

# CURRENT SITUATION OF VEGETABLE PRODUCTION AND RESEARCH IN JAPAN

Akira Kotani\*

## ABSTRACT

In Japan, areas where vegetables are produced have expanded from the periphery of big cities to more distant areas to provide a large amount of fresh vegetables to the urban population. At the same time the scale of operation has been enlarged along with the improvement of the marketing structure, which is mainly associated with the development of the transportation system. Besides, the development of new cultivars and cultivation methods adapted to the various climatic zones of Japan has contributed to the promotion of vegetable cultivation over wide areas and in various seasons. As a result, the supply of main vegetables has become possible at any time of the year.

1. Recent statistics of vegetable production show that the planted area covers 600 thousand hectares, the production amounts to 16.5 million tons, and the yield to 25-27 tons/hectare. However, one of the main constraints is the instability of the production mainly caused by the changes in the meteorological conditions. Although the amount of consumption has remained stable at 110 kg/person/year for a decade, consumer demand for various kinds of vegetables with good quality is increasing.

2. To meet such requirements, it is important to improve the quality of and increase the number of cultivars, to diversify the kinds of vegetables produced, stabilize production, and develop an appropriate distribution system. Therefore, research deals with the following aspects : evaluation and utilization of genetic resources, development of new breeding methods and propagation of strains by the use of biotechnology, analysis of physiological and ecological characteristics of cultivars and control of their growth, control of the environment in the greenhouse, control of pests, preservation and improvement of soils, prevention and control of natural disasters, etc. Besides, research for the development of methods to evaluate and preserve the quality of vegetables after harvest is also being promoted.

## Current situation and problems

In Japan, the production of vegetables rapidly increased after World War II when the economy was reconstructed and food situation improved. Areas where vegetables are produced have expanded from the periphery of big cities to more distant areas to provide a large amount of fresh vegetables to the urban population. At the same time the scale of operation has been enlarged along with the development of the transportation system. Besides, the development of new cultivars and cultivation methods adapted to the various climatic zones of Japan has contributed to the promotion of vegetable cultivation over wide areas and in various seasons. As a result, the supply of main vegetables has become possible at any time of the year.

Recent statistics of vegetable production show that the planted area covers about 600 thousand hectares mainly due to the reorganization of paddy field use. The production amounts to 16.5 million tons, and the yield to 25-27 tons/hectare (Fig. 1). However, one

---

\*Okinawa Branch, Tropical Agriculture Research Center, Maesato, Ishigaki, Okinawa, 907 Japan.

