

## Chapter 14

# Agriculture in the Islands of Kagoshima - Special Reference to Fruit Production in the Yakushima and Amami Islands -

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### 1. Introduction

There are more than 200 islands in the Kagoshima Prefecture, extending 600 km from the north to south. However, the Osumi Islands (comprising Tanegashima Is., Yakushima Is., and Kuchinoerabujima Is.) and Amami Islands (comprising Amami-Oshima Is., Kikaijima Is., Tokunoshima Is., Okinoerabujima Is., and Yoronjima Is.) are major islands involved in agricultural production. Many of the smaller islands other than the above major islands, for example, Mishima Village Islands (comprising Takeshima Is., Iojima Is., and Kuroshima Is.) and Toshima Village Islands (comprising Kuchinoshima Is., Nakanoshima Is., Suwanosejima Is., Tairajima Is., Akusekijima Is., Kodakarajima Is., and Takarajima Is.) have low population and produce only beef cattle.

The Osumi Islands have 1 city and 2 towns in Tanegashima Is. and 1 town in Yakushima Is. Tanegashima Is. is not mountainous, but has many flatlands; therefore, the predominant agricultural crops include sugarcane, sweet potato, vegetables, rice, and tobacco. In comparison, the central part of Yakushima Is. has a high mountain (Mt. Miyanouradake) of altitude more than 1,000 m; hence, the cultivation area is concentrated along the shoreline, with few rice fields and farms. Approximately 60 % of agricultural input is fruit production, for example, ponkan (*Citrus reticulata* Blanco) and tankan (*Citrus tankan* Hayata). The Kuchinoerabujima Is., which is a part of the Yakushima Town, is small and similar to the sizes of the Mishima and Toshima villages. The agricultural population is low on this island, and beef cattle production is the main industry.

The 5 Amami Islands are located 300-500 km away from Kagoshima and Yoronjima Is., which

are located at the south end of this island group. One city, 8 towns, and 2 villages are present in the Amami Islands. Further, these islands have a warm subtropical climate; however, the rainfall and sunshine vary among the island; therefore, the implemented agriculture type varies across the 5 islands constituting the Amami Islands. Different types of agriculture such as forced culturing of temperate vegetables and tropical and subtropical crops and diversified farming, including sugarcane cultivation and livestock production are employed.

Here, the agriculture structure of the Yakushima and Amami Islands is shown, with special focus on fruit production.

### 2. Outline of the agriculture in the Yakushima and Amami Islands

#### 2.1. Yakushima Is.

The total cultivated area and economic output of Yakushima Town were 625 ha and JPY ¥1,299 million in 2009 and 631 ha and ¥1,161 million in 2010 (Table 1). The agricultural outputs (except for livestock) of these islands were 1,050 and 930 million in 2009 and 2010, respectively. Fruit production is the largest form of agriculture on Yakushima Town, representing approximately 50 % and 60 % of the total production from the Yakushima Town in 2009 and 2010, respectively (Yakushima Town 2012). For this reason, the Yakushima Is. is called “the island of the fruit trees.” The second most important form of agriculture is livestock (mainly beef cattle), followed by vegetables, industrial crops, and ornamental crops.

#### 2.2. Amami Islands

The number of agricultural farms and the agricultural population in the Amami Islands were 12,058 and 38,209, respectively, in 1990. Subsequently,

there was a gradual decline, with 8,723 farms and 19,315 people in 2005 (Fig. 1) (Kagoshima Prefecture 2012).

The total cultivated area in the Amami Islands was 123,139 ha in 2009, with the average cultivated area per farm being 1.93 ha. When considering the total cultivated area and average area per farm in every island, the largest total cultivated area was in Tokunoshima Is., 6,942 ha, followed by Okinoerabujima Is., 3,875 ha; Kikaijima Is., 2,226 ha; Amami-Oshima Is., 1,790 ha; and Yoronjima Is., 970 ha. However, the average area per farm in 2009 was the highest in Kikaijima Is., 3.37 ha, followed by Okinoerabujima Is., 2.43 ha; Tokunoshima Is., 2.38 ha; Yoronjima Is., 1.23 ha; and Amami-Oshima Is., 0.9 ha (Fig. 2).

The number of agriculture workers on each island in 2005 was the highest in Tokunoshima

Is., 5,205, followed by Okinoerabujima Is., 3,966; Yoronjima Is., 1,968; Amami-Oshima Is., 1,929; and Kikaijima Is., 1,208.

