Asian Food Supply-Demand Situation from a Global Perspective

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Abstract

Due to the rapid economic growth, Asian food market is facing a diversification process. The change cannot be easily predicted as the Asian food sector has some peculiar characteristics. Food consumption pattern and production practices are not fully comparable with those empirically observed in the other regions. Diversification of the food market in monsoon Asia seems unprecedented. The paper examines the past trend of food supply and demand in the region compared with the rest of the world. Reviewing the past projection studies, a general picture of the future situation is given. Some factors which have not sufficiently been introduced in the models are discussed using practical statistical analysis.

As a result, it appears that the region's agriculture has enough potential to support the population provided that the current level of yield growth is kept. The yield will be dependent on key factors such as further improved irrigation systems and efficiently controlled chemical inputs. Also feed requirement based on the strong demand for livestock products in the region may not be as large as anticipated, as far as grains are concerned. Regarding trade, the region should be careful about reforming the policy, and even within the framework of freer trade, the region's food supply potential should be maintained and improved by promoting the diversification process.

Introduction

The global situation of food supply and demand can not be discussed without considering the impact of the changes in the Asian food market due to the large population of the region and also due to other factors which are peculiar to the region. Although the region as a whole, as many studies predict, seems to eliminate the persistent problem of malnutrition, it is still doubtful whether the region will have a sufficient capacity to feed itself in the future. As a result, rapid expansion of food import may occur. However, it remains to be determined whether these analyses are based on enough scientific evidence or not. It sometimes appears that some of the analyses show a simple analogy with the other regions, and the others are just extrapolations of historical trends.

This paper reviews historical data on the food supply and demand situation in Asia[1]. Mainly for the statistical reasons, Asia in this paper excludes Near East (including Afghanistan), Asian republics of the former Soviet Union, not otherwise specified. Reviewing the existing stud-

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ies which are usually based on econometric models, the issues which lead to the differences in the projection results and the limitation and shortcomings of the models are outlined. Then, the factors affecting the food supply and demand are presented with some statistical analyses. The paper also discusses the effect of trade which may improve or adversely affect the future food demand and supply situation in the region. In the paper, the region is geographically divided into three sub-regions, namely East, Southeast and South Asia (Table 1).

Table 1 Definition of Asia and sub-regions

Sub-region	Countries and economic regions	Population (mil., 1995)
East Asia	Japan, China, Taiwan, Korea Rep., D.P.R. Korea, Mongolia	1,425 (25%)
Southeast Asia	ASEAN countries, Cambodia	484 (8%)
South Asia	India, Pakistan, Nepal, Sri Lanka, Bhutan, Maldives	1,239 (22%)

Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.
Note: % in parenthesis are the shares in the world population.

Overview of Asian food demand and supply

1 Past trend

For the past 25 years, food availability per person per day has markedly increased in the region. According to the FAO food balance sheets, which are the only reliable and comparable source for the developing world, Asia increased its average calorie intake by 23% during this period (Table 2) and achieved a level close to the world average. Even in South Asia where the population increase was fairly high, the figure has been raised by 11% which is the same rate of increase as that of the world total. In Asia total food availability in terms of calorie supply was approximately 2,600 kcal in 1994. As a result of this improvement, the number of undernourished people in the region significantly decreased from 714 million in 1969-71 to 524 million in 1990-92, according to the recent FAO survey (FAO, 1996).

Cereals are by far the most important source of calorie supply in the region, and this is

Table 2 Average calorie-supply in Asia (Cal. / day)

	1970	1994	Cereals	1994/70
East	2142	2842	60%	133%
Southeast	1984	2492	63%	126%
South	2102	2337	63%	111%
Asia	2105	2591	61%	123%
N. America	3051	3591	23%	118%
World	2441	2718	50%	111%

Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

one of the substantial characteristics of the region's food sector. More than 60% of total calories is derived from cereals in all the sub-regions of Asia. Self-sufficiency rates (SSRs)[2] for cereals have remained at a level of above 90% for the past 25 years (Fig. 1). And if Japan is removed from the list, the region can be considered to be practically self-sufficient for cereals. Among the sub-regions, in Southeast Asia, which used to be a net exporting region in the 1980s, SSR has recently declined and the region has become just self-sufficient for cereals.

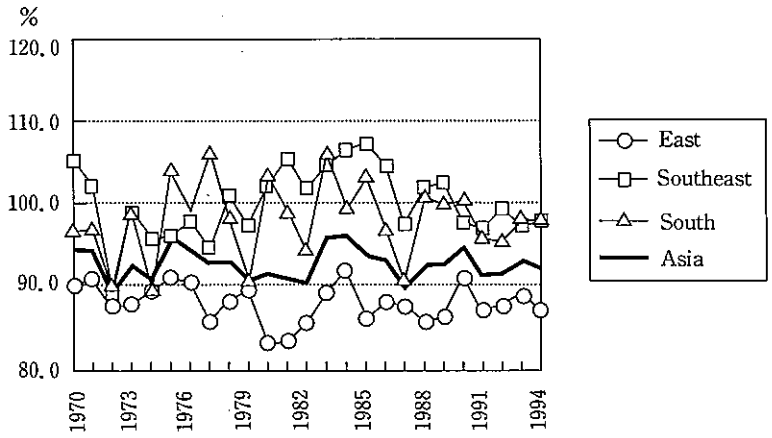

Fig. 1 Self-sufficiency rates of total cereals

Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

Maize and soybeans are the commodities generally considered to be insufficient in the region because of the rising feed demand. However the statistics show relatively stable trends of the SSRs for both commodities (Fig. 2), suggesting that the region is increasing the production of feed crops in keeping pace with the rapid expansion of livestock production. For meat, trade is very limited in the region and intra-regional trade is dominant. Therefore the SSR is close to 100 for the region as a whole.

