5. Support for individual challenges (1) (fuel price [1])

- Preparation of plans for promoting energy-saving and other measures to promote the shift to management resistant to the effects of sharp fuel price rises, under which compensation is provided to production areas striving to cut the use of fuel by more than 15% if fuel prices rise by a set standard (115% of average of prices in five of the past seven years).

In addition, (1) special low temperature measure to lower the trigger benchmark price when the monthly temperature falls below the average-year temperature and (2) special soaring price measure that is implemented in the case of a rise of more than 20% from the previous year’s average price.

### Key points of countermeasures

**Point 1** Benchmark prices for triggering the safety net

Using the average of type-A fuel oil prices in five of the past seven years or excluding two years of the highest and lowest prices as a benchmark, 115% of the benchmark serves as a benchmark triggering price.

**Point 2** Special low-temperature measure

When the temperature in the year concerned falls below the average-year temperature, the benchmark trigger price is lowered in stages.

**Point 3** Special soaring temperature measure

When the fuel price rises above the average of prices during the previous year’s warming season by more than 20% and also above the benchmark price, the difference from the benchmark price is covered.

### Shift management resistant to steep fuel price rises

- Preparation of plans to promote energy-saving and other measures to create a safety net in production areas striving to cut more than 15% in the use of fuel to stabilize management by easing effects of steep fuel price rises that cannot be covered by energy-saving efforts alone.

### Support for creation of a safety net (subsidy rate: 1/2)

- Example: Setting a reduction target for fuel use (more than 15%) and programs to attain the target

- In case of greenhouse horticulture and other production area launching measures

- Coverage of difference from benchmark triggering price from the fund saved by the state and that saved by producers at rate of 1 to 1.

### Price of type-A fuel oil

<table>
<thead>
<tr>
<th>Benchmark prices</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>80.4 yen</td>
<td>Nov. 2010 - Apr. 2011</td>
</tr>
<tr>
<td>88.3 yen</td>
<td>Nov. 2011 - Apr. 2012</td>
</tr>
<tr>
<td>93.7 yen</td>
<td>Nov. 2012 - Apr. 2013</td>
</tr>
<tr>
<td>102.5 yen (higher price)</td>
<td>Nov. 2013 - Apr. 2014</td>
</tr>
<tr>
<td>89.0 yen</td>
<td>Nov. 2014 - Apr. 2015</td>
</tr>
<tr>
<td>66.4 yen</td>
<td>Nov. 2015 - Apr. 2016</td>
</tr>
<tr>
<td>71.2 yen</td>
<td>Nov. 2016 - Apr. 2017</td>
</tr>
</tbody>
</table>

### Transition of fund composition

<table>
<thead>
<tr>
<th>Year</th>
<th>Composition of fund 1:1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 2010 - Apr. 2011</td>
<td>84.5 yen (benchmark price)</td>
</tr>
<tr>
<td>Nov. 2011 - Apr. 2012</td>
<td>97.2 yen (benchmark price x 115%)</td>
</tr>
<tr>
<td>Nov. 2012 - Apr. 2013</td>
<td>97.2 yen (benchmark price)</td>
</tr>
<tr>
<td>Nov. 2013 - Apr. 2014</td>
<td>97.2 yen (benchmark price)</td>
</tr>
<tr>
<td>Nov. 2014 - Apr. 2015</td>
<td>89.0 yen (benchmark price)</td>
</tr>
<tr>
<td>Nov. 2015 - Apr. 2016</td>
<td>84.5 yen (benchmark price)</td>
</tr>
<tr>
<td>Nov. 2016 - Apr. 2017</td>
<td>97.2 yen (benchmark price)</td>
</tr>
</tbody>
</table>

### Comparison of average prices

- Case in fiscal 2017

  - Average price: 71.2 yen
  - Benchmark trigger price: 97.2 yen

- Compensation: 4.7 yen/liter (89.2 yen – 84.5 yen)

- Special soaring price measure

  - Fuel oil A: 84.5 yen/liter
  - Special soaring price: 97.2 yen/liter (71.2 yen/ liter x 120%)