Moreover, in the Amami Islands, over 50% of the farmers were aged about 60 years, and thus, the numbers of farmers aged 70 years or more became particularly high. However, the ratio of farmers aged 45-54 and 40-45 years were high, and the ratio of farmers aged 30 years or less were higher than all farmers in all other age groups. The number of farmers of all age-ranges was the highest in Tokunoshima Is. followed by Okinoerabujima Is., 5,205 and 3,966, respectively (Fig. 3).

Because of the humid and wet subtropical weather of the Amami Islands, several crop types, except rice paddy, can be cultivated. The output percentage of horticultural crops such as vegetables, flowers, and fruit trees increased after 1990,

Table 1. Agricultural production in Yakushima Island (2009, 2010)

	2009				2010			
	Cultivated acreage ha	% of total	Production million Yen	% of total	Cultivated acreage ha	% of total	Production million Yen	% of total
Common crops	41	6.6	54	4.2	50	7.9	33	2.8
Industrial crops	84	13.4	136	10.5	90	14.3	136	11.7
Vegetables	83	13.3	201	15.5	74	11.7	129	11.1
Ornamental crops	6	1.0	84	6.5	6	1.0	84	7.2
Fruit	411	65.8	574	44.2	411	65.1	547	47.1
Livestock	-	-	250	19.2	-	-	232	20.0
Total	625	100.0	1299	100.0	631	100.0	1161	100.0

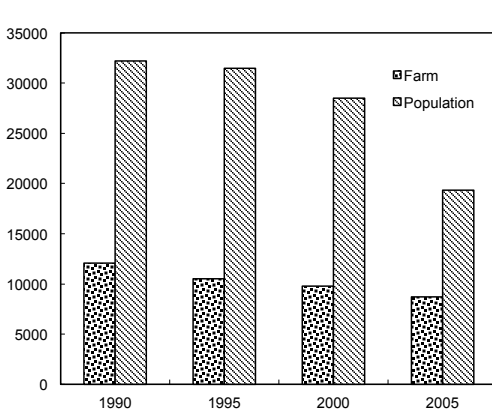


Fig. 1. Changes of number of agricultural farms and population in Amami Islands.

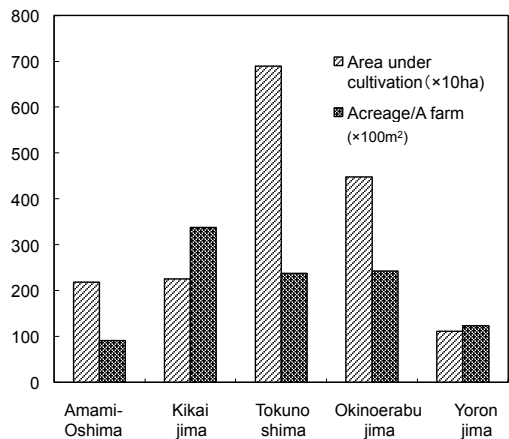


Fig. 2. Agricultural scale of each island in Amami Islands (2009).

followed by sugarcane production. Only a very low percentage of the cultivated crops are traditional crops such as rice. Beef cattle production has gradually increased since 1990 (Fig. 4).

The sugarcane cultivation area is the highest, representing about 60% of the total cultivated area in the Amami Islands, followed by vegetable crops, animal feed crops, fruit trees, and ornamental crops. However, the income from sugarcane decreased to about one-third of the total income from the Amami Islands, with the income of hor-

ticultural crops increasing to more than 50% of the total agricultural income. Thus, the distinctive features of agriculture in the Amami Islands is diversified farming, with sugarcane being the main crop, because of its tolerance to natural disasters, including typhoon and drought, in combination with horticultural crops and beef cattle production, which have also shown high-yields (Fig. 5).

The gross agricultural output was the highest in

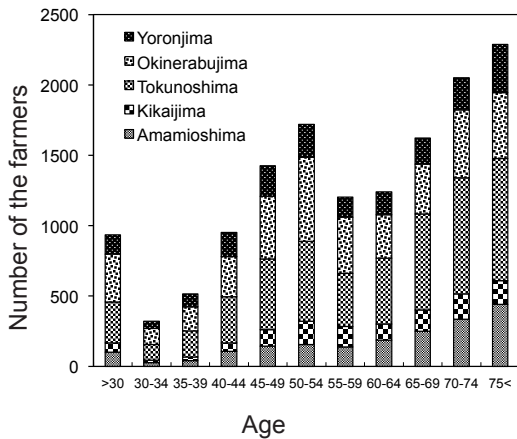


Fig. 3. Agricultural population in all age groups of each island in Amami Islands (2005).