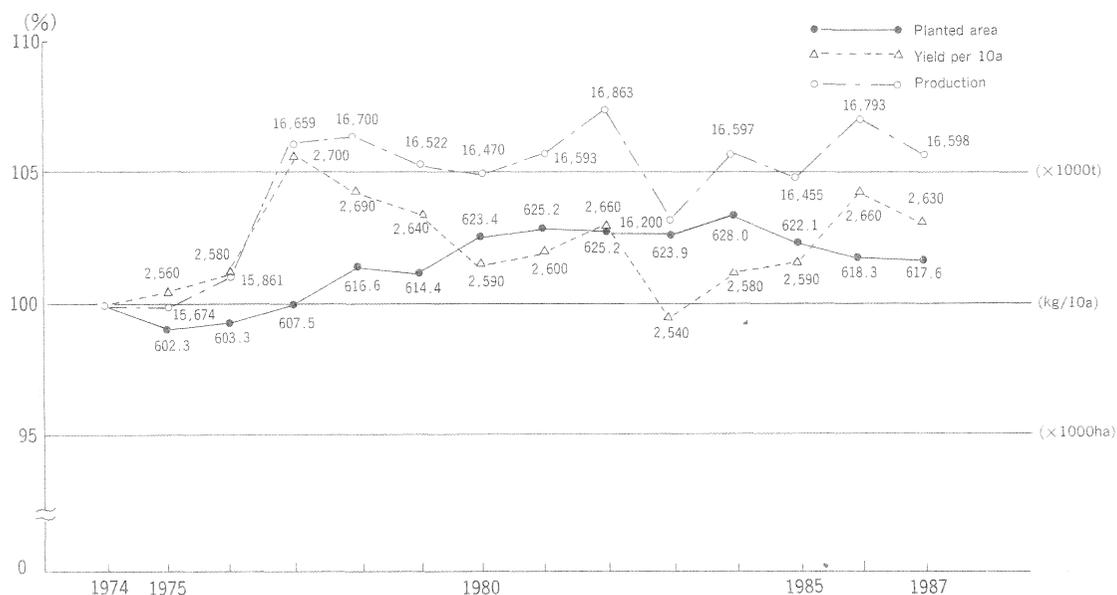


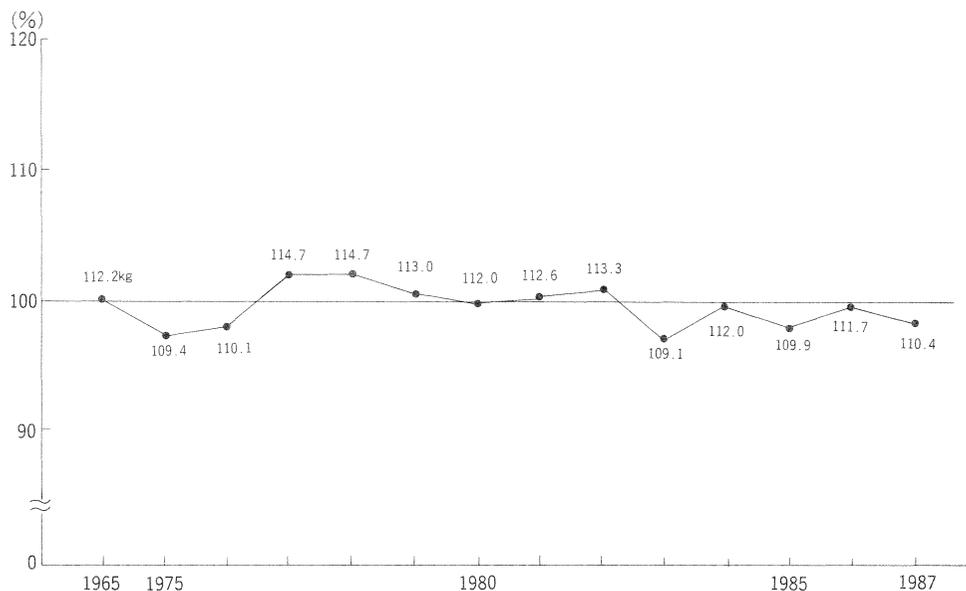
Fig. 1 Trends in planted area, yield per 10a and amount of vegetables produced (49 kinds)  
Sources : MAFF, 1987a

of the main constraints is the instability of the production largely caused by the changes in the meteorological conditions. Although the amount of consumption has remained stable at 110 kg per caput per year for a decade (Fig 2), the consumer demand for various kinds of vegetables with good quality is increasing.

There are about 100 plant species used as vegetables in Japan. Among them, 80 species are very popular with the production of 33 species amounting to more than 50 thousand tons, and 18 species to more than 10 thousand tons (MAFF, 1987b). Along with the diversification of the consumer demand for a larger number of vegetables with improved quality that are available in various seasons, the production of new kinds of vegetables, such as edible flowers is increasing. The vegetables, which are widely cultivated and supplied include radish, Chinese cabbage, taro, carrot, lettuce, bamboo shoots, spinach, welsh onion, pumpkin and squash, cucumber, eggplant, tomato, sweet corn, etc, while those used as fruits are watermelon, melon, strawberry, etc. Potato and sweet potato are also important vegetables.

The areas where vegetables are cultivated extend from Hokkaido in the North to Okinawa in the South, and are located at altitudes ranging from 0 m to more than 1000 m. As a result, it is possible to cultivate the same vegetables in different areas and different seasons (MAFF, 1987b). As genetic factors such as species and varieties of vegetables, and environmental conditions, such as altitude and latitude, interact and generate ecological differentiation of vegetable cultivars, hence, various cultivars adapted to different areas and different seasons can be released. Furthermore, as a result of the diversification of the consumer demand, the development of horticulture under structures, such as glass or plastic greenhouses, and transportation system enable to promote the diversification of the types of cultivars, and harvest season of vegetables. In contrast, vegetable production in the subtropics in the summer is often very difficult and the amount and the types of vegetables produced there are limited.

