Analytical Study of Influxes of Korean Rice and the Korean Rice Production Development Program: 1910-1939

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CONTENTS

Ⅰ. Introduction

The agricultural development of Korea under pre-World War II (so-called Japanese colonial rule) is deeply related to the rice economics and agricultural development process of Japan. At that time, rice was the most significant agricultural product in Korea, comprising 60 to 80 percent of the value of the total agricultural output. Further more, the role of rice in food consumption was equally important.

However, agricultural production in Korea was almost stagnant between 1920 and 1930. Output grew at a annual compound rate of only

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0.46 percent[1]. This slow growth was due to ineffective implementation of policies for "Promoting Agricultural Production" and to the lack of economic incentives to farmers[2].

From 1930 to 1939, however, agricultural production showed a great higher growth rate of 1.92 percent per year. The rice yield per hectare of paddy field area was also constant up to 1930 at a level of 1.3 metric tons. From this level, it increased up to a level of 2.2 metric tons towards the end of the 1930's[3].

The expansion of rice production was achieved through an increase in the yield per hectare. This was mainly due to an increased application of chemical fertilizer combined with the introduction of fertilizer-response, high-yielding varieties and development of irrigation facilities, which were started in the 1920's after the "Korean Rice Production Development Program."

The Korean Rice Production Development Program (hereafter referred to simply as KRDP) was initiated in 1920 as a solution to the rice shortage in Japan, and in order to develop the farm- household economics of Korea[4]. Therefore, the factors which contributed most to the successful rice increase in this period were facilitated by such inputs as land improvement and technical farming.

Land infrastructure improvement such as irrigation and drainage represent a basic condition for the development and diffusion of seed-fertilizer technology. These facilities allow the substitution of fertilizer and other current inputs for land, thereby breaking the constraint of scarce land resource and agricultural production[5].

Thus, if dissemination of high-yielding varieties in Korea were not

1) Ban. Agricultural Growth in Korea 1918–1971. in Yujiro Hayami, Vernon W. Ruttan and Herman Sowthworth. (1973) pp. 92–93.

2) ————. op. cit., pp. 92–95. Ban (1974 (6))

3) See Reference (5, 6, 10, 11, 16)

4) for example, Yanaihara (1926), Yagi (1932), Kuma (1935),

5) Akino (1981 (3)), p. 129.

accompanied by inputs of fertilizer, irrigation, land improvement and farming technology, there would have been a possibility that total rice production may have decreased instead of increasing. Therefore, introduction of high-yielding varieties has been identified as one of the most important factors in the growth of agricultural productivity in Korea.

These high-yielding varieties naturally came about as a result of investment in agricultural research and development.

Southworth and Johnston(1967) state that there can be no economic growth without agricultural progress, and no agricultural progress without investment of agricultural research and development[6]. According to Kennedy and Thirwall(1972), research tends to be directed to the search for new knowledge, while development is devoted to the capacity to produce[7].

Three categories of research and development are normally distinguished: basic research, applied research and development. The definition of the three categories given by the National Foundation of America is as follows.

Basic research consists of original investigations for the advancements of scientific knowledge that do not have specific commercial objectives. Applied research consists of investigations that are directed to the discovery of new knowledge that has specific commercial objectives with respect to products or processes. Finally, development means technical activities of a non–routine nature concerned with translating research findings or other scientific knowledge into products or processes[8].

Generally speaking, new knowledge through activities of agricultural research and development produce two types of final products. First, there are the latest functional development i. e., technical knowledge of invisible. Secondly, there are the physical production factors or products[9].

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6) Southworth and Johnston (1967),pp. 175–180.

7) Kennedy and Thirwall (1972),pp.43–45.

8) ———— op. cit., pp. 43–46.

9) Akino (1981 (1)),pp. 1–3.

The former are technology of cropping, breeding and land utilization etc. The latter refer to varieties or high-yielding varieties representing the physical production factors[10].

Agricultural growth in Korea under pre-World War II period was mainly accomplished by efforts such as agricultural research and development through the "KRDP".

In this paper, we shall examine the following. First, theoritical background of the KRDP with respect to agricultural development of Korea. Secondly, correlation of the real price of Korean and Japanese rice. Thirdly, relationship between the relative price of Korean and Japanes rice and influxes of Korean rice. Fourthly, why the rice consumption per capita is decreasing despite increasing rice production.

Ⅱ. Agricultural Growth and the Korean Rice Production Development Program(KRDP)

1. Trends in Land Improvement Investment and Irrigated Areas

Since the 1918 rice riots, one of the most significant problems in Japanese agriculture has been the rice shortage brought about by an increase in demand due to increasing population and absolute rice shortage. As already pointed out in the introductory section, the KRDP was started in 1920 as a solution to the food problem of Japan.

At that time, Japanese agriculture may has been limited by intensive rice farming seed-fertilizer technology based on the relatively well-developed irrigation system from feudal times[11].

In other words, the possibility of increasing paddy field area or yield per area was severely limited. Thus, as far as rice was concerned, the Japanese government found it necessary to use external expansion rather than internal expansion in order to solve the land scarcity problem. This was carried out under the disguise of the so-called the KRDP.

10) Akino (1981 (1)),pp.1–3.

11) Kikuchi (1976),pp.64–90.