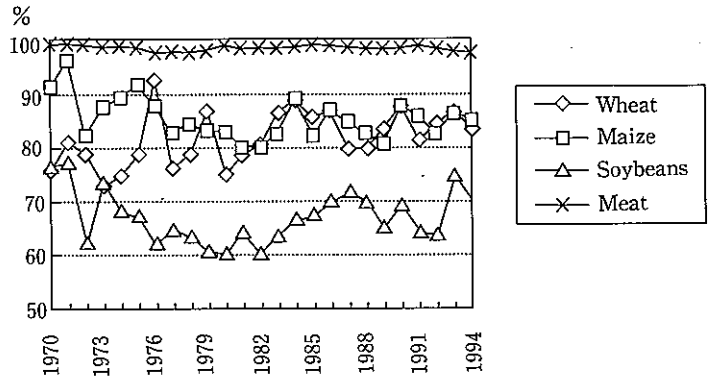

Fig. 2 Self-sufficiency rates by item

Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

[2] Self-sufficiency rates are calculated by dividing the regions' production numbers by the regions' total supply numbers which include net import of the regions.

As indicated above, the region markedly increased its agricultural production during the last quarter of century on a calorie supply basis. The growth should be examined based on individual commodities. As shown in Fig. 3, there is a large difference among the growth rates. In the last 25 years, the production of wheat and maize roughly tripled, and that of soybeans and peanuts doubled, while in contrast the production of minor coarse grains declined sharply. The speed of the production expansion in Asia was nearly twice as fast as that of the rest of the world if all the major crops are added. Many people believe that this agricultural growth is one of the major components of the so-called "Asian miracle".

To summarize the past trend, Asia has showed a remarkable performance in agricultural production. As a result, the nutritional status of the Asian population has been improved dramatically at least on average. However, the good performance in the past does not necessarily imply that it will be maintained in the future.

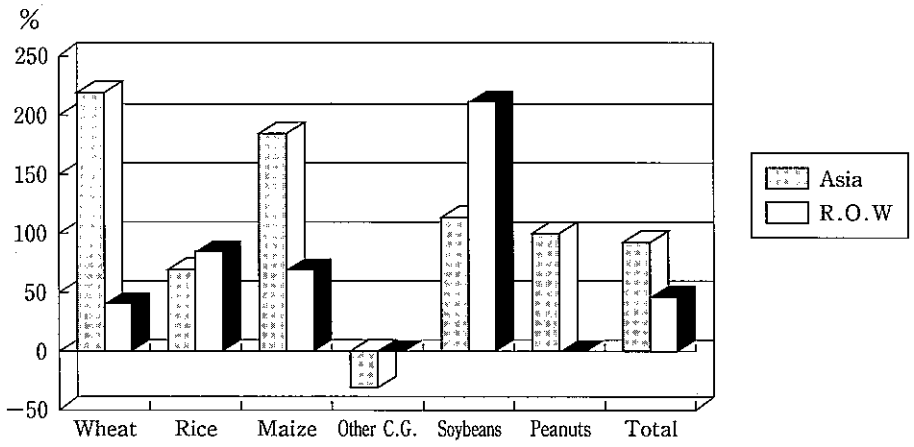

Fig. 3 Percentage increase of production of major crops in Asia (1970-1995)
Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

2 What are the issues

Table 3 shows the growth rates of per capita food consumption by item. During the last quarter of century the consumption of livestock products, vegetable oils and alcoholic beverages grew fast, while that of traditional foods like starchy roots and pulses declined. This phenomenon is typically observed in the stage of development, and it is referred to as "Westernization" of food consumption pattern in Japan. Asian agriculture must respond to this drastic change. Although it is a process of diversification in general, Asia may have peculiar characteristics different from those recorded historically.

Population projections issued by the United Nations indicate that in future population pressure will be considerably eased at least in terms of growth rate. Estimated annual population growth rate in the period of 1995-2025 is close to 1.0% per year in Asia. This figure is far lower than the current rate, 1.8%, and it will decrease to c.a. 0.5% p.a. in the period of 2025-2050. However the annual increment of Asian population is not low and may reach more than 40 million people in the period of 1995-2025 on average. And by the year 2050, Asia will have to feed 1.8 billion people in addition to the present population. Continuous

pressure on food supply due to the increase of the population is one of the major problems in the region (Fig. 4).

Arable land and permanent crop land in Asia did not increase during the last 25-year period with the exception of Southeast Asia where roughly 25% of land was newly added (Fig. 5). Consequently land availability per person has become much lower than 25 years ago. An average person in Asia can currently use only 0.13 ha of land for agricultural production including non-food products. Among the sub-regions, East Asia has the least land available per person. With this amount of land Asian agriculture has to implement more and more land-intensive production systems, since the situation will certainly be more severe in the future due to the continuing urbanization process and the population increase in the region.

Under these circumstances, it is difficult to predict the future Asian food situation. It is necessary to review the past projection studies.

