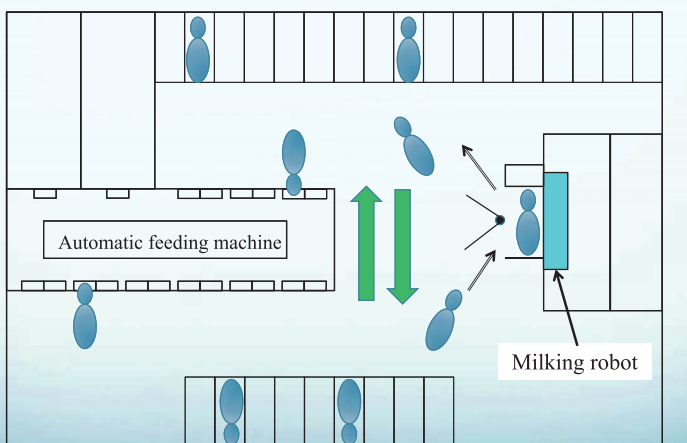
Fifth edition (2006)		Sixth edition (2017)	
Prologue	Basic policy of revision and composition	Prologue	Basic policy of revision and composition
Chapter 1	Unit of nutrients and requirements	Chapter 1	Unit of nutrients and requirements
Chapter 2	Nutrient requirement（1）	Chapter 2	Nutrient requirement（1）
Chapter 3	Nutrient requirement（2）	Chapter 3	Nutrient requirement（2）
Chapter 4	Factors influencing nutrient requirements and notes about feed management	Chapter 4	Factors influencing nutrient requirements and notes about feed management
Chapter 5	Notes about feeding methods	Chapter 5	Notes about feeding methods
		Chapter 6	Smoothing of lactation curve
Chapter 6	Group feeding and changes in nutrients	Chapter 7	Group feeding and changes in nutrients
Chapter 7	How to use the feeding standard and notes	Chapter 8	How to use the feeding standard and notes
Chapter 8	Equation formula of nutrient requirement	Chapter 9	Equation formula of nutrient requirement
Chapter 9	References	Chapter 9	References
Appendix1	Feeding method of bulls	Appendix1	Feeding method of bulls
	Growth curve of bulls		Growth curve of bulls
	Feeding techniques of bulls		Feeding techniques of bulls
Appendix2	Feed content sheet (abstract of 2001 version)	Appendix2	Feed content sheet (abstract of 2009 version)

Chapter 7-2: Feeding management during milking by the robot (1)

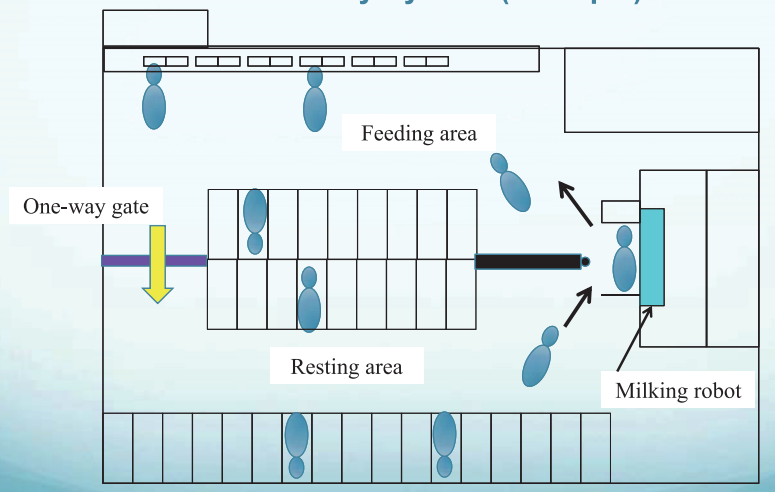
Behavior control of cow and introduction to the milking robot

- There is a positive correlation between the milking frequency and the average milk yield
- The motive for entering the milking robot is concentrated feed supplied in the robot
- There are briefly two systems; free-access system and one-way system
- Free-access system;
  - Merit; Easy adaptation to the milking robot
  - Demerits; Milking capacity will be reduced because unnecessary cows enter the robot. More concentrate feed is needed in the robot
- Wan-way system;
  - Merits; No decrease in milking capacity, less concentrate feed is needed
  - Demerits; Need more cost in order to construct the entry gate, rest space, and feeding area. There is a risk that low-ranked cows need to wait in the waiting area longer and milking frequency will be reduced.

Structure of cowshed using milking robot (1) Free-access System (Example)



Structure of cowshed using milking robot (2)
One-way System (Example)



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Chapter 7-2: Feeding management during milking by the robot (2)

Basic feeds

- PMR (Partly Mixed Ration) which is TMR by deducting concentrated feed supplied in the robot.
- It is important to balance the nutrients in PMR and feed in the milking robot. In particular, it is necessary to feed roughage sufficiently.
- Feed the efficient nutrients by utilizing BCS and metabolic profile tests.
- It is necessary to consider feeding balance due to the system difference.
- Consider that PMR alone does not satisfy nutrients, and method to improve the acceptability of PMR.
- Can be used TMR for feeding in the robot in case of using TMR center. It is recommended that to feed 20% of concentrated feed in the robot of one-way system.

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Chapter 7-2: Feeding management during milking by the robot (3)

Concentrated feed

- Need to set an upper limit of feeding and increase the frequency of milking, and pay attention to acidosis.
- It is recommended to frequently setting the concentrates amount and the frequency of milking, for example once a week, because it is easy to know the information of milk yield in the milking robot.

Points of aware by changing the milking method

- Be aware not to over feed or mal nutrition because the milk yield will be changed by the introduction of milking robot.
- Keep in mind that there are certain number of cow that are not adapted with the robot.
- It is necessary to pay attention to energy shortage cause of milk yield increase.
- Be aware of hoof management and ensuring visits to the milking robot by behavior control besides nutrition control.

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NEWS

Oct 6, 2016

BUSINESS

Biggest robot dairy in Asia setting up Japan's milk revival

BY AYA TAKADA
BLOOMBERG

Jin Kawaguchiya gave up a career in finance to help revive Japan's ailing dairy industry, one robot at a time.

In a country that relies increasingly on imported foods like cheese and butter, Japan's milk output tumbled over two decades, touching a 30-year low in 2014. Costs rose faster than prices as the economy stagnated, eroding profit, and aging farmers quit the business because they could not find enough young people willing to take on the hard labor of tending to cows every day.

But technology is altering that dynamic. In Hokkaido, Japan's top dairy-producing region, Kawaguchiya transformed the 20-cow farm he inherited from his father-in-law 16 years ago into Asia's largest automated milking factory. Robots milk 360 cows three times a day and make sure the animals are fed and healthy.

The machines even gather up poop and deposit it in a furnace that generates electricity.

"Without robots, I would have to hire as many as 15 part-time workers to take care of cows," Kawaguchiya, 44, said during an interview at the dairy in Kakuyama. "I can save ¥15 million a year thanks to them."

Kawaguchiya had no experience in farming before taking over the farm from his father-in-law, whose three daughters were not interested in running a dairy that required them to manually attach milking tubes to the teats of each cow. Kawaguchiya says he quit a job as a manager in Tokyo for Shoko Fund & Co., a business lender, because he saw an opportunity to make a better living in agriculture, provided he could change the

OCT 6, 2016
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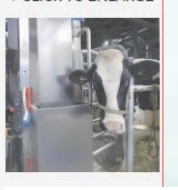

Jin Kawaguchiya

https://www.japantimes.co.jp/news/2016/10/06/business/biggest-robot-dairy-asia-setting-japans-milk-revival/

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