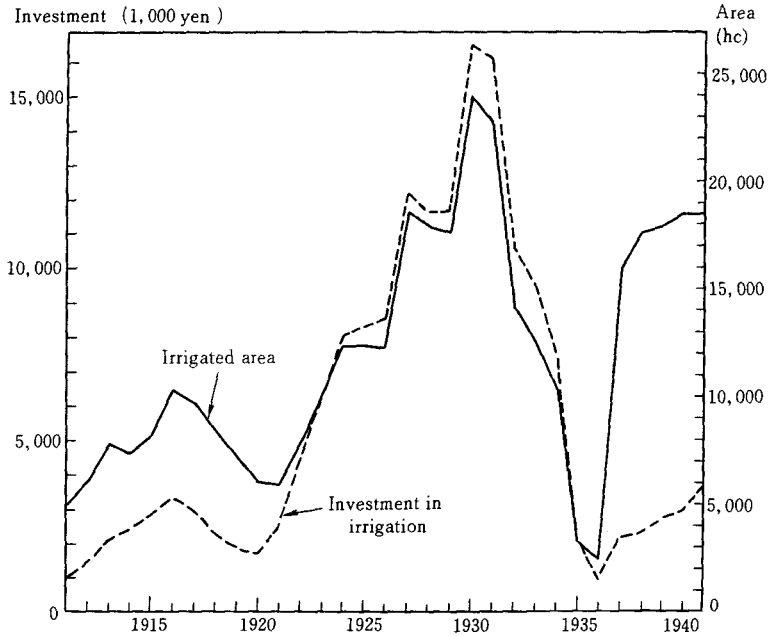

FIG. 2–1. TREND OF IRRIGATION INVESTMENT AND IRRIGATED AREA (FIVE-YEAR MOVING AVERAGES)
NOTE : INVESTMENT IS IN TERMS OF 1934–1936 CONSTANT PRICES
SOURCE : M. KIKUCHI

Investment in irrigation and irrigated areas are plotted in Figure 2–1. As shown in Figure 2–1, the drastic increase in annual irrigated areas during the 1920's was accompanied by a remarkable increase in the irrigation investments.

However, this sharp rising trend in irrigation investment through the 1920's fell drastically following the abolition of the Bureau of Land Improvement in 1932. The abolition was due to the fall in the price of rice in the Japanese market and the general worldwide depression[12].

The ratio of government direct investment to total investment in-

12) Chosen beikoku keizairon (1939),pp.10–20.
Chosenmai no shinten (1935),pp.19–22.

creased from 10 percent in the 1910's to more than 59 percent in the 1930's. Further more, the role of the government in investment increased through direct investment and low-interest loans[13].

2. Dissemination of Rice HYV and Production

As pointed out in the introduction, rice yield per hectare remaind constant at 1.3 metric tons up to the mid-1920's and then rose to 2.2 metric tons by the end of the 1930's.

This growth was facilitated by the higher rate of rice HYV to the total rice paddy area, which increased rapidly to 10 percent in the early 1910's and reached almost 90 percent in the late 1930's.(see Fig2–2)

On the other hand, in 1918, following World War I, the Japanese government strengthened rice production in Korea through improvement of rice farming and irrigation facilities. In accordance with this policy, the ratio of rice HYV area increased rapidly to 57 percent in 1920 and reached

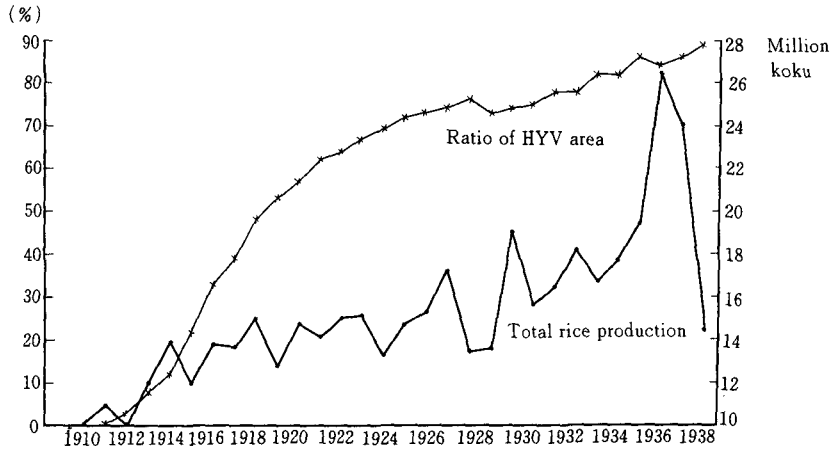

FIG. 2 — 2. TREND OF RATIO OF HYV AREA AND TOTAL RICE PRODUCTION

SOURCE : KOREA GOVERNMENT GENERAL, CHOSEN NOGYO-HYO. (AGRICULTURAL STATISTICS)
CHOSEN BEIKOKU YORAN, VARIOUS ISSUES.

13) Kikuchi (1976),pp.71–79.

TABLE 2－1 THE COMPARISON OF RICE PRODUCTION IN KOREA, JAPAN AND TAIWAN 1910–1939

YEAR	KOREA PROD.	INDEXES	5－YEAR AVERAGES	JAPAN PROD.	INDEXES	5－YEAR AVERAGES	TAIWAN PROD.	INDEXES	5－YEAR AVERAGES
1910–1914	12,303	100		53,025	100		4,611	100	
1915–1919	14,101	115	115	58,349	110	110	4,776	104	104
1920–1924	14,501	118	103	57,368	109	99	5,561	121	116
1925–1929	15,798	128	109	60,886	115	106	6,751	146	120
1930–1934	17,002	138	108	59,146	112	97	8,600	186	127
1935–1939	21,174	172	124	64,245	121	108	9,358	202	108

SOURCE : KOREA GOVERNMENT GENERAL, NOGYO TOKEI–HYO (AGRICULTURAL STATISTICS) CHOSEN BEIKOKU YORAN

90 percent in the late 1930's. Fertilizer inputs per hectare of rice crop area also increased greatly in terms of nitrous content from less than 3 kilogram in the late 1910's to 20 kilogram in the late 1930's[14].

The comparison of rice production between Korea, Japan and Taiwan are shown in Table 2–1.

As shown in Table 2–1, the indexes of rice production in Korea increased remarkably to 100–115 in the late 1910's and further increased to 138 in the mid-1930's and to 172 in the late 1930's.

3. Relationship Between Rice Consumption and Production in Korea and Japan

Total rice production in Korea increased more than two and a half times over the period 1910–1939, while the consumption per capita decreased by half over the same period, On the other hand, total rice production in Japan also increased by one and a half times between

14) *Ban (1973).pp.90–99.*

1910–1939. However, the consumption per capita remained constant over the same period.