Table 3 Average annual growth of per capita direct food consumption
(1970 - 1994)

Meat	4.5%	Fish/seafood	1.9%
Alcoholic bev.	3.7%	Vegetables	1.2%
Vegetable oils	3.7%	Cereals ex. beer	0.6%
Milk ex. butter	2.4%	Pulses	−1.2%
Fruits ex. wine	2.2%	Starchy roots	−2.1%

Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

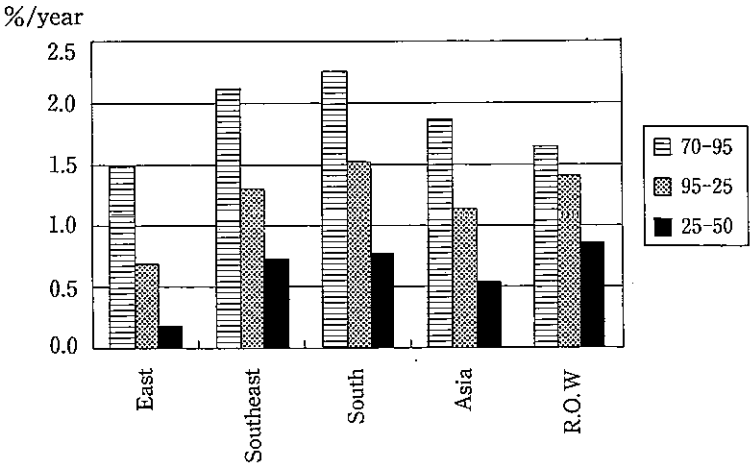

Fig. 4 Future population increase in Asia-annual growth
Source: UN World population prospects (rev.1994).

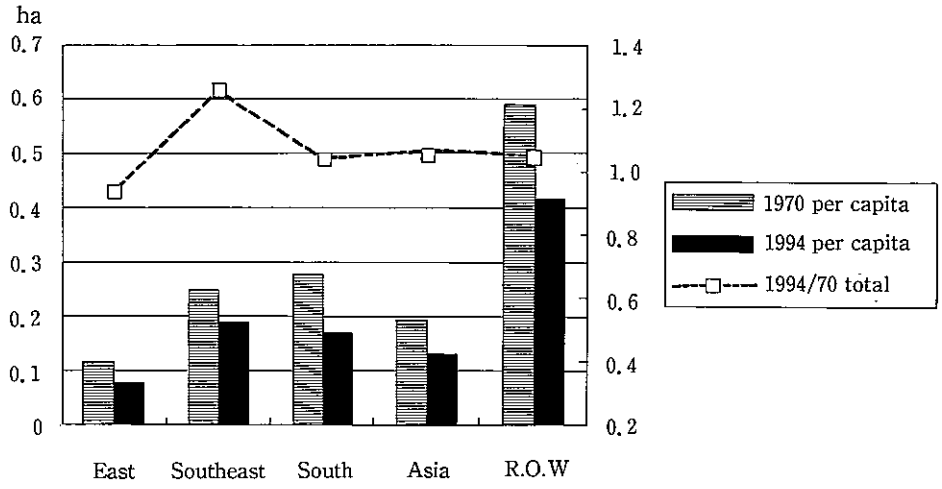

Fig. 5 Arable and permanent crop land per person
Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

Review of global projections

Various organizations are trying to project the future market situation by operating large-scale econometric models. Each organization has its own purpose for the projection studies. For example, one is trying to forecast the price of commodities in the next year and another intends to analyze the impact of policy changes. Therefore, commodity and country coverage or selection of variables of the models varies widely from one study to another. Projection period targeted also makes the model structure different. Long-term analysis is taken into consideration in this paper. Unfortunately no comprehensive study of this kind has been conducted exclusively for the Asian food market. In the following sections, therefore, the results for Asia of the major world wide studies will be compared.

Among global long-term studies, those carried out by FAO (FAO, 1995), World Bank (Mitchell *et al.*, 1997), IFPRI (Rosegrant *et al.*, 1996) and MAFF (MAFF, 1995) are selected for comparison. As shown in Fig. 6, annual growth rate of the total demand of cereals in Asia (excluding Japan) during the projection periods remained at around 2% per year reflecting optimistic assumptions for the region's economic growth, with the exception of MAFF (2)[3] study which is based on the assumption that production constraints will become serious in the future[4] and thus food prices may increase. This fact suggests that there is a kind of consensus for the demand side and that the opinions expressed in the studies regarding the region's production potential vary considerably. Except for MAFF (2), production increase per year is projected in the range from 1.7% to 2.2%, which is much higher than the region's population growth but lower than the historical performance of the region's agricultural expansion.

[3] There are two scenarios in this study, one for the continuation of the past trend (MAFF(1)), the other for assuming a lower productivity (MAFF(2)).
[4] The condition is that annual yield growth will be gradually declining to the level of a half of the current growth rate in ten years.

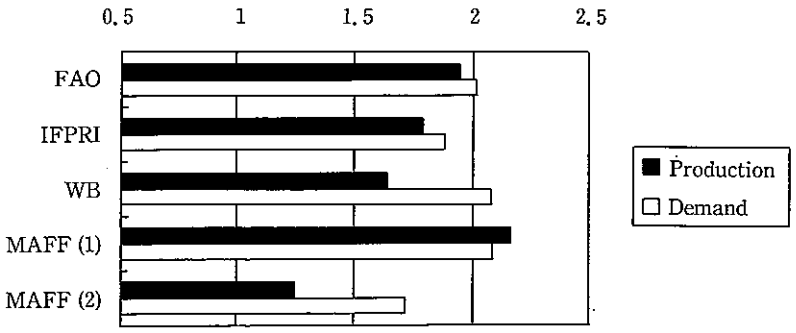

Fig. 6 Projections of annual growth rates of cereal production and demand for Asia (excl. Japan)
Source: FAO (1995), Rosegrant *et al.* (1995), Mitchell *et al.* (1997), MAFF (1995).