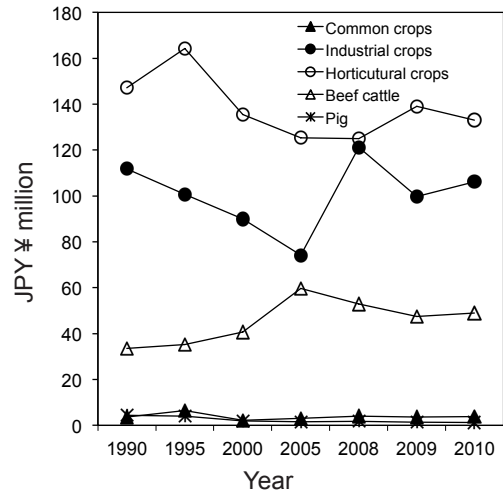


Fig. 4. Changes of agricultural output in Amami Islands (JPY ¥ million).

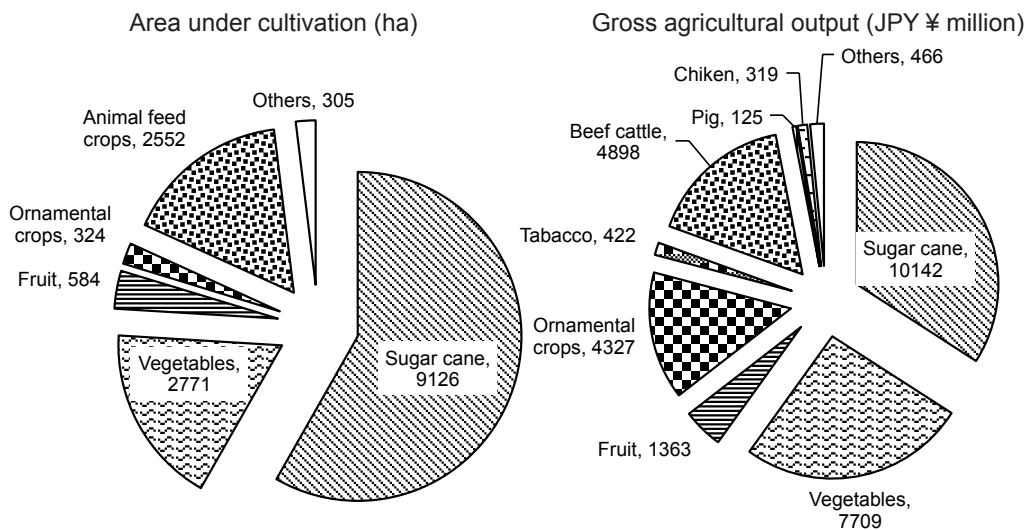


Fig. 5. Agricultural production in Amami Islands (2010).

Tokunoshima Is., followed by Okinoerabujima Is., Amami-Oshima Is., Kikaijima Is., and Yoronjima Is. (Fig. 6). Each of the islands constituting the Amami Islands has a predominant agricultural crop. For instance, in Okinoerabujima Is., sugarcane production is limited, and horticultural crops such as potato, chrysanthemum, and flower bulbs are prominently cultivated. In Tokunoshima Is., although sugarcane is the major crop, vegetable crop and beef cattle production are equally high. In Kikaijima Is., both sugarcane cultivation and beef cattle production are high. In Amami-Oshima Is., sugarcane, vegetable crop, and beef cattle production are the main agricultural outputs. In Yoronjima Is., sugarcane and beef cattle production are the major agricultural outputs.

In conclusion, in the Amami-Oshima Is., which has the largest area and highest population among all the Amami Islands, the average cultivated area is less, with sugarcane and fruit tree production being equally high, followed by vegetable crops. In Okinoerabujima Is., vegetable and ornamental crop production is higher than beef cattle production. Moreover, beef cattle production is increasing in Tokunoshima Is. and Kikaijima Is., despite both these islands having high sugarcane production.

In addition, the maintenance of agricultural lands by using storm measures and irrigation fa-

cilities is necessary because the Amami Islands are frequently subject to typhoons and droughts.