At that time, viewed from economic theory, rice consumption per capita of Korea had to be increased along with an absolute increase in total rice production. Rice consumption per capita, however, decreased rapidly to half the level of the mid-1910's and mid-1930's. One of the most important reasons for this decrease in consumption per capita was due to a huge increase in the effluxion of rice to Japan[15].

What was the reason for this huge efflux?. We must consider two points-political and economic.

Firstly, all policies concerning Korea were controled by the Japanese government. Thus, the Korean Rice Production Development Program(KRDP) was initiated basically in order to meet the rice shortage in Japan.

Secondly, modernization of rice farming in Korea needed a money-capitalism system such as chemical fertilizer, new-seed and agricultural implements. This was funded almost entirely by brrowing from Japanese enterprises and government.

Table 2–2 and 2–3 show the project funds of the KRDP and expenditure of rice farming funds.

As shown in Tables 2–2 and 2–3, the Korean farmers were greatly oppressed by these debts, and therefore, they had to sell their rice products immediately after harvest. They had to pay the cost of land improvement, fertilizer and taxes etc[16].

Who really profited from the KRDP?. According to Yanaihara (1926), the ones who profited were rice traders, makers of fertilizer and agricultural implements, construction enterprisers from land improvement, financial operators and landlords. Most of these beneficiaries were Japanese[17].

15) Yanaihara (1926),pp.13–20.
Kuma (1935)

16) Kuma (1935),pp.12–36.

TABLE 2 — 2 *CHOSEN—MAI ZOSHOKU KOSHIN KEIKAKU—HYO (KRDP)*

OPERATION AREA	LAND IMPROVEMENT AREA 350,000	IRRIGATION IMPROVEMENT	195,000	CHO
		LAND CONVERSION	90,000	〃
		LAND RECLAMATION	33,050	〃
		CLEARING	31,950	〃
PROJECT FUND	FUNDS FOR LAND IMPROVEMENT	GOVERNMENT SUBSIDIZE	65,070,000	YEN
		ENTERPRISER SUPPORT	22,067,000	YEN
		LOW INTEREST BY GOV. MEDIATION	198,197,000	YEN
	CONTENTS	O—KURASYO	99,098,000	YEN
		TOYO TAKUSHOKU	49,549,000	YEN
		CHOSEN TAKUGIN	49,549,000	YEN
INCREASING YIELD BY K. R. D. P	INCREASING YIELD OF REGION K. R. D. P 4,720,000 KOKU	IRRIGATION IMPROVEMENT	195,000 CHO	2,047,500 KOKU
		LAND CONVERSION	90,000 〃	1,655,000 〃
		LAND RECLAMATION	33,050 〃	495,225 〃
		CLEARING	31,950 〃	512,275 〃
		TOTAL	350,000 〃	4,720,000 〃
		INCREASING YIELD BY LAND IMPROVEMENT		2,800,000 〃
		INCREASING YIELD BY FARMING IMPROVEMENT		1,920,000 〃
	INCREASING YIELD OF OTHERS 3,447,875 KOKU			

SOURCE : CHOSENMAI NO—SHINTEN

Table. 2 — 3 Expenditure of Rice Farming Fund (in 1933)

CONTENTS	TOTAKU	TAKUGIN	FINANCIAL COOP.	TOTAL
Fertilizer	2,414,759yen	2,408,184yen	2,418,447yen	7,242,000yen
Ag. Implement	10,090 〃	3,400 〃	23,972 〃	37,462 〃
Processing improvement	8,900 〃			8,900 〃
Warehouse	11,700 〃	7,000 〃		18,700 〃
Cultivating cow	184,811 〃	315,090 〃	29,999 〃	428,990 〃
TOTAL	2,631,260 〃	2,633,674 〃	2,471,446 〃	7,736,380 〃

SOURCE : CHOSENMAI NO SHINTEN.

17) Yanaihara (1926),pp.1–9.

The invasion of Japanese capitalism brought about many landless farmers in Korea. That is to say, the number of Japanese landlords who had more than a hundred CHO paddy field(CHO＝0.99hectare) increased by 10 percent over the period 1922–1928, while the number of Korean landlords decreased by 20 percent over the same period[18].

On the other hand, here, we are only going to consider a quantitive study concerning the contributory effect of colonial rice on the Japanese rice shortage.

The relationship between the surplus and shortage of rice consumption, production in Korea and Japan are presented in Table 2–4 and in Figure 2–3.

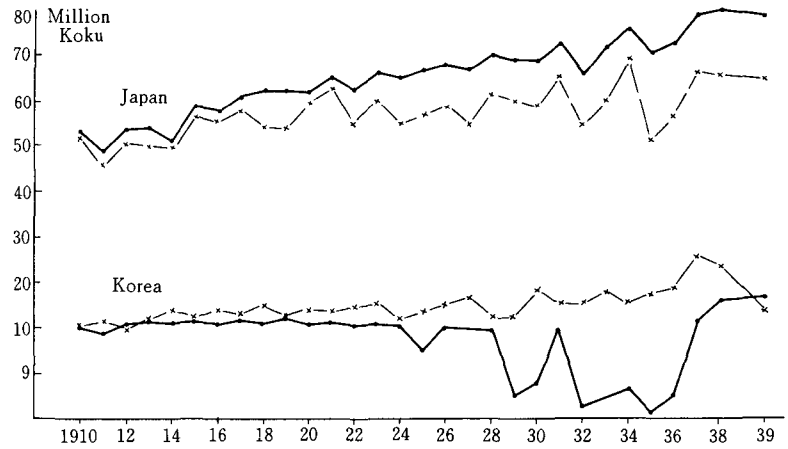

FIG. 2－3. TREND IN PRODUCTION AND CONSUMPTION OF RICE IN KOREA AND JAPAN
—●—●—●Consumption
—×—×—×production
SOURCE : NOGYO TOKEI-HYO CHOSEN BEIKOKU YORAN.