Table 4 Projection results for net export and per capita consumption of cereals
(Asia, excl. Japan)

	Net export (million tons)			
FAO	1989	−23	2,010	−45
IFPRI	1990	−26	2,020	−79
WB	1990	−24	2,010	−91
MAFF(1)	1992	−27	2,010	−25
MAFF(2)	1992	−27	2,010	−103

	Per capita consumption(kg)			
FAO	1989	234	2,010	258
IFPRI	1990	241	2,020	272
WB	1990	240	2,010	268
MAFF(1)	1992	232	2,010	261
MAFF(2)	1992	232	2,010	245

Source: FAO (1995), Rosegrant *et al.* (1995), Mitchel *et al.* (1997), MAFF (1995).

Per capita total consumption of cereals is projected to increase substantially in the region, however, net import value differs depending on the supply (Table 4). The factors which are responsible for these differences will be analyzed in the later part of this paper.

By all means, econometric models are a simplification of the real economy, and it is true that they show only a small part of the reality. However, the quality of macro-scale studies has to be enhanced, as they are essential to those who need to acquire a general picture of the economy. In this regard, the following parameters are considered to be the key factors in the analyses of the region's food sector as a whole: the potential for yield increase for crops, and the extent of the feed demand. Both will play a determinant role in the direction of the supply-demand balance in the coming decades. The former is normally calculated in a model as time trend. The latter is normally estimated in proportion to the livestock production.

Every past study using econometric models has shortcomings in both points, thus the results are questionable not only for these variables but for the total picture. In other words, projection results can be easily changed according to the level of these two key parameters for Asia. In addition, trade issues should be considered, as inter-dependence among the regions will further deepen and discussion of regional food market without trade is meaningless.

Key factors affecting food supply and demand in Asia

1 Potential for crop yield increase

Yield increase is a prerequisite for Asian agriculture. In fact most of the production gain in Asia was derived from the increase of yield per unit land in the past. Fig. 7 shows the historical trend of average cereal yield. It is obvious that Asia has performed much better than the rest of the world. The average yield in Asia has surpassed that of the rest of the world since the end of the 1970s when Chinese cereal production jumped by the introduction of the liberalized farm policy. It does not seem that cereal yield has reached a ceiling in Asia as far as the statistics are concerned. But this aspect must be examined in more detail.

In order to analyze the trend, the percentages of annual growth rates were calculated for each ten-year period in the last 25 years by using a simple regression method[5]. This was done partly because short-term fluctuations should be removed and partly because yield response to the investment is known to be realized with a relatively long time-lag. As seen in Fig. 8, the growth of yield peaked at the end of the 1970s and the beginning of the 1980s. In the 1980s when the international grain market was stagnant due to the surplus of production in many exporting countries, yield increase in Asia also slowed down. This slow-down can partly be

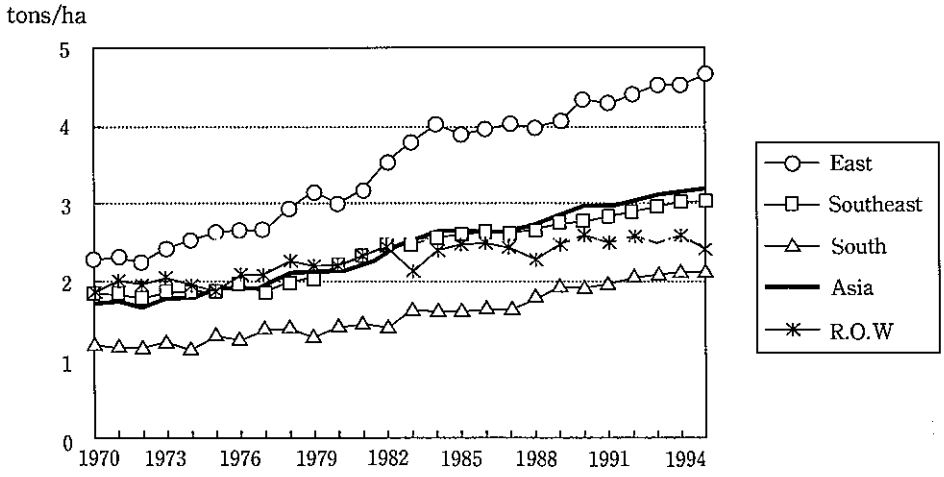

Fig. 7 Historical trend of cereal yield
Source: FAO FAO-STAT/PC (1996) with JIRCAS-STAT.

[5] Percentage of growth rate was estimated using the following equation.
Ln Y=a+bT, where Y: yield, T: time, estimated b: percentage of growth.

explained, particularly in Asia, by the fact that the benefit of the green revolution had been spread out to the extent that no more drastic gain was observed.

However, entering into the 1990s, yield increase has kept a constant level of around 2-2.5% per year. This pace is far above the population increase of the region, and it is higher than the production projection reviewed which was derived from the data collected until the beginning of the 1990s. It is also considered sufficiently fast for covering the increase of the demand including animal feed, as mentioned above.

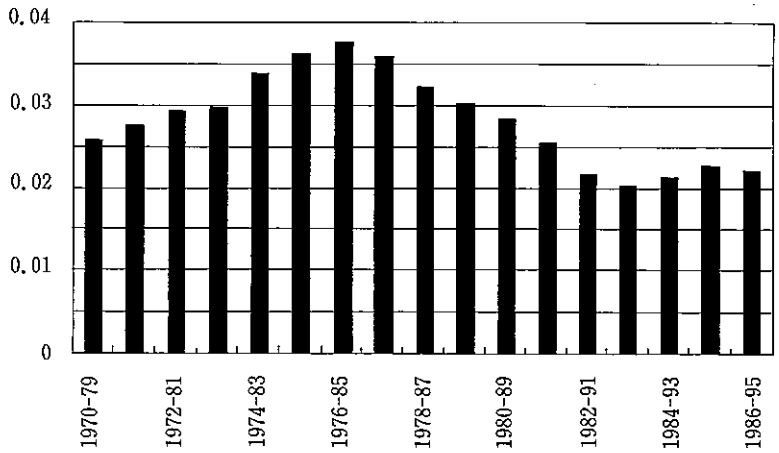

Fig. 8 Cereal yield growth in Asia-% trend of 10-year-periods
Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

Is it appropriate to assume a 2% annual increase in cereal yield for the coming decades in Asia ? Two components of yield increase, irrigation and fertilizer input, are examined further. Although there are other technologies which may determine the future productivity such as new varieties, Asia has some peculiarity for the two technologies compared to the other regions.