### 3. Fruit production in the Yakushima and Amami Islands

#### 3.1. Fruit production in Yakushima Is.

Fruit production is the primary industry in Yakushima Is., representing about 60% of the island's total agricultural output. In 2010, the major fruit produced in Yakushima Is. was ponkan, with the cultivated area, yield, and gross output value being 216 ha, 774 t, and JPY ¥1,300 million, respectively. The second major fruit was tankan, with the cultivated area, yield, and gross output value of 178 ha, 1,227 t, and ¥3,800 million, respectively. These were followed by passion fruit, with 7.9 ha, 71 t, and ¥100 million, and finally loquat, with 4 ha, 5 t, and ¥3 million (Table 2).

Thus, citrus fruits (primarily ponkan and tankan) represent the major agricultural products of Yakushima Is. (Fig. 7). However, this industry

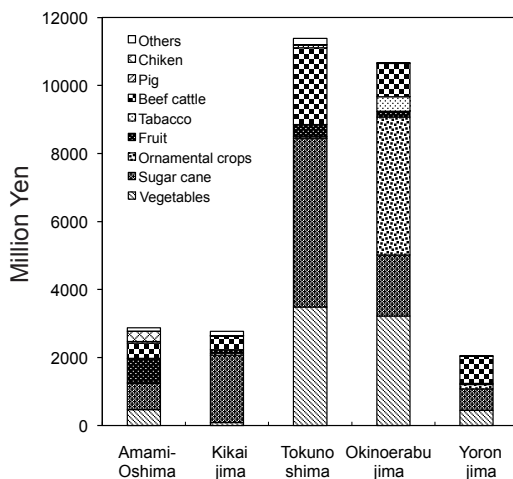


Fig. 6. Agricultural production of every islands in Amami Islands (JPY ¥ million).

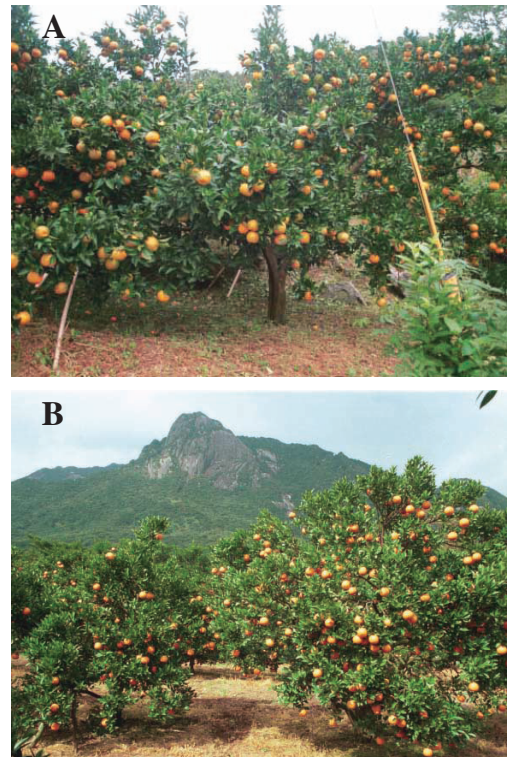


Fig. 7. Ponkan (A) and Tankan (B) growing in Yakushima Is.

Table 2. Fruit production in Yakushima Island (2009, 2010)

	2009			2010		
	Acreage ha	Production ton	Output JPY ¥ million	Acreage ha	Production ton	Output JPY ¥ million
Ponkan	216	1,020	134	216	774	134
Tankan	178	1,882	406	178	1,227	381
Loquat	4	12	3	4	5	3
Passion fruit	8	65	14	8	71	12
Others	6	45	17	6	45	17
Total	411	3,024	574	411	2,122	547

Table 3. Bird and animal damage on agriculture in Yakushima Island

Year		Monkeys	Deers	Bulbuls	Total
2008	Money *	19,127	3,827	28,239	51,193
	Acreage (ha)	100	45	75	220
2009	Money *	18,074	4,240	5,604	27,918
	Acreage (ha)	91	45	45	181
2010	Money *	29,521	23,471	66,098	119,090
	Acreage (ha)	152	150	206	508

\* JPY ¥ 1,000

has several problems, such as low cooperative marketing and large variation in the growing region and cultivation methods. Therefore, in 1997, nondestructive fruit selection machines were introduced at the packinghouses of the Agriculture Cooperative Association (JA Kumage). Ponkan fruit is shipped to markets as a gift item at the end of year. This raises some problems, such as the need for a concentrated seasonal labor for the harvesting and production of high quality fruits in some years. Therefore, the cultivation of ponkan is decreasing, whereas tankan cultivation was revitalized, because this fruit is of high quality with high market appeal. In addition-the harvest season of this fruit is after February and a concentrated labor force for fruit picking is not required.