18) For example, the number of Japanese landlords increased from 490 to 553 over the period 1922–1928, while the number of Korean landlords decreased from 426 to 335 over the same period.
Yagi (1932),pp.31–34. Kuma (1935),pp.28–36.

TABLE. 2－4 RELATIONSHIP BETWEEN THE SURPLUS AND SHORTAGE OF RICE CONSUMPTION, PRODUCTION IN KOREA AND JAPAN

YEAR	① Con. /Capita koku	② Total Con. 1000. koku	③ Total Pro. 1000. koku	④=③−② Sur. and Sho. 1000. koku	⑤=④−⑫ +⑥ Stock 1000. koku	⑥ Import 1000. koku	⑦ Con. /Capita koku	⑧ Total Con. 1000. koku	⑨ Total Pro. 1000. koku	⑩=⑨−⑧ Sur. and Sho. 1000. koku
1910	0.77	10,251	10,405	154	40	2	1.08	53,603	52,437	− 1,166
11	0.71	9,857	11,568	1,711	1,385	8	0.98	49,124	46,633	− 2,491
12	0.77	11,054	10,865	− 189	958	7	1.06	54,322	51,711	− 2,611
13	0.69	11,508	12,109	601	1,272	3	1.05	54,503	50,222	− 4,281
14	0.71	11,119	14,130	3,011	3,363	2	0.98	51,327	50,259	− 1,068
15	0.74	11,835	12,846	1,011	2,404	2	1.11	58,921	57,077	− 1,914
16	0.67	11,039	13,933	2,894	3,978	15	1.08	58,225	55,924	− 2,301
17	0.72	12,063	13,687	1,804	4,602	12	1.12	61,219	58,452	− 2,767
18	0.68	11,560	15,294	3,734	6,616	13	1.14	62,740	54,567	− 8,173
19	0.72	12,386	12,708	322	4,146	21	1.12	62,078	54,700	− 7,378
20	0.63	10,906	14,882	3,976	6,491	12	1.11	62,317	60,818	− 1,499
21	0.67	11,630	12,342	2,694	6,293	13	1.15	65,027	63,208	− 1,819
22	0.63	11,102	15,014	3,912	7,082	159	1.10	62,861	55,180	− 7,681
23	0.65	11,465	15,174	3,709	7,497	87	1.15	66,710	60,693	− 6,017
24	0.60	10,825	13,219	2,394	5,431	378	1.12	65,778	55,444	− 10,334
25	0.52	9,534	14,773	5,419	6,800	746	1.13	67,046	57,170	− 9,876
26	0.53	10,142	15,300	5,158	7,491	132	1.13	68,222	59,704	− 8,518
27	0.52	10,026	17,298	7,272	8,992	245	1.09	67,164	55,592	− 11,572
28	0.54	10,347	13,511	3,164	5,333	75	1.13	70,276	62,102	− 8,174
29	0.45	8,583	13,701	5,118	5,149	122	1.10	69,467	60,303	− 9,164
30	0.45	8,853	19,108	10,255	10,359	78	1.07	68,910	59,557	− 9,353
31	0.52	10,536	15,872	5,336	7,781	33	1.12	72,978	66,815	− 6,103
32	0.41	8,392	16,345	7,953	8,569	45	1.01	66,374	55,215	− 11,159
33	0.41	8,508	18,192	9,684	10,767	42	1.08	72,413	60,390	− 12,021
34	0.42	8,709	16,717	8,008	9,865	46	1.13	76,720	70,829	− 5,891
35	0.38	8,133	17,844	9,751	11,228	189	1.02	70,552	51,840	− 18,712
36	0.39	8,507	19,410	10,903	13,350	46	1.04	73,034	57,456	− 15,600
37	0.57	12,579	26,796	14,217	20,877	32	1.11	79,066	67,339	− 11,727
38	0.70	15,783	24,138	8,355	19,115	21	1.11	80,022	66,319	− 13,703
39	0.78	17,646	14,355	− 3,291	10,155	106	1.09	79,319	65,869	− 13,450
TOTAL				139,040	10,155	2,692				−226,523

(Continued on next page)

	⑪ Influxes from Taiwan 1000. koku	⑫ Influxes from Korea 1000. koku	⑬=⑫/⑩ percent	⑭=(⑪+⑫)/⑩ percent	⑮=⑩−(⑪+⑫) Sur. and Sho. 1000. koku	⑯ Import 1000. koku	⑰ Export 1000. koku	⑱=⑯−(⑮+⑰) Stock 1000. koku
1910	749	114	9.7	74.0	− 303	918	36	579
11	706	368	14.7	43.1	− 1,417	1,719	53	828
12	652	246	9.4	34.3	− 1,713	2,011	43	1,083
13	981	294	6.8	29.7	− 3.006	3,329	40	1,366
14	812	1,023	95.7	171.8	+ 767	2,471	44	4,560
15	694	1,872	97.8	134.0	+ 652	517	59	5,670
16	801	1,332	57.8	92.6	− 168	2,991	74	5,719
17	786	1,195	43.1	71.5	− 786	523	87	5,319
18	1,139	1,732	21.1	35.1	− 5,302	3,663	78	3,652
19	1,262	2,805	38.0	55.1	− 3,311	5,432	27	5,746
20	663	1,652	110.2	154.4	+ 816	750	26	7,286
21	1,034	2,904	159.6	216.4	+ 2,119	816	43	10,178
22	740	3,136	40.8	50.4	− 3,805	3,791	240	9,904
23	1,131	3,453	57.3	76.1	− 1,433	1,623	60	10,034
24	1,658	4,547	44.0	60.0	− 4,129	3,327	104	9,128
25	2,522	4,428	44.8	70.3	− 2,926	5,137	649	10,690
26	2.186	5,213	61.1	86.8	− 1,119	2,141	27	11,685
27	2,637	5,903	51.0	73.7	− 3,032	4,129	17	12,765
28	2,430	7,068	86.4	116.1	+ 1,324	1,756	24	15,821
29	2,253	5,377	58.6	83.2	− 1,534	1,277	11	15,553
30	2,185	5,167	55.2	78.6	− 2,001	1,249	6	14,795
31	2,698	7,992	130.9	175.1	+ 4,587	830	7	20,205
32	3,419	7,198	64.5	95.1	− 542	986	80	20,569
33	4,216	7,531	62.6	97.7	− 274	998	6	21,287
34	5,123	8,952	151.9	238.9	+ 8,184	174	6	29,639
35	4,511	8,434	45.0	69.1	− 5,767	73	6	23,939
36	4,823	8,970	57.5	88.4	− 1,807	409	5	22,536
37	4,855	6,736	57.4	98.8	− 136	287	4	22,683
38	4,970	10,149	74.0	110.3	+ 1,416	151	8	24,242
39	3,933	5,690	42.3	71.5	− 3,827	156	6	20,565
TOTAL	66,569	131,481	58.0	87.4	−28,473	50,934	1,096	20,565