Irrigation was the prerequisite for the introduction of the high-yielding varieties which supported the agricultural expansion in Asia. It is obvious that irrigated land shows a much higher productivity than rain-fed or flooded areas in principle, and that the average yield per ha and irrigation rate are closely correlated empirically. But it is often considered that investment to irrigation systems in Asia has declined since the 1970s due to the cost increase and lack of suitable sites for investment. In budgetary terms there are evidences that many governments and international organizations have reduced the programs for large-scale irrigation systems.

Nevertheless, no matter how the quality of the system is, the irrigated area is gradually increasing in the region, and the ratio to arable and permanent crop land is still steadily increasing according to the FAO statistics (Fig. 9). As shown in the chart, Asian agriculture is characterized by a heavy reliance on irrigation systems. The maintenance of the systems has become a the matter of concern in the future. It seems that although the acreage of irrigated

land can increase further in the region, information on the quality of the systems including management of old facilities and efficiency of water use is not available in the official statistics. It is necessary to investigate local conditions to answer correctly the question of whether irrigated land can be expanded further.

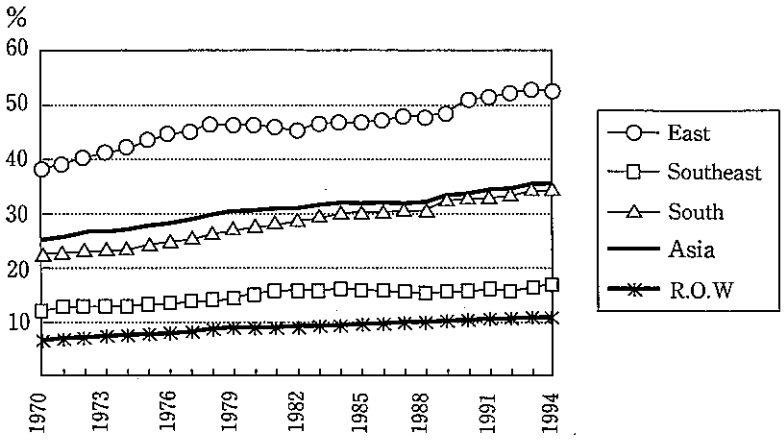

Fig. 9 Irrigation rate (% of arable land and permanent crop land)
Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

Environmental degradation by the excessive use of chemical inputs is a major issue for sustainability in many advanced countries. Asia is a typical region where this problem is seriously taken into consideration. In fact, Asian agricultural expansion has been dependent on heavy chemical inputs. Statistics show that chemical fertilizer input per ha has increased nearly five times as much as the amount used 25 years ago (Fig. 10). In East Asia, above all, average fertilizer input already exceeds 300 kg per ha. It is obvious that chemical fertilizer input can not be increased at this pace. In this case, Asia may face a limitation on future yield increase. And it is still unknown to what extent this problem could be solved by efficient and proper application of chemical inputs.

High yield of Asian agriculture is not only realized by extended irrigation systems and heavy chemical inputs, but also, perhaps mainly, supported by labor-intensive production systems. However, the labor productivity of Asian agriculture is relatively low. Major crop production per agricultural labor in Asia is less than a half of that in the rest of the world (Fig.11). This implies that agricultural products in the region will easily lose their competitiveness against the international average as the labor cost goes up. Although the productivity is increasing gradually, it should be noted that there are still large redundant human resources in Asian rural areas. Therefore it is not unrealistic to consider that such resources, apart from promoting the transition to other industries, can be used for yield increase or value-added initiatives, which is essential for the survival of Asian agriculture. Labor-saving technology is needed as well, but labor-intensive technology can still play a certain role in Asia.

To summarize the argument of yield potential, it is generally assumed that crop yield in Asia could increase at around 2% annually, provided that irrigated land continues to be ex-

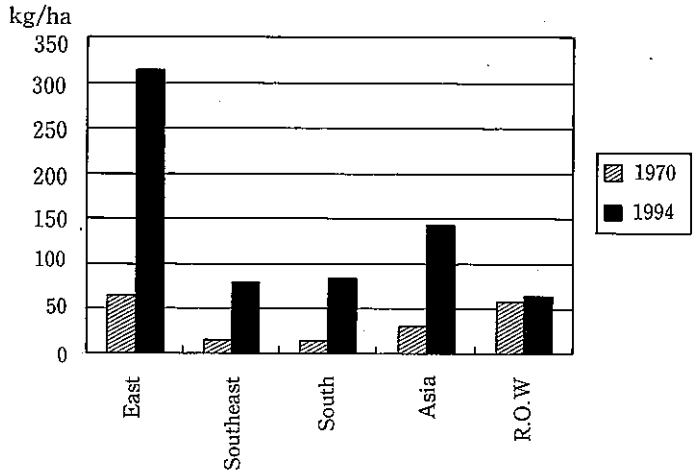

Fig. 10 Fertilizer use per arable land
Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