- Special low temperature measure

  - From 0.1 to 0.4 ℃: 93.0 yen/liter
  - From 0.5 to 0.9 ℃: 88.7 yen/liter
  - 1.0 ℃ or more: 84.5 yen/liter

- Promotions

  - Benchmark trigger price: 97.2 yen
  - Price soar by 20% or more compared with the previous year

- Energy-saving programs

  - In cases where the temperature is lower than the average-year temperature in the following range:
    - From 0.1 to 0.4 ℃: 93.0 yen/liter (benchmark price x 110%)
    - From 0.5 to 0.9 ℃: 88.7 yen/liter (benchmark price x 105%)
    - 1.0 ℃ or more: 84.5 yen/liter (benchmark price x 100%)

- Special measure

  - Special soaring price measure

  - Special low-temperature measure

- Support

  - Handling by the safety net
  - Promotion of energy-saving plan
  - Coverage of difference from benchmark triggering price from the fund saved by the state and that saved by producers at rate of 1 to 1.

- Time of preparation of plan

  - 1st year
  - 2nd year
  - 3rd year

- Amount of fuel use

  - Cut of more than 15% in the amount of fuel use by promoting the energy-saving promotion plan

- Support for creation of a safety net (subsidy rate: 1/2)

  - Triggering of the safety net
  - Normal compensation
  - State Reserved fund
  - Coverage of difference from benchmark triggering price from the fund saved by the state and that saved by producers at rate of 1 to 1.
5. Support for individual challenges (1) (fuel price [2])

○ It is necessary to stabilize management through cuts in the burden on greenhouse horticulture farm households by supplying fuel oil for agricultural, forestry and fishery use stably at as low a price as possible and also to secure a stable supply of agricultural, forestry and fishery products.

○ Implementation of exemption from oil and coal tax (2,800 yen/KL) related to imports of type-A fuel oil for agricultural, forestry and fishery use and of refund of amount (2,800 yen/KL) equivalent to oil and coal tax related to type-A fuel oil for agricultural, forestry and fishery use (special measures extended for three years for fiscal 2017 to 2019)

○ In case of type-A fuel oil imports for agricultural use

Importers (Zen-Noh, etc.) are exempted from oil and coal tax and pass it onto selling price for farmers

Duties of custom

- Application
- Duty exemption 2,800 yen/kiloliter (*including tax for measures against global warming)
- Importer of A-type fuel oil (Zen-Noh, etc.)
- Proof of use
- MAFF
- Proof of use
- Passage of duty exemption onto sales price!
- JA, etc.
- • Passage of duty exemption onto sales price
  • Stable supply of inexpensive type-A fuel oil
- Farmers

Tax offices

- Application
- Refund 2,800 yen/kilo liter (*including tax for measures against global warming)
- Producers of type-A fuel oil
- Proof of purchase
- Duty exemption onto sales price!
- Zen-Noh, etc.
- Proof of purchase
- Stable supply of inexpensive type-A fuel oil
- JA, etc.
- Duty exemption onto sales price!
- Proof of purchase
- Maintenance and stability of farm management achieved!!
- Farmers

○ In case of domestic type-A fuel oil for agricultural use

If type-A fuel oil, produced in Japan from crude oil, with oil and coal tax already levied, is used in agriculture, an amount equivalent to oil and coal tax is refunded to producers who pass the exemption onto sales prices for farmers.
5. Support for individual challenges (2) (insects for pollen mating (honeybee))

○ Honeybees are used for pollen mating for strawberries, melons, water melons, etc. and their effects in Japan (use inside facilities) are estimated at about 73 billion yen.

○ The Ministry of Agriculture Forestry and Fisheries created a supply-demand coordination system between horticulture farmers and honeybee keepers in fiscal 2009 to adjust supply and demand, when a honeybee shortage for pollen mating is expected, by sharing information on the prefectures in which supply is possible. But supply-demand balance has grown tighter due to damage caused by natural disasters and unseasonable weather conditions in recent years, so programs to achieve stable honeybee securement are necessary.