### 3.2. Problems of fruit tree production on Yakushima Is.

There are some major problems with fruit tree production in Yakushima Is. Such issues include frequent damage by typhoons and major damage by animals (such as monkeys, deer, and birds [bulbul]). Strong typhoon winds damage fruit trees by

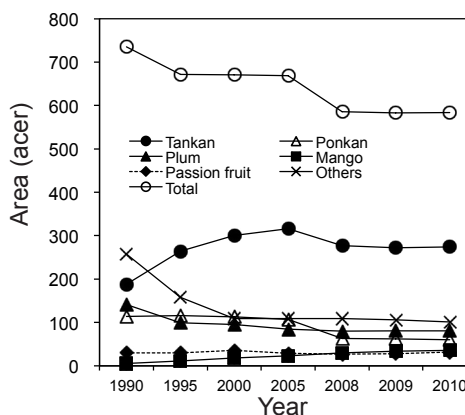


Fig. 8. Changes of cultivated acreage of fruit trees in Amami Islands.

causing the leaves to fall, branches to break-off, and salt damage. In addition, damage to leaves causes canker. Such damage degrades the marketability of the fruit, causing farmer income to decline. The total loss because of bird and animal damages in Yakushima in 2010 was in 508 ha and JPY ¥120 million (Table 3).

### 3.3. Fruit tree production in the Amami Islands

In the Amami Islands, tankan, ponkan, and karari (tropical plum) constitute the main open-field fruit tree industry, while tropical and subtropical fruit trees, such as mango and passion fruit, have been increasingly cultivated recently under greenhouse conditions, thus, utilizing the warm climate of these islands.

The total area of fruit tree production decreased gradually from 1990 to 2010, but was particularly high from 2005 to 2008 (Fig. 8). This large decline



in citrus crops was because of the increase in aging farmers.

Tankan production was the highest among all fruit tree crops in the Amami Islands, particularly, with respect to both the cultivation area and production, followed by Tokunoshima Town, Kikai Town, Tatsugo Town, Yamato Village, and

Setouchi Town (Table 4, Fig. 9).

Ponkan production was highest in Amami City, followed by Setouchi Town and Uken Village. Plum (karari) production was the highest in Yamato Village, followed by Amami City (Table 5, Fig. 10). The cultivation area of some tropical fruits, such as mango and passion fruit, was also

Table 4. Tankan production of each island in Amami Islands (2010)

	Cultivated acreage ha	Production ton	Output JPY ¥ million
Amami City	122	741	219
Yamato Village	16	19	5
Uken Village	14	120	30
Setouchi Town	24	156	58
Tatsugou Town	17	102	31
Kikai Town	18	100	35
Tokunoshima Town	45	156	56
Amagi Town	11	48	17
Isen Town	4	43	15
Wadomari Town	1	15	8
China Town	2	15	4
Yoron Town	0	0	0



Fig. 9. Tankan growing in Amami City.

Table 5. Ponkan and plum production of each island in Amami Islands (2010)

	Ponkan			Plum (karari)		
	Cultivated acreage ha	Production ton	Output JPY ¥ million	Cultivated acreage ha	Production ton	Output JPY ¥ million
Amami City	23	122	25.9	22	73	20.4
Yamato Village	4	3	0.6	49	100	23.7
Uken Village	10	55	8.3	2	3	0.9
Setouchi Town	10	76	11.4	4	5	1.5
Tatsugou Town	5	15	3.0	4	5	3.3
Tokunoshima Town	7	20	7.2	0	0	0
Amagi Town	2	8	3.0	0	0	0
Isen Town	1	3	0.9	0	0	0