SOURCE : KOREA GOVERNMENT GENERAL, NOGYO TOKEI HYO. CHOSEN BEIKOKU YORAN. CHOSENMAI NO SINTHEN. TAIWAN GOVERNMENT GENERAL, BEIKOKU TOKEI. JAPAN GOVERNMENT GENERAL, CHOSENMAI KANKEI SHIRYO.

As shown in Table 2–4 and in Figure 2–3, total rice production in Korea greatly exceeded total consumption during the whole period(except for 1912). On the other hand, total rice production in Japan was below total consumption for the same period. Therefore, the Japanese government was dependent upon the rice from colonial regions such as Korea and Taiwan. The increased shortage of Japanese rice brought about on increased influx of colonial rice (especially Korean rice from 1914 onwards).

Influxes of Korean rice accounted for 58 percent of the shortage of Japanese rice between 1910–1939. Adding to this the influx of Taiwan rice, accounted for 87 percent. Thus, it seems unreasonable to consider the rice surplus in Japan as entirely a result of the huge influx of Korean rice into Japan's rice market, since the Japanese government imported only the shortage of rice left over after the supply of Korean and Taiwan rice was taken into account.

Ⅲ. Relation Between the Price and the Influxes of Korean Rice

1. Correlation of the Real Price of Korean and Japanese Rice in Japan's Rice Market and Influxes of Korean Rice

In this section, we shall analyze the correlation of the real price of the two countries (Korea and Japan) in Japan's rice market and influxes of Korean rice.

According to other studies, up until now, the fall in rice prices in Japan's rice market have been attributed mainly to the huge influx of colonial rice (especially Korean rice). If it is so, we must consider the following four points:

1. In what months the influxes of Korean rice were largest,
2. Relation between the abundant and lean rice production years in two countries,

3. Correlation between the influxes of Korean rice and rice production in two countries,

4. Correlation between the real prices of Korean and Japanese rice and influxes of Korean rice.

Indexes of seasonal variation of influxes, price and transference for Korean and Japanese rice are presented in Table 3–1 and in Figure 3–1.

As showned in Table 3–1, influxes of Korean rice had been largest from November through to March. The reason for this behaviour is that the

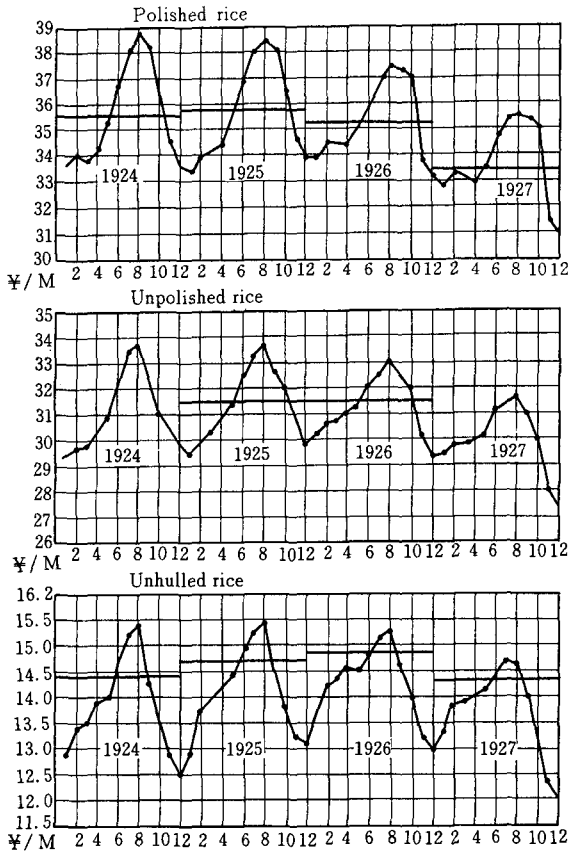

FIG. 3－1. SEASONAL CHANGE OF RICE PRICE BY MOVING AVERAGE METHOD

SOURCE: K. KUMA

TABLE 3－1 INDEXES OF SEASONAL VARIATION IN TRANSFERENCE FOR KOREAN AND JAPANESE RICE (1921—1930)

MONTH	KOREAN RICE	JAPANESE RICE *
10	57.4	112.5
11	137.9	131.6
12	210.2	159.6
1	146.3	125.0
2	116.7	84.7
3	120.0	91.8
4	110.7	89.1
5	86.5	88.9
6	77.8	82.3
7	51.6	75.5
8	42.5	72.6
9	42.4	86.4
AVERAGE	100.0	100.0

NOTE * TO DOMESTIC REGION
SOURCE : BEIKA OYOBI BEIKATOSEI MONDAI

Korean farmers were forced to sell the harvested rice immediatly without regard to cheap prices in order to repay debts[19].

On the other hand, as shown in Table 3–2, during the last thirty years, the correlation coefficient of the relation between the abundant and lean rice production years in the two countries is about 0.01205. In other words, the relation between the abundant and lean rice production years in the two countries is not particularly coincidental (see Table 3–2).

Next, Correlation between the influxes of Korean rice and rice production in the two countries are presented in Table 3–3.