○ Situation of honeybee use for pollen mating in greenhouse horticulture of vegetables

<table>
<thead>
<tr>
<th>Section of use</th>
<th>Total area (ha)</th>
<th>Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of greenhouse horticulture of vegetables (total)</td>
<td>39,635</td>
<td></td>
</tr>
<tr>
<td>Of which, area of honeybee use</td>
<td>7,795</td>
<td>19.7</td>
</tr>
<tr>
<td>Area of strawberry cultivation</td>
<td>3,970</td>
<td></td>
</tr>
<tr>
<td>Of which, area of honeybee use</td>
<td>3,553</td>
<td>89.5</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture, Forestry and Fisheries, “Situation of Facilities Installed for Horticulture”

○ Support for stable procurement of honeybees for pollen mating

Support (from 2018) for expenses related to programs between horticulture production areas and honeybee keepers to prevent a shortage of honeybees for pollen mating (preparation of plans for cooperation between horticulture farmers and honeybee keepers, technology to ease damage using yellow hornet repellent, long-term sanitary utilization technology using biodegradable plastics as frames for hive boxes, technology for high-speed breeding of queen bees, technology to create an appropriate environment within a greenhouse, technology to prevent mite damage, technology to reduce dissipation in winter, efficient retreat from damage, etc.)
Bumblebees are used for pollen mating for tomatoes and other produce grown inside facilities. Their economic effects in Japan (for use inside facilities) are estimated at about 5.3 billion yen.

Bombus terrestris were designated as an invasive alien species in 2006 and the raising and keeping of them are banned in principle. The new introduction of them is also banned. If authorized by the Minister of Environment, raising and keeping them is possible as an exception.

Shipments of Bombus terrestris have remained level since their designation as an invasive alien species, while the number of indigenous-breed bumblebees used has maintained a certain level. Bombus ignitus bumblebees have been found to be little different from Bombus terrestris in function.

Based on these facts, the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Environment decided in 2017 on the policy of using an alternative to Bombus terrestris and to accelerate the shift to an alternative to large earth bumblebees under the target of halving the use of Bombus terrestris by 2020.

### Situation of using bumblebees for greenhouse production of vegetables

<table>
<thead>
<tr>
<th>Section of use</th>
<th>Total area (ha)</th>
<th>Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of greenhouse vegetable production (total)</td>
<td>39,635</td>
<td></td>
</tr>
<tr>
<td>Area of bumblebees used</td>
<td>2,905</td>
<td>7.3</td>
</tr>
<tr>
<td>Area of tomato cultivation</td>
<td>6,971</td>
<td></td>
</tr>
<tr>
<td>Area of bumblebees used</td>
<td>2,665</td>
<td>38.2</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture, Forestry and Fisheries, “Situation of Facilities Installed for Horticulture”

### Changes in shipments of bumblebees

- **Policy of using an alternative to large earth bumblebees**
  - In Hokkaido, Bombus ignitus is not used, and the use of indigenous species (Bombus hypocrita sapporoensis) is demonstrated. The shift to them is being promoted since the demonstration.
  - Outside Hokkaido, Bombus ignitus has been used under due management. Bumblebees are properly treated after use so that they do not fly into fields because they, even the indigenous species, have artificially uniformized genes.

- **Support for increase in use of bumblebees of indigenous species**
  - The Ministry of Agriculture, Forestry and Fisheries has supported demonstrations (since 2017) needed for the shift to bumblebees of indigenous species in horticulture production areas promoting planned efforts to half the use of Bombus terrestris.
5. Support for individual challenges (3) (Cost of building a greenhouse [1])

- Greenhouse prices have sharply increased in Japan in recent years against the backdrop of rises in material prices and labor cost.
- In greenhouse horticulture, the cost of building greenhouses needs to be lower as facility expenses account for more than 10% of farm management expenses.

- The prices of greenhouses for agricultural use in Japan

Base price of a pipe greenhouse has risen by a factor of roughly 1.7 compared to 10 years ago.