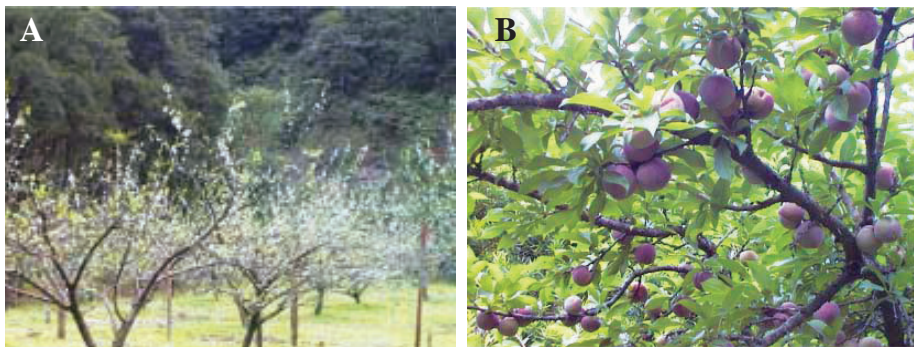


Fig. 10. Karari (tropical plum) growing in Yamato Village (A: flowering, B: mature fruit).

high. The cultivation area of mango was high in Amami City, Amagi Town, and China Town; further, the cultivation of mango is increasing in all cities in the Amami Islands, because of the high yield obtained owing to the warm climate conditions of the islands. Similarly, passion fruit pro-

duction is the highest in Amami City, followed by Setouchi Town and Tatsugo Town (Table 6, Fig. 11).

Table 7 lists the tropical fruit species, except mango and passion fruit, which are cultivated in the Amami Islands.

Table 6. Mango and passionfruit of each island in Amami Islands (2010)

	Mango			Passionfruit		
	Cultivated acreage ha	Production ton	Output JPY ¥ million	Cultivated acreage ha	Production ton	Output JPY ¥ million
Amami City	5	23	41.9	11	101	81.3
Yamato Village	0	0	0.0	0	0	0.0
Uken Village	3	8	24.6	3	6	3.6
Setouchi Town	0	0	0.0	6	59	48.3
Tatsugou Town	3	17	16.2	5	15	7.5
Kikai Town	3	16	51.2	0	3	2.0
Tokunoshima Town	2	5	12.0	0	2	1.8
Amagi Town	5	40	120.0	2	17	15.3
Isen Town	3	10	25.0	3	38	34.7
Wadomari Town	4	23	57.5	0	1	0.6
China Town	5	39	97.5	2	3	0.9
Yoron Town	2	7	18.2	0	2	0.8



Fig. 11. Mango (A) and passionfruit (B) growing in Amami City.

Table 7. Tropical and subtropical fruits species cultivated of municipalities in Amami Island (2010)

	Guava	Banana	Papaya	Atemoya	Dragonfruit	Pineapple	Carambola
Amami City	+	+					
Setouchi Town	+	+				+	
Kikai Town	+	+					
Tokunoshima Town		+	+	+	+		
Amagi Town					+	+	
Isen Town	+						
Wadomari Town					+	+	
Yoron Town				+	+		+

### 3.4. Problems of fruit tree production in the Amami Islands

The major problems with fruit production in the Amami Islands are typhoon damage and continuous heavy rains, which may be because of global warming, and citrus greening disease (Huanglongbing; HLB).

### 3.5. Future of the agriculture industry in the Amami Islands

Several measures must be implemented for the future development of the agricultural industry in the Amami Islands. First, the construction of a stable sugarcane production system is required. For this, mechanization, scale expansion by farmland accumulation that are then provided to leading farmers, premeditated agricultural production, and breeding and extension of new cultivars are necessary. Second, an improvement in the output and production of high-quality horticultural crops (*i.e.*, vegetables, ornamental crops, and fruit tree) are necessary, by taking advantage of the subtropical climate conditions. To achieve the above, the growers need to be organized, technically improved, and financially strengthened. Further, improvement of shipment systems within a low cost is necessary to maintain the freshness and high

quality of the agricultural products, for example, by using low-temperature containerized transportation. Third, environment friendly agriculture must be promoted. For this, the soil conditions for crop cultivation must be improved. Fourth, low-cost beef cattle raising techniques are required to produce high-quality meat by compound management with sugar cane cultivation and horticulture, in addition to using the abundant grass resources of the islands. Fifth, an agricultural base needs to be maintained through the improvement of farming support system. Therefore, stable production by cost reduction, improving farm irrigation, and enhancing countermeasures for typhoon and drought damages are necessary. Sixth, the promotion and restructuring of community farming are required. Therefore, the activation and development of community agriculture by a tie-up between elderly farmers and their successors are necessary for ensuring an environment friendly agriculture system that cooperates with the consumers.

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