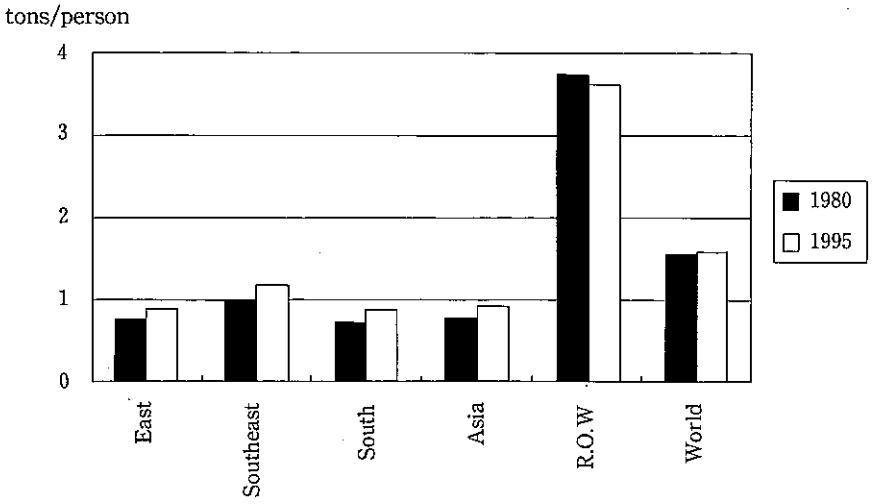

Fig. 11 Production of cereals, soybeans, peanuts in relation to agricultural labor
Source: FAO FAO-STAT/PC (1996) with JIRCAS-STAT.

panded, and that chemical inputs are controlled to avoid any severe environmental problems and any limitation to the yield increase. Obviously, other natural and policy conditions will be similar to those in the past. It is also suggested that appropriate technology for labor-intensive agriculture may contribute to the continuation and expansion of Asian agriculture.

2 Feed livestock complex

Changes in food consumption pattern, especially increasing consumption of livestock products by the Asian population indicate that a large amount of agricultural products will be required which are used in a different manner than in the traditional way. Animal feed is

a typical example. In Japan, Taiwan, and Korea, for example, a large amount of grain feed and protein feed is currently being imported for livestock production from abroad. It is natural that people become concerned about future feed requirement of Asia, in taking account of the large population. Currently feeds account for a small proportion of cereal consumption. Asia uses only one-tenth of grain feed compared to the developed countries on a per capita basis (Fig. 12).

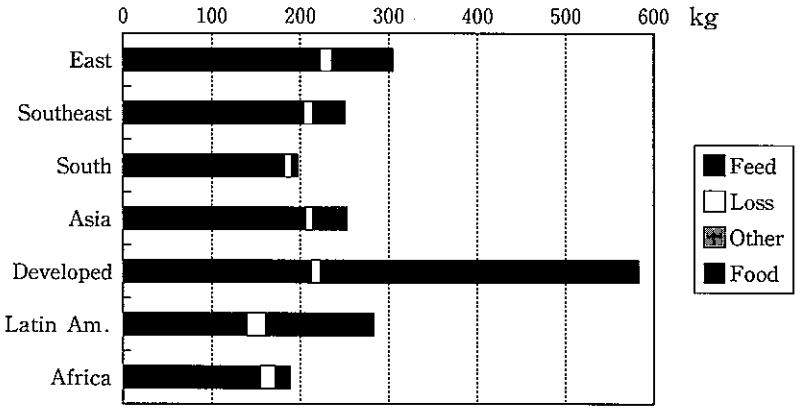

Fig. 12 Cereal use per person
Source: FAO FAO-STAT/PC (1996) with JIRCAS-STAT.

However, it is not obvious that the increase in consumption of livestock products generates a corresponding increase in feed requirement and many other factors are involved. It is also possible that Asia imports livestock products rather than producing them inside the region. But probably the most important factor is the efficiency of feeding. Fig. 13 indicates the trend of feed-livestock coefficients in Asia. The coefficients show how many kilograms of feed are needed to produce one kilogram of livestock products[6]. Surprisingly the coefficients are very low in Asia compared with the countries where the most efficient feeding technology is applied. Moreover, efficiency has been enhanced since the end of the 1970s for several seasons. One possible explanation is that in Asia animals are fed with other crops-crop residues than grains for energy intake. Another explanation could be that feed use is not included in the official statistics, in other words feed use is counted either as food use or waste or not counted at all (for example in small-scale livestock farms which predominate in Asia).

Nevertheless, there must be some resources hidden behind the statistics for animal feed in Asia, since many micro-level studies in the region suggest the existence of a very low efficiency of the feeding practices. The analysis revealed that Asian livestock production has so

[6] Livestock products are converted into poultry meat equivalent using the following factors considering the feeding pattern in the developing countries. 1 kg of poultry meat=1 kg of pig meat=0.3 kg of bovine and ovine meat=0.1 kg of milk=1 kg of eggs.

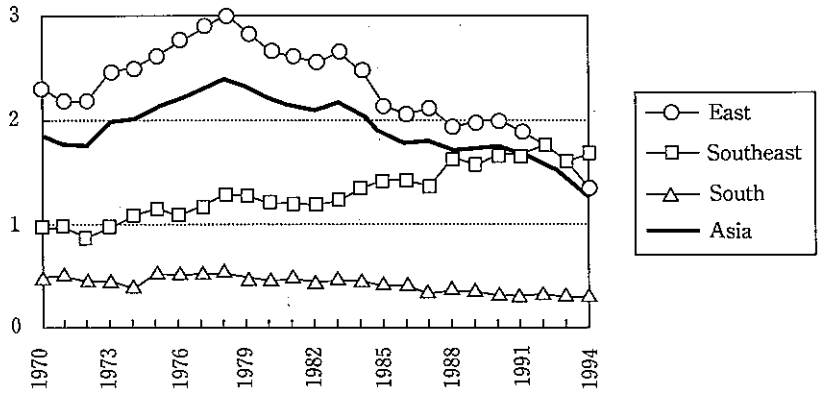

Fig. 13 Feed-livestock coefficient
Source: FAO FAO-STAT/PC (1996) with JIRCAS-STAT.

far been less dependent on grain feed and this tendency may continue in the future.