- Ratio of facility expenses to farm management cost

<table>
<thead>
<tr>
<th>Facility expenses</th>
<th>Farm management cost (in 1,000 yen)</th>
<th>Ratio of facility expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse horticulture of vegetables</td>
<td>620</td>
<td>13%</td>
</tr>
<tr>
<td>Greenhouse horticulture of flowers</td>
<td>1,563</td>
<td>12%</td>
</tr>
<tr>
<td>Open-field cultivation of vegetables</td>
<td>238</td>
<td>5%</td>
</tr>
<tr>
<td>Cultivation of fruits</td>
<td>291</td>
<td>7%</td>
</tr>
<tr>
<td>Cultivation of rice</td>
<td>103</td>
<td>6%</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture, Forestry and Fisheries, "Statistics on Type-by-Type Agricultural Management" (2015)

* Base price of a pipe greenhouse and price of arch pipes: Prices are quoted from greenhouse maker’s catalogue (Arch price is for a set of 20 pipes).
Price of arch pipes is not listed due to unavailability in the 2017 catalogue.
* Unit labor cost: Ministry of Land, Infrastructure, Transport and Tourism, "Public Works Design and Unit Labor Cost (Ordinary Workers)" (Unit cost in Kumamoto Prefecture)
5. Support for individual challenges (3) (Cost of erecting greenhouse for agricultural use [2])

- To cut the cost of erecting greenhouses for agricultural use based on "Programs to Reinforce Competitiveness of Agriculture," (1) Preparation of a guidebook for introducing weather-resistant greenhouses, (2) Development and dissemination of technology to cut the cost of weather-resistant greenhouses, and (3) Promotion of self-building of pipe greenhouses, etc. will be promoted.

- Preparation of a guidebook in 2018 to enable farmers to strengthen greenhouses and specifications matching their own management. (Before the guidebook, a leaflet was prepared in fiscal 2017 to sort out in simple terms ideas for choosing necessary strength. At the time of preparation, rules for wind resistance, snow resistance, weight resistance, and other issues of concern for greenhouses were relaxed.)

- Preparation of a low-cost technology catalogue and collection of examples of low-cost cases through exploration of technologies, including regional small and midsize makers (convening of technology proposal session) in fiscal 2017.

- To demonstrate and establish a greenhouse capable of cutting the cost of building a greenhouse per se and interior facilities by 30% from the current level by fiscal 2019 (project to reinforce the management unit under the fiscal 2016 supplementary budget)

- Preparation of a self-building manual for farmers by Zen-Noh in fiscal 2017

- 30% cut in cost of erecting a weather-resistant greenhouse

- Prevention of over specifications and dissemination of high quality and low-cost greenhouses for agricultural use through farmers' selection

- Establishment of technology capable of cutting materials cost and building cost combined by 30% through innovation

- 20% cut in cost of erecting pipe greenhouses

- Cut (20%) in building cost by self-construction

- To shift the design standard for weather-resistant greenhouses from "industry standards" to "Guidebook for Farmers."

- Exploration, development and dissemination of information of cost-cutting technology.

- Promotion of self-construction of pipe greenhouses by agricultural corporations and JA working groups

- Furtherance of excessively large space by leaving strength and specifications to makers

- High building cost
Specific programs to cut the cost of improving facilities

- Example of technological development (technology revealed at a technology proposal session)
  - Cut in building cost by means of the pile foundation method

- Leaflet for farmers
  - Preparation of leaflet in fiscal 2017, sorting out ideas in plain terms for selecting needed strength

<table>
<thead>
<tr>
<th>Strength resistant to strong wind (wind-resistance design value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
</tr>
<tr>
<td>Mito City, Ibaraki Prefecture</td>
</tr>
<tr>
<td>Yokkaichi City, Mie Prefecture</td>
</tr>
</tbody>
</table>

(Features)
Construction period is shortened and direct driving piles eliminates the boring work and formwork needed in groundwork

- Studies on project to reinforce management unit (Technology introduced at technology proposal session)
  - Small-scale, low-cost greenhouse utilizing materials for construction scaffolding

Increase in farmers' income and expansion of greenhouse horticulture market
### Key points of model

Family-run business seeking to expand operations and improve productivity by adopting environmental control technology, etc. and concluding direct sales contracts with actual users.

