

# 第3次フードレジームにおける世界の野菜・果物貿易の空間 流動

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著者名	高柳,長直
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# Global Flows of Fruit and Vegetables in the Third Food Regime

Nagatada Takayanagi\*

**summary** : This study investigated spatial flow patterns of international agricultural trade, employing Q-mode factor analysis for the international trade volume of fruit and vegetables with FAO statistics. As previous studies have pointed out, this quantitative research verified the characteristics of the third food regime where fruit and vegetables are the major sector of the agricultural trade and are exported from developing countries in Africa or Latin America to developed countries. This study also indicated that apart from north-south trade, trade of fruit and vegetables among developed countries is the mainstream flow, and a load of leguminous vegetables or nuts are traded among developing countries in Southeast Asia or the Indian subcontinent. Consequently, global trade of fruit and vegetables is in the process of multi-polarization.

**Key words** : agricultural trade, food regime, FFV (fresh fruit and vegetables), spatial flow patterns, factor analysis

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## I. Introduction

### 1. Research Agenda

Globalization would put feeble Japanese agriculture in the crisis of collapse in the near future, but has made hefty profits in the world. These profits, however, are not fairly shared among countries or social stratum ; globalization has established the structure that dichotomized the world into the starved South and the epicurean North. From this viewpoint, food regimes theory attracts a lot of attention to geographers and sociologists in Europe and North America.

Food regimes theory advanced by Friedmann & McMichael (1989) has revealed capital accumulation from the historical perspective and global hegemonism in the agro-food sector. The first food regime, in which wheat and frozen meat were exported from South America and Australia to industrialized urban areas in Europe under the British hegemony, emerged from 1870 to World War I. The global agricultural trade was altered from the complementary system where scarce commodities were exchanged to the modern system based on comparative advantage. Consequently, farmers in Western countries were forced to compete with their counterparts in other countries and started the industrialization of agriculture.

After World War II, American industrialized agriculture took the helm of world agro-food

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\* Tokyo University of Agriculture

systems based on the productionism. Although this type of agriculture, which churned out wheat, livestock products, and soybeans grown in a crop rotation prevailed all over the world, it needed energy, agrichemicals, and agricultural machinery produced in developed countries like the U.S. Accordingly, as a result vertical integration and vertical disintegration progressed (Takayanagi, 2005), and the second food regime was formed by transnational corporations, or agribusiness, which reorganized world agro-food systems.

Many scholars point out that current world agro-food systems started getting into a new stage after the oil crises and the collapse of Bretton Woods system. The Expanded European Community, incorporating the U.K., Ireland, and Denmark in 1973, became a counterforce against the U.S. in the world food market. As the agricultural crisis got worse due to overproduction and overloaded debt of farms, trade wars were waged in the 1980s. The World Trade Organization, which was set up in 1995 as the successor of GATT, promoted its affiliated countries to reduce agricultural support packages and export subsidies, and the tariffication of most agricultural products to intensify the free trade system (Jarosz, 1966). This trade liberalization exerted an influence on the investment of agribusinesses on the global scale. For instance, trade liberalization for beef in Japan attracted foreign investment of Japanese trading firms and American food companies to Australia (Ufkes, 1993). It follows previous statements that the current agro-food system is the transition of the third food regime where transnational corporations reign supreme under the free trade system. In addition to the U.S. and EU, since Japan became to have strong clout for international agricultural trade, the ongoing third food regime is based on a multi-polarity of power (Le Heron, 1993).

In recent years, several articles have been devoted to research on the global agro-food systems, which was characterized by the flow of fresh fruit and vegetables (FFV) from farmers in developing countries to upscale consumers in developed countries (Arce & Marsden, 1993 ; Kritzinger et al., 2004 ; Dolan & Humphrey, 2004). These discourses are worthy of attention in considering the relationships between agribusiness, contract farmers, and consumers, but no studies have attempted to explain the spatial flow patterns of agricultural trade on the whole. Therefore, the purpose of this study is to identify flow patterns of international agricultural trade, particularly fruit and vegetables, on global scale.

## **2. Research Materials and Analysis Method**

This research uses the FAOSTAT and the World Agricultural Trade Matrix (WATM) provided by the Food and Agricultural Organization. First, this research outlines world agricultural trade, focusing on the magnitude of fruit and vegetables, and then finds out international flow patterns of fruits and vegetables respectively by employing factor analysis.

Numerous studies using factor analysis in geography have been conducted to figure out nodal regions over the few decades. This analysis method has been well established since spatial flow patterns, such as automobile traffic (Hayashi, 1974), commodity flows (Kanno, 1976), truck traffic (Okui, 1980), cargo flows (Murayama, 1984), and person trips (Ito, 1997), have been obtained. In recent years, international flows such as flight networks (Park, 1995) have

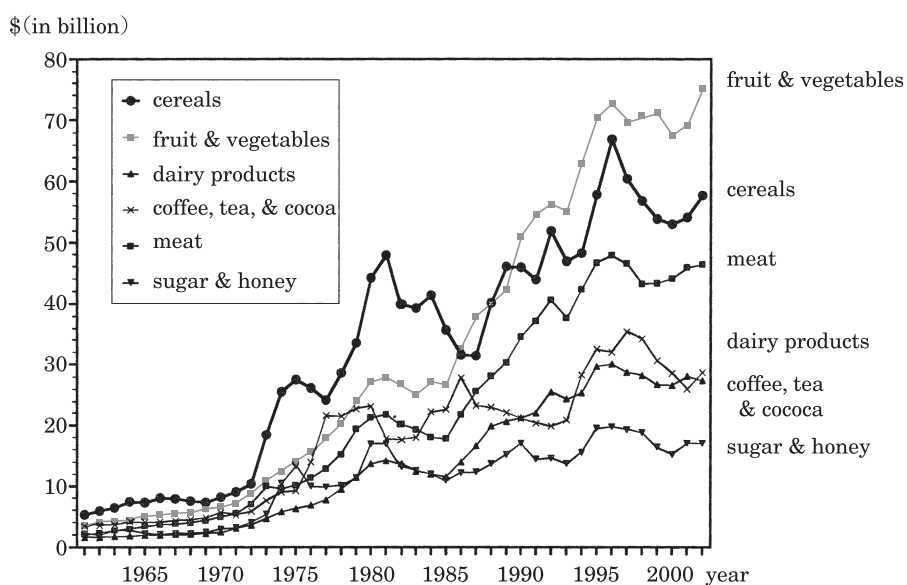
been studied, but there has been no attempt on the international agricultural trade flows.

The WATM is statistical data showing the flow matrices from export countries to import countries by specific commodities, not showing aggregated data like vegetables or fruits. Therefore, I categorized those items into vegetables or fruits in line with Japanese agricultural statistics : vegetables include melons, cantaloupes, watermelons, berries, pulses (excluding soybeans), tubers (excluding cassavas and powdered or starch) ; and fruits include nuts<sup>1)</sup>. This analysis was mainly conducted on the basis of volume, because most items affect the daily diet in the world agro-food systems, even though their prices are low. Besides, this analysis adopted the data of import volume in light of statistical reliability, because the WATM lacks export data for some developing countries, which may be due to political instability<sup>2)</sup>.

## II. Expansion of World Fruit and Vegetables Trade