The total area of vegetable production in Japan is about 620 thousand hectares, of



**Fig. 2 Trends in vegetable consumption per caput per year (49 kinds)**  
Sources : MAFF, 1987a

which 144 thousand hectares are cultivated with various methods involving the use of different kinds of materials for maintaining a higher temperature. Vegetables covering an area of 35 thousand hectares are cultivated in the greenhouse and this type of cultivation is becoming increasingly popular. The vegetables cultivated in the greenhouse consist of eggplant, tomato, sweet pepper, cucumber, pumpkin and squash, watermelon, melon, lettuce and strawberry. Cultivation in plastic tunnels and under plastic mulches in the open covers 57 and 52 thousand hectares, respectively, while, the area of vegetable cultivation in the open on converted paddy fields is increasing and reaches 124 thousand hectares.

About 80% of the products are mainly handled through the National Federation of Agricultural Cooperative Associations and standardization of vegetables is promoted. Though 95% of the demand is domestically supplied, fluctuations of wholesale price are considerably large (MAFF, 1987b). The total amount of fresh, frozen, and processed vegetables imported reaches 1.05 million tons (MAFF, 1987b), among which, fresh vegetables such as onion, garlic, pumpkin and squash, melon, strawberry are imported from New Zealand, Taiwan, Mexico, USA, and China.

To meet the growing sophistication in the demand for vegetables in Japan, it is important to improve the quality of and increase the number of cultivars, to diversify the kinds of vegetables produced, stabilize production, and develop an appropriate distribution system. Therefore, research deals with the following aspects (Res. Council, MAFF).

1) Evaluation and utilization of genetic resources, for example, resistance to diseases and insect pests, tolerance to climatic stress, ecological variability such as earliness, high yielding ability and new characteristics.

2) Development of new breeding methods and propagation of varieties by the use of biotechnological procedures involving interspecific or intergeneric crosses, mutation, male sterility, tissue and cell culture including cell fusion and cell screening, as well as mass-production of seeds and nursery methods.

3) Breeding of new varieties for resistance to diseases and insect pests, tolerance to various climatic stresses, earliness, high-yielding ability, good quality for fresh consumption or processing, and adaptability to mechanization or labour-saving cultivation.

4) Analysis of physiological and ecological characteristics of cultivars and control of their growth, including carbohydrate metabolism in relation to photosynthesis, translocation and storage of assimilates, metabolism in relation to quality, mineral nutrition and water metabolism, as well as physiological disorders, developmental physiology in relation to growth, dormancy, senescence, bolting, flower and fruit formation, and ecological response to climatic conditions.

5) Development of economical cultivation systems.

6) Control of the environment for cultivation under structures, for example, environment in structures in relation to growth, suitable climatic conditions for growth, adverse conditions for growth, improvement of management or cultivation techniques as well as materials and instruments in structures.

7) Development of forecasting methods for yield and harvest time.

8) Control of pests, for example, eco-physiological studies and evaluation of damage, forecasting methods, and pest management including biological control.

9) Preservation and improvement of soils, for example, improvement of soil physical, chemical and biological properties, prevention of run-off of fertilizer components and suitable nutritional environment.

10) Prevention and control of natural disasters, for example, distribution and utilization of climatic resources, etc.

In addition, research for the development of methods of evaluation and preservation of the quality of vegetables after harvest is also being promoted (Res. Council, MAFF 1988).

## References

- 1) Ministry of Agriculture, Forestry and Fisheries (MAFF) (1987a) : Tables of Food Demand and Supply.
- 2) Ministry of Agriculture, Forestry and Fisheries (MAFF) (1987b) : Report on Statistics of Vegetable Production and Shipment.
- 3) Research Council of Agriculture, Forestry and Fisheries, MAFF (1988) : Retrieval System for Current Research in Agricultural Science (RECRAS)-II.