Feed use statistics are among the least reliable statistics in agriculture. As shown in Fig. 14, each statistics office has its own method to estimate the figures, and statistics of the livestock sector are seldom checked. Therefore credibility of future projection work in this area is likely to be very limited.

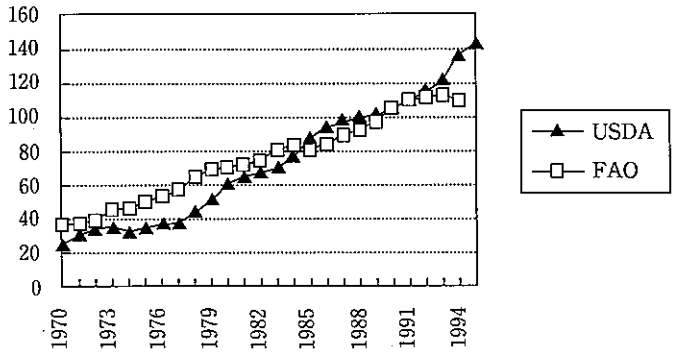

Fig. 14 Cereal feed use statistics for Asia from different sources (million tons)
Source: USDA PS&D View (1997), FAO FAO-STAT/PC (1996), with JIRCAS-STAT.

It is also necessary to outline the characteristics of Asian livestock consumption itself. Theoretically the higher the income, the larger the consumption of livestock products. In fact in many econometric models income elasticities for livestock products are used with values close to unity for Asia. Food consumption statistics also show proportional correlation with the income growth (Table 3). However, as shown in Fig. 15 in the case of meat, the consumption level of Asian countries is generally, with some exceptions such as Hong Kong and

Mongolia, less than the level theoretically expected[7], for various reasons, one of which being the intake of vegetable-origin protein or fish products due to religious or climate restrictions. Thus it appears that Asia as a whole, will not have the same consumption level of livestock products which most high income western hemisphere countries currently enjoy. Meat consumption in some high income countries has recently started to decline for health reasons. This could also be an evidence for stating that the "western" food consumption pattern is not the ultimate goal for Asian population.

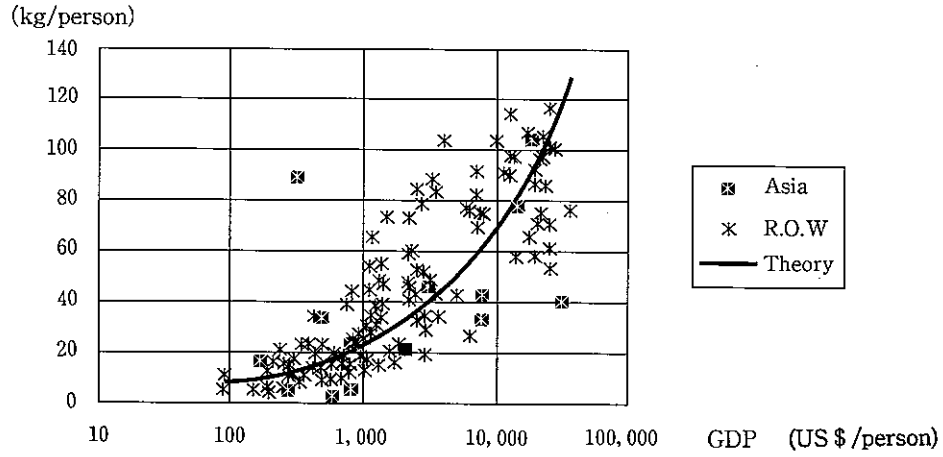

Fig. 15 Meat consumption and GDP per capita
Source: WB World*data (1996), FAO, FAO-STAT/PC (1996), with JIRCAS-STAT.

In summary, although feed statistics could be improved, it is suggested that Asian livestock production requires less grain feed and that per capita consumption of livestock products in Asia as a whole may not become as large as in the other regions, even if rapid economic expansion were to continue in the future. However, further studies should be carried out in this field as actual feeding practices in the region have not been sufficiently quantified for the analysis.

3 Trade issue

Trade is an issue that cannot be avoided in the projections of food supply and demand, since no regions can be totally self-sufficient in a modern society. Asia is also part of the global economy, being the growth center of the world economy. As the size of the economy expands, the share of agricultural products in the total merchandise trade tends to decline continuously just as the share of food expenditure in a household decreases when the income increases. In Asia the share is now less than 10% for both import and export (Fig. 16). Agricultural trade which used to be an important component of the region's economy, is now only a part of the total trade, suggesting that agricultural trade policy should be handled within

[7] Theoretical level was expressed in relation to the estimated consumption level corresponding to the countries' per capita GDP. Estimation was made using a normal double log function.

the framework of total trade policy. It was natural that various special treatments were given to agricultural trade when agricultural commodities were strategically important. As the trade liberalization of industrial commodities is being promoted, it becomes more and more difficult for agricultural trade to be treated in an exceptional manner.