The estimated coefficient shows that the influxes of Korean rice in abundant years have increased slightly, while the lean rice production years in Japan showed a negative correlation of about −0.0908. In other words, in the lean rice production years in Japan, influxes of Korean rice have increased slightly.

On the other hand, correlation between the real price of Korean and

TABLE 3－2 Relation Between the Abundant and Lean Rice Production Years in Korea and Japan

YEAR	K.R.P	Normal Value	Relative Variation	Criterion of A and L	J.R.P	Normal Value	Relative Variation	Criterion of A and L
1910	10.40	11.50	−10.5	B	52.43	51.75	1.2	D
11	11.56	11.72	−1.3	E	46.63	52.25	−11.8	B
12	10.86	11.94	−9.9	E	51.71	52.55	−1.6	E
13	12.10	12.16	−0.4	E	50.22	52.95	−5.4	E
14	14.13	12.39	12.3	A	50.25	53.35	−6.1	E
15	12.84	12.63	1.6	D	57.00	53.76	5.6	C
16	13.93	12.87	7.6	C	55.92	54.17	3.1	D
17	13.68	13.11	4.1	D	58.45	54.58	6.6	C
18	15.29	13.36	12.6	A	54.56	55.00	−0.8	E
19	12.70	13.61	−7.1	E	54.70	55.42	−1.3	E
20	14.88	13.87	6.7	C	60.81	55.84	8.1	C
21	14.32	14.13	1.3	D	63.20	56.27	10.9	A
22	15.01	14.39	4.1	D	55.10	56.70	−2.9	E
23	15.07	14.67	3.2	D	60.69	57.13	5.8	C
24	13.21	14.94	−13.0	B	55.40	57.56	−3.8	E
25	14.77	15.23	−3.1	E	57.17	58.00	−1.4	E
26	15.30	15.51	−1.3	E	59.70	58.45	2.0	D
27	17.29	15.81	8.5	C	55.59	58.89	−5.9	E
28	13.51	16.10	−19.1	B	62.10	59.34	4.4	D
29	13.70	16.41	−19.7	B	60.30	59.79	0.8	D
30	19.18	16.72	12.8	A	59.55	60.25	−1.1	E
31	15.87	17.03	−7.3	E	66.87	60.71	9.2	C
32	16.34	17.36	−6.2	E	55.21	61.17	−10.7	B
33	18.19	17.68	2.8	D	60.39	61.64	−2.0	E
34	16.71	18.02	−7.8	E	70.82	62.11	12.3	A
35	17.88	18.36	−2.6	E	51.84	62.58	−20.7	B
36	19.41	18.70	3.6	D	57.45	63.06	−9.7	E
37	26.79	19.06	28.8	A	67.33	63.54	5.6	C
38	24.13	19.42	19.5	A	66.31	64.03	3.4	D
39	14.33	19.78	−38.0	B	65.86	64.52	2.0	D

NOTE : The original data of this table were obtained by calculating the following data : CHOSEN BEIKOKU YORAN. CHOSENMAI NO SHINTEN, AND VARIOUS ISSUCS.

normal value of Korean and Japanese rice were obtained by log linear as follows : LOG Y=2.42410+0.01879X(K.R) LOG Y=3.93907+0.00766X(J.R) criterion of abundant and lean rice production is as follows; value of diviation; more than 10%(A), less than −10%(E), 5～9%(C) 0～4%(D)) and more than −10%(B).

A=ABUNDANT, E=LOW, C=HIGH, D=AVERAGE AND B=LEAN.

CORRELATION COEFFICIENT=0.01205

TABLE. 3 — 3 Correlation Between the Influxes of Korean Rice and Rice Production in Korea and Japan

YEAR	Influxes of K.R	Normal Value	Rel-Diviation of I.K.R(x)	Rel-Diviation of K.R.P(y)	Rel-Diviation of J.R.P(z)
1910	1.14	1.98	−7.3	−10.5	1.2
11	3.68	2.70	26.6	−1.3	−11.8
12	2.46	3.62	−4.7	−9.9	−1.6
13	2.94	4.80	−6.3	−0.4	−5.4
14	10.22	6.28	38.5	12.3	−6.1
15	18.72	8.10	56.7	1.6	5.6
16	13.32	10.32	22.5	7.6	3.1
17	11.95	12.98	−8.6	4.1	6.6
18	17.32	16.10	7.0	12.6	−0.8
19	28.05	19.70	29.7	−7.1	−1.3
20	16.52	23.80	−44.0	6.7	8.1
21	29.04	28.38	2.2	1.3	10.9
22	31.36	33.39	−6.4	4.1	−2.9
23	34.53	38.77	−12.2	3.2	5.8
24	45.47	44.43	2.2	−13.0	−3.8
25	44.28	50.25	−13.4	−3.1	−1.4
26	52.13	56.08	−7.5	−1.3	2.0
27	59.03	61.77	−4.6	8.5	−5.9
28	70.68	67.14	5.0	−19.1	4.4
29	53.77	72.02	−33.9	−19.7	0.8
30	51.67	76.25	−47.5	12.8	−1.1
31	79.92	79.66	0.3	−7.3	9.2
32	71.98	82.13	−14.1	−6.2	−10.7
33	75.31	83.58	−10.9	2.8	−2.0
34	89.52	83.93	6.2	−7.8	12.3
35	84.34	83.18	1.3	−2.6	−20.7
36	89.70	81.35	9.3	3.6	−9.7
37	67.36	78.52	−16.5	28.8	5.6
38	101.49	74.80	26.2	19.5	3.4
39	56.90	70.31	−23.5	−38.0	2.0

NOTE : The original data of this table were obtained by calculating the following data: CHOSEN BEIKOKU YORAN. CHOSENMAI NO SHINTEN AND VARIOUS ISSUES.

normal value of influxes of Korean rice were obtained by log second parabola curve as follows:

