AG 17

Estimates of Factor Shares for Rice Production in Japan for the Period of 1922-1944

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Abstract: After World War I, the development of the agriculture sector was delayed in contrast with the rapid growth of the industrial sector. Japanese agriculture accelerated by innovation after the economic revitalization following World War II. It clarifies the production structure of the rice production in Japan, and there is this study before the end of World War II after the First World War end during the analysis period. This study clarifies a change of factor shares of the rice production sector in this time. The purpose of this study is to elucidate the characteristics of the production structure of the rice production in Japan from 1922 through 1944, and the agriculture in Japan at this time is considered to be in a developing stage. The historic change of the rice production in Japan gives a suggestion for agriculture development in modern Asia. The measurement of factor shares of the rice production in the analysis period applies "a method to estimate land income as rest." In addition, it measures the Cobb-Douglas's type amount of production formation function. It clarify the contribution of the production input. The changes of factor shares are as follows. The change of factor shares is land, labor, fertilizer, cost of draft animals, agricultural machinery, materials, building for agriculture, seed in order of the average value from 1922 through 1944. As for the development of production technological system, it is a technological innovations land-saving and fertilizer-using. The results of estimate by the amount of production formation function are as follows. In the periods of 1922-1944, the input of the labor is excess level, the input of the fertilizer is under level and the input of the land is equilibrium level.

INTRODUCTION

World War I, the development of the agriculture sector was delayed in contrast with the rapid growth of the industrial sector. Japanese agriculture accelerated by innovation after the economic revitalization following World War II. It clarifies the production structure of the rice production in Japan, and there is this study before the end of World War II after the First World War end during the analysis period. It corresponds to the Meiji period and the prewar age of the Showa period, and this period is a stagnation period of agricultural production. This study clarifies a change of factor shares of the rice production sector in this time. The purpose of this study is to elucidate the characteristics of the production structure of the rice production in Japan from 1922 through 1944, and the agriculture in Japan at this time is considered to be in a developing stage. The historic change of the rice production in Japan gives a suggestion for agriculture development in modern Asia. The measurement of factor shares of the rice production in the analysis period applies "a method to estimate land income as rest." In addition, it measures the Cobb-Douglas's type amount of production formation function. It clarify the contribution of the production input.

METHODOLOGY

◇The estimates of factors share

The measurement of factor shares of the rice production in the analysis period applies "a method to estimate land income as rest." It is presented by the following:

Factor sharesL＝(PL･L)/(P･Q)

Factor sharesK＝(PK･L)/(P･Q)

Factor sharesV＝(PV･L)/(P･Q)

Factor sharesS＝1-(PL･L)/(P･Q)-(PK･L)/(P･Q)-(PV･L)/(P･Q)

where Q is output; P output price; L labor input; K capital input; V fertilizer input; S land input; LP labor input price; KP capital input price; VP fertilizer input purice and S land input price.

◇Amount of production formation function

The function type assumed is the Cobb-Douglas's type production function. The function to estimate is the next formula.

$X = A \cdot L^{\alpha} \cdot V^{\gamma} \cdot S^{\delta}$ （$0<\alpha, 0<\gamma, 0<\delta, \alpha+\gamma+\delta \fallingdotseq 1$）

It is presented by the following:

$\ln X = \ln A+\alpha BC\ln LBC+\gamma \ln V+\delta \ln S+\zeta$

where X is output; L labor input; V fertilizer input; S land input.

◇Examination of the contribution of the production input

The marginal productivity of input X is MPX. P is an output price. PX is X input price. In the case of ①: MPX> (PX/P), the input of X is under. In the case of ②: MPX = (PX/P), the input of the factor of production is equilibrium. In the case of ③: MPX <(PX/P), the input of the agent of production is excess. It is represented by the following. ④Value of production elasticity of X>factor shares X. ⑤Value of production elasticity of X= factor shares X. ⑥ Value of production elasticity of X<factor shares X.

DATA

Yukio ISHIBASHI et al,"Teikoku Nokai Kome Seisanhi Cyousa Syusei (Imperial Agricultural Organization cost of rice production investigation collection)" is (from 1922 to 1948) (Natl. Res. Inst. of Agricultural Economics) (Natl. Res. Inst. of Agricultural Economics publication, the 207th). A period of estimation of factor shares and the amount of production formation function by estimate is 1922 through 1945. Sample data are thyme series data for 24 years.

RESULTS AND DISCUSSION

◇The change of factor share of the rice production: 1922-1944

The change of factor shares is land, labor, fertilizer, cost of draft animals, agricultural machinery, materials, building for agriculture, seed in order of the average value from 1922 through 1944. As for the development of production technological system, it is a technological innovations land-saving and fertilizer-using.

Table 1. Changes in factor shares for rice production in Japan :1922-1944

Year	seed (%) ①	fertilizer (%) ②	labor (%) ③	materials (%) ④	draft animals (%) ⑤	machine (%) ⑥	building (%) ⑦	land (%) ⑧
1922	0.0147	0.2250	0.4618	0.0199	0.0651	0.0314	0.0341	0.1480
1923	0.0129	0.2047	0.3835	0.0173	0.0561	0.0286	0.0318	0.2651
1924	0.0100	0.1611	0.3294	0.0170	0.0419	0.0210	0.0259	0.3936
1925	0.0081	0.1410	0.2265	0.0129	0.0268	0.0184	0.0159	0.5503
1926	0.0082	0.1676	0.2392	0.0155	0.0302	0.0261	0.0204	0.4928
1927	0.0080	0.1787	0.2306	0.0182	0.0333	0.0194	0.0190	0.4928
1928	0.0081	0.1762	0.2454	0.0200	0.0319	0.0206	0.0200	0.4777
1929	0.0082	0.1606	0.2421	0.0154	0.0269	0.0202	0.0196	0.5070
1930	0.0121	0.2416	0.4498	0.0331	0.0548	0.0374	0.0293	0.1420
1931	0.0103	0.2035	0.4021	0.0291	0.0490	0.0359	0.0312	0.2389
1932	0.0089	0.1599	0.3420	0.0271	0.0400	0.0296	0.0263	0.3662
1933	0.0088	0.1740	0.3275	0.0245	0.0390	0.0295	0.0254	0.3712
1934	0.0081	0.1497	0.2992	0.0212	0.0347	0.0260	0.0232	0.4378
1935	0.0088	0.1457	0.2974	0.0210	0.0350	0.0255	0.0212	0.4454
1936	0.0085	0.1451	0.2762	0.0217	0.0315	0.0248	0.0208	0.4714
1937	0.0095	0.1455	0.2633	0.0223	0.0320	0.0263	0.0204	0.4806
1938	0.0096	0.1500	0.2819	0.0252	0.0352	0.0283	0.0193	0.4505
1939	0.0082	0.1355	0.3058	0.0258	0.0386	0.0303	0.0185	0.4374
1940	0.0109	0.1933	0.3753	0.0312	0.0494	0.0361	0.0198	0.2839
1941	0.0105	0.1748	0.3872	0.0316	0.0540	0.0377	0.0236	0.2805
1942	0.0107	0.1417	0.4049	0.0336	0.0543	0.0408	0.0240	0.2900
1943	0.0095	0.1328	0.3571	0.0315	0.0499	0.0393	0.0241	0.3557
1944	0.0112	0.1232	0.4231	0.0440	0.0624	0.0549	0.0296	0.2515

Note: ⑧＝1−(①+②+③+④+⑤+⑥+⑦)

◇The examination of the estimated result of the amount of production formation function

The measurement results of the amount of production formation function are as follows.

$\ln X = +0.0097 +0.1233\ln L +0.3609\ln V +0.3627\ln S$

$R^2 = 0.6030$

Firstly, the value of A is 0.0097. It is supposed that this suggests the existence of the neutral technological change. Secondly, the value of α is 0.1233. Thirdly, the value of γ is 0.3609. As for the fourth, a value of δ is 0.3627. As for the fifth, α+γ+δ is 0.8468, and the values are less.

◇Examination of the contribution of the production input

The results of estimate by the amount of production formation function are as follows. In the periods of 1922-1944, the input of the labor is excess level, the input of the fertilizer is under level and the input of the land is equilibrium level.

CONCLUSION

The purpose of this study is to elucidate the characteristics of the production structure of the rice production in Japan from 1922 through 1944. The measurement of factor shares of the rice production in the analysis period. In addition, it measures the Cobb-Douglas's type amount of production formation function. It clarify the contribution of the production input. The changes of factor shares are as follows. The change of factor shares is land, labor, fertilizer, cost of draft animals, agricultural machinery, materials, building for agriculture, seed in order of the average value from 1922 through 1944. As for the development of production technological system, it is a technological innovations land-saving and fertilizer-using. The results of estimate by the amount of production formation function are as follows. In the periods of 1922-1944, the input of the labor is excess level, the input of the fertilizer is under level and the input of the land is equilibrium level.