### Outline of technology and program

- Labor saving and expansion of operations by adopting environmental control technology to automate temperature, humidity, and other adjustments.
- Sharp increase in amount of production (from 10.4t/10a to 35t/10a) by adopting high-yield products with high sugar content, a hydroponic system, long-term cultivation and the environmental control technology in ICT.
- Creation of local employment throughout the year by realizing year-round cultivation
- Cost reduction by adopting heat pumps and other energy-saving devices
- Conclusion of direct sales contracts and realization of stable management and sales route expansion by producing tomatoes of the quality demanded by consumers

### Feature of management development

#### (Type of management)
Family-run (two people and 17 temporary employees)

#### (Scale of management and type of cropping)
<table>
<thead>
<tr>
<th>Arable land under management</th>
<th>1ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables subject to greenhouse horticulture</td>
<td>Tomatoes 1ha</td>
</tr>
<tr>
<td>Settled planting</td>
<td>August</td>
</tr>
<tr>
<td>Shipment</td>
<td>From September to July of the following year</td>
</tr>
</tbody>
</table>

#### (Results of estimation)

| Gross revenue | 105 million yen |
| Management expenses | 93.4 million yen |
| Labor cost | 21.5 million yen |
| Agricultural income | 11.6 million yen |
| Income of main worker (per person) | 5.8 million yen |
| Work hours by main worker (per person) | 1,800 hours |

### Topics of production technology

- **Long-term cultivation (tomatoes)**
  - Longer harvesting period than before and large increase in amount of production thanks to a hydroponic system using a high wire system

- **Compound environmental control system**
  - Pursuit of optimal growth environments and cost reduction through the combination of compound environmental control system and energy-saving equipment

- Implementation of direct contract sales to supermarkets, department stores, restaurants, sellers of home-meal replacements, etc.
Model of corporation-type greenhouse horticulture shows gross revenue of 500 million yen utilizing ICT and regional energy at large-sized greenhouses

<table>
<thead>
<tr>
<th>Types of agricultural management</th>
<th>Vegetable cultivation (next-generation greenhouse horticulture)</th>
<th>Area covered</th>
<th>Nationwide</th>
</tr>
</thead>
</table>

**Key points of model**

Corporate management engaging in integrated next-generation greenhouse horticulture from production to coordination to shipment, combining local energy, such as wooden biomass, and cutting-edge technology

**Labor saving by environmental control technology and expansion of operations by promoting amassment of farmland and securing deserted arable land and industrial parks, etc.**

**Sharp increase in amount of production (from 10.4t/10a to 35t/10a) by adopting high-yield products with high sugar content, a hydroponic system, long-term cultivation and the environmental control technology in ICT.**

**Creation of local employment throughout the year by realizing year-round cultivation**

**Utilization of local energy, such as wooden biomass, to break away from the reliance on fossil energy (30% cut in use of fossil energy)**

**Realization of stable management and securement of sales routes through direct contract sales (from 304 yen/kg to 350 yen/kg)**

**Outline of technology and program**

- Control of temperature, humidity, CO2, amount of insolation, amount of fertilizer used, etc. by utilizing ICT
- Utilization of geothermal energy
- Wooden biomass boiler
- Hydroponic system
- Venlo greenhouse
- Screen of an environmental control system
- Roof window, curtain and cyclical fan

**Feature of management development**

(Type of management)

Management by corporation (4 people, 6 full-time employees and 82 temporary employees)

(Scale of management and type of cropping)

Arable land under management 4ha
Vegetables subject to greenhouse horticulture 4ha
Tomatoes 4ha
Settled planting August
Shipment From September to July of the following year

(Results of estimation)

Gross revenue 490 million yen
Management expenses 434.5 million yen
Labor cost 123.6 million yen
Agricultural income 55.5 million yen
Income of main worker (per person) 13.9 million yen
Work hours by main worker (per person) 1,800 hours

**Topics of production technology**

Control of temperature, humidity, CO2, amount of insolation, amount of fertilizer used, etc. by utilizing ICT

(Reference) Feature of average worker primarily engaging in agriculture

(Type of management)

Family-run (2 people and 1 temporary employee)

(Scale of management and type of cropping)

Arable land under management 0.33ha
Vegetable subject to greenhouse horticulture Tomatoes 0.33ha
Settled planting September
Shipment From November to June of the following year