LOG $Y = 0.36502 + 0.32762X - 0.00667X^2$

CORRELATION COEFEICIENT

(x, y) $= 0.1446$

(x, z) $= -0.0978$

TABLE. 3－4 Correlation Between the Real Prices of Korean and Japanese Rice and Influxes of Korean Rice

YEAR	(Prices of Korean Rice) observation value	normal value	relative diviation	(Prices of Japanese Rice) observation value	normal value	relative diviation	diviation of I.K
			(x)			(y)	(z)
1910	19.1	20.6	−7.2	21.9	25.5	−14.1	−7.3
11	24.1	20.9	15.3	27.5	25.6	7.4	26.5
12	18.2	21.3	−9.8	20.8	25.6	−18.7	−4.7
13	26.9	21.6	24.5	32.0	25.7	24.5	−6.3
14	20.9	21.9	−4.5	28.0	25.8	8.5	38.5
15	17.3	22.2	−22.0	22.4	25.8	−13.1	56.7
16	18.6	22.5	−17.0	21.0	25.9	−18.9	22.5
17	22.9	22.8	0.4	24.1	25.9	−6.9	−8.6
18	26.2	23.1	13.4	28.9	26.0	11.5	7.0
19	30.7	23.4	31.1	31.8	26.1	22.3	29.7
20	28.1	23.7	18.5	33.7	26.1	29.1	−44.0
21	20.3	24.1	−15.7	22.1	26.2	−15.3	2.2
22	24.3	24.4	−0.4	28.3	26.2	8.0	−6.4
23	22.7	24.6	−7.7	24.5	26.3	−6.4	−12.2
24	27.1	24.9	8.8	28.9	26.4	9.8	2.2
25	29.7	25.1	15.5	31.8	26.4	20.4	−13.4
26	29.0	25.4	14.4	30.6	26.5	15.9	−7.5
27	27.5	25.6	7.0	29.0	26.5	9.4	−4.6
28	24.5	25.7	−4.6	26.3	26.5	−0.7	5.0
29	24.1	25.9	−6.9	25.1	25.5	−1.5	−33.9
30	25.3	26.1	−3.0	26.1	26.6	−1.8	−47.5
31	19.1	26.1	−26.8	19.9	26.6	−24.8	0.3
32	21.8	26.2	−16.4	22.1	26.7	−17.2	−14.1
33	22.3	26.4	−15.5	22.2	26.7	−16.8	−10.9
34	24.8	26.5	−6.4	25.4	26.8	−5.2	6.2
35	30.1	26.7	12.7	29.8	26.9	10.7	1.3
36	30.0	26.8	11.9	29.9	26.9	11.1	9.3
37	28.6	26.9	6.3	28.0	26.9	4.0	−16.5
38	28.1	27.0	4.0	28.1	27.0	4.0	26.2
39	28.5	27.1	5.1	27.8	27.1	6.2	−23.5

NOTE : The original data of this table were obtained by calculating the following data;
KOREA GOVERNMENT GENERAL, CHOSEN BEIKOKU YORAN. KOREAN RICE ASSOCIATION, CHOSENMAI NO SHINTEN.
JAPANESE GOVERNMENT GENERAL, CHOSENMAI KANKEI SHIRYO
TAIWAN GOVERNMENT GENERAL, BEIKOKU TOKEI.
The deflator used is the CPI deflator (1935=100)
normal value of Korean and Japanese rice were obtained by log second parabola curve or log linear as follows:

$$\text{LOG } Y = 3.0125 + 0.0162X - 0.00022X^2$$

$$\text{LOG } Y = 3.2395 + 0.0020X \text{ (J. R)}$$

Prices for Japanese rice were taken from the TOKYO rice market.
Prices for Korean rice were taken from the OSAKA rice market up to 1925 and thereafter from the TOKYO rice market.

CORRELATION COEFFICIENT

$(x, y) = 0.92844$
$(x, z) = -0.08398$
$(y, z) = -0.09977$

Japanese rice and influxes of Korean rice are presented in Table 3–4. As we can see in Table 3–4, the correlation coefficient between the real prices of rice in the two countries show a strong correlation of about 0.92844.

In other words, we can consider that Korean rice is identical in quality with the rice produced in Japan. The correlation coefficient between the real prices of rice in the two countries and the influxes of Korean rice show a weak negative correlation of about −0.08398 and −0.09977. In other words, it seems unreasonable to consider that influxes of Korean rice have been in response to the real prices of rice in the two countries.

2. Estimation of the Influx Function

Before analysis, the trend in relative price of Korean and Japanese rice and influxes of Korean rice were plotted in Figure 3–2.

As showned in Figure 3–2, influx function on influxes of Korean rice in the whole period were divided into periods as follows:

First period 1910–1914, second period 1915–1920 (except for 1919), third period 1923–1930 and fourth period 1931–1938.

Thus, we shall estimate the influx function by using the three time dummy variables since influx function were shifted usually to the up-ward

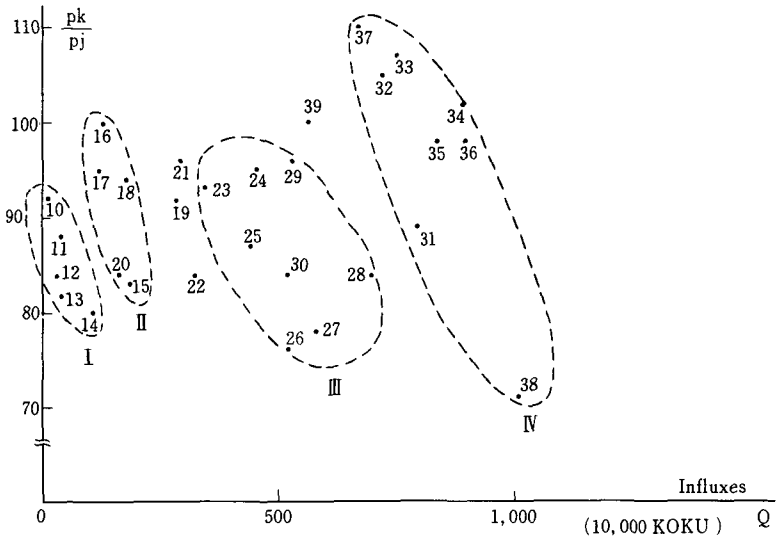

FIG. 3－2. TREND IN RELATIVE PRICE OF KOREAN AND JAPANESE RICE AND INFLUXES OF KOREAN RICE

SOURCE : KOREA GOVERNMENT GENERAL, NOGYO TOKEI HYO. CHOSEN BEIKOKU YORAN. CHOSENMAI NO SINTHEN. TAIWAN GOVERNMENT GENERAL, BEIKOKU TOKEI. JAPANESE GOVERNMENT GENERAL, CHOSENMAI KANKEI SHIRYO.

right by technical progress and increasing population in supply and demand sector.

Influxes of Korean rice in the first period were treated similarly in terms of quality and price of foreign rice, because, at that time, Korean rice contained many miscellaneous items such as sand or dust in the commercial rice. This was mainly due to lack of processing technology and improved varieties.

However, in the second period, the introduction of rice HYV and improvement of processing technology gradually raised the relative price and influxes of Korean rice.

On the other hand, in the third period, rice production in Korea was increased remarkably by investment in such areas as land improvement, irrigation facilities, chemical fertilizer and high-yielding varieties under

the KRDP. However, the relative price on influxes of Korean rice in Japan did not rise in spite of the rice shortage in Japan. The reason for this was that Korean farmers were strained to sell the harvested rice immediately without regard to cheap prices, in order to repay debts to capitalists, landlords and the Japanese government. Therefore, capitalists, landlords and the Japanese government were guaranteed a large amount of cheap rice from Korea.

However, in the fourth period, korean rice was treated equally or even better than Japanese rice in standards of quality and prices. This was accomplished through the improvement of processing technology and a higher rate of the dissemination of rice HYV. Thus, Korean rice strained a drop in the price in Japan's rice market. Therefore, from 1933, the Japanese government established various kinds of control laws concerning the influx of Korean rice. In particular, in 1938, 2 years of continuous rice production pressed relative prices of Korean rice down while pushing up the influx of Korean rice.

In this section, we shall estimate the influx function in order to review the correlation results between the influxes of Korean rice and the real price of Korean and Japanese rice.

The influx function is defined as:

$$I=f\ (P,\ Y,\ pk/pJ,\ D_1,\ D_2,\ D_3,)$$

Here, the influx function is specified as two regression in the logarithmic linear forms:

$$\log I=\log\ \alpha_0+\alpha_1 \log P_k/P_J+\gamma_1 D_2+\gamma_2 D_3+\gamma_3 D_4+e \quad \text{——— (I)}$$

$$\log I=\log\ \alpha_0+\alpha_1 \log P+\alpha_2 \log Y+\alpha_3 \log P_k/P_J+\gamma_1 D_2+\gamma_2 D_3+\gamma_3 D_4+e \quad \text{——— (II)}$$

Where, I = influxes of Korean rice

P = population (in Japan)

Y = income per capita (in Japan)

Pk = unpolished rice price in Korea (GPI deflator 1935 = 100)

Pj = unpolished rice price in Japan (CPI deflator 1935 = 100)

Time dummy variables:

D = (1915−1920 = 1 and otherwise = 0 except for 1919 = 0)

D = (1923 − 1930 = 1 and otherwise = 0)

D = (1931 − 1938 = 1 and otherwise = 0)

e = Error Term

Estimated results are presented in Table 3–5.

TLBLE. 3 − 5 Estimates of Influx Function (1910−1939)

Variable	C. E.	S. E.	F	SG
log pk/pJ	−1.5053	0.7248	4.313	*
D_2	1.6841	0.2262	55.411	**
D_3	2.7955	0.1995	196.337	**
D_4	3.4495	0.2197	246.391	**
Constant	5.5095	$\bar{R}^2$=0.925	(REGRESSION I)	
log P	6.4351	3.2502	3.920	*
log Y	−1.3703	1.2536	1.195	
log pk/pJ	−1.2117	0.7360	2.710	**
D_2	1.3490	0.2815	22.957	**
D_3	2.0848	0.4806	18.815	**
D_4	2.2508	0.7788	8.351	**
Constant	−12.8156	$\bar{R}^2$=0.932	(REGRESSION II)	

Number of samples=26　C. E. (Coeffecient elasticity)
S. E. (Standard Error)　SG　*=5%　**=1%
SG (Significant level)

As shown in table 3–5, the relationship between the relative price and influxes of Korean rice follows a right downward direction due to the negative value of the relative price parameter.

However, the positive value of the time period variables parameter is shown the gradual shifting of the influx curve in the right upward direction. As mentioned previously, the factors shifting the influx curve appear mainly due to increasing population and absolute rice shortage in demand sector.

Thus, it was inevitable that the Japanese government increases in the influx of Korean rice despite rises in the relative price.

Ⅳ. Conclusion

Total rice production in Korea increased remarkably prior to World-War Ⅱ. This increase was accomplished through an increase in yield per hectare brought about by the introduction of fertilizer-responsive, high-yielding varieties and the development of irrigation, which was started in the 1920's after the Korean Rice Production Development Program.

Despite an increase in rice production, rice consumption per capita in Korea declined. There were two reasons for this. One is that the modernization of rice farming through capitalistic systems initiated by Japanese colonial rule largely strained the finances to Korean farmers. The other is that, from the time of the 1918 rice riots in Japan, influxes of Korean rice had been greatly increasing. However, since 1934, influxes of Korean rice increased despite the rising relative price in Japan's rice market.

Under the Korean Rice Production Development Program, agriculture in Korea was transformed from a natural-economic to a capitalistic system. Thereby, institutional changes and quantitive achievement were brought about. In spite of this quantitative progress, no evidence could be found to show that the living standard(equal to rice consumption per capita) of Korean farmers improved after the initiation of the Korean Rice Production Development Program.

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