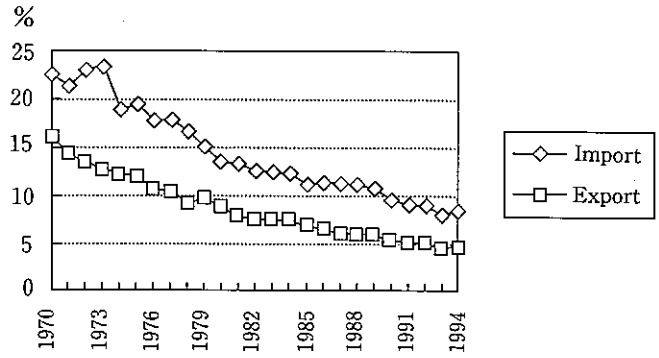

Fig. 16 Share of agricultural products in the total merchandise trade
Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

Some economists argue that free trade may answer all the problems which arise from misallocation of resources for some reasons. It is true that liberalized markets can increase interdependence and global linkage, and eventually that the outcome will be advantageous by appropriate division of labor. It may also be true that Asia can not supply enough food to its increasing population without importing a large amount of food or feed from outside of the region.

Nevertheless Asia as a whole is still in the developing phase. Transportation, communication, job mobility, storage facilities, market places, financial support, insurance, flexible production technology, which are required for the market mechanism are still poorly developed. The benefit from international trade market is likely to be very limited in many countries. There is even a danger that the economically disadvantaged farmers who do not have enough facilities to compete may lose the market resulting in a vicious cycle of resource degradation. Corrupt production systems can not be easily recovered. Trade policy is to be carefully reformed.

As mentioned earlier, food balance for the region as a whole indicates that Asia is almost self-sufficient in volume terms. This is natural because the region accounts for 55% of the global population and 60% of its population is engaged in agriculture. In Fig.17 net trade position of all food commodities excluding fish products in real value terms is calculated. It is noticed that the region has a slight surplus in food trade if Japan is excluded. This fact suggests that Asia can maintain food self-sufficiency in value terms by exporting valuable food items such as fruits or processed food, even though it needs to import bulk commodities like grains for which the region is not competitive because of land scarcity. This target, self-sufficiency in value terms, could be taken into account as a realistic target for Asian food security.

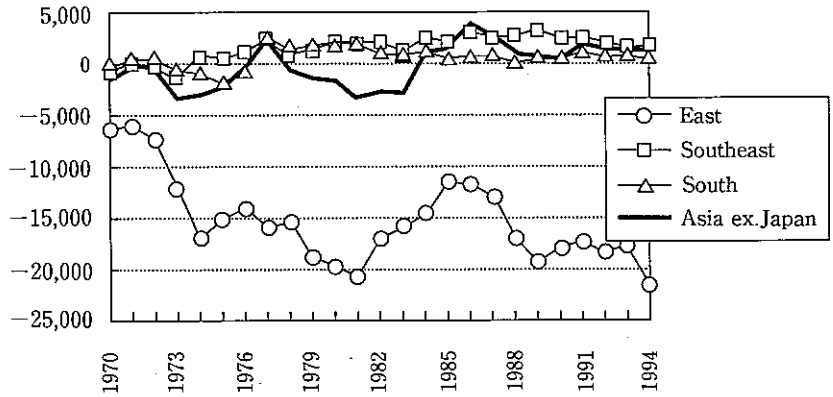

Fig. 17 Net trade position of food commodities, million US$ (1987 constant), excluding fish
Source: FAO, FAO-STAT/PC (1996) with JIRCAS-STAT.

With the help of trade, people in the region can certainly eat better. It is true that land-scarce Asia has a comparative advantage in other industries than land-dependent agriculture. Even so agriculture in Asia is important, since 55% of the global population can not be fully dependent on other regions' products. Amount of tradable food is too small in proportion to the amount needed for the Asian population.

Conclusion

In this paper, overall Asian food situation was analyzed in a global perspective. All the major aspects of Asian food supply and demand could not be described in a short paper. Therefore, several points, which were considered to be critical in the future, were selected and analyzed in this paper. By examining the past trend and by reviewing existing projection studies, a general picture was obtained. The following aspects were clarified based on practical statistical analyses.

Firstly, it was recognized that the Asian food situation had significantly improved. As far as cereals are concerned, if several conditions for yield increase were to be satisfied, the situation could be further improved. Improvement of irrigation systems and environmentally friendly control of chemical inputs were emphasized. Although other conditions such as favorable policies must be added as well as new technology including new varieties, etc. which were not discussed in this paper, the two selected conditions will be the key and presumaly very difficult to fulfill for the region.

Secondly, it was noted that the feed requirements will significantly depend on the future feeding pattern which might be different from that observed in other regions. As far as grains are concerned, it was also revealed that the future requirement for feed may not be as large as expected, partly because livestock production in Asia is less grain-dependent and partly because the consumption of livestock products in Asia is lower than in other regions. However the quality of statistics, thus the quality of analysis must be improved in these aspects.

Thirdly, some aspects of agricultural trade in Asia were examined. It was concluded that trade policy should be carefully implemented in the region because the region's agriculture is still in the developing stage. The importance of enhancing the regional supply potential will not be reduced in the future even under freer trade conditions.

Asia, with a dense population and with land fully utilized, reflects the future conditions of the world in the coming centuries. If Asian people cannot tackle successfully the food issue which encompasses many aspects such as poverty, environment, technology, resource control, etc., the future of human beings may be jeopardized. At present, however, a significant proportion of the population of the region is still facing food inadequacy and food insecurity. In addition, the region has to deal with problems typical of a transitional stage of development such as income disparities among regions or industries, and misallocation of natural and human resources among various sectors. With the trend to globalization, the policy makers have few options for their domestic food and agricultural policies to deal with the issues. Regional cooperation must be promoted, and a new market framework to secure the region's total food system is required. In this regard, it is concluded that studies on the regional food supply-demand situation focusing on the region's peculiar characteristics should be further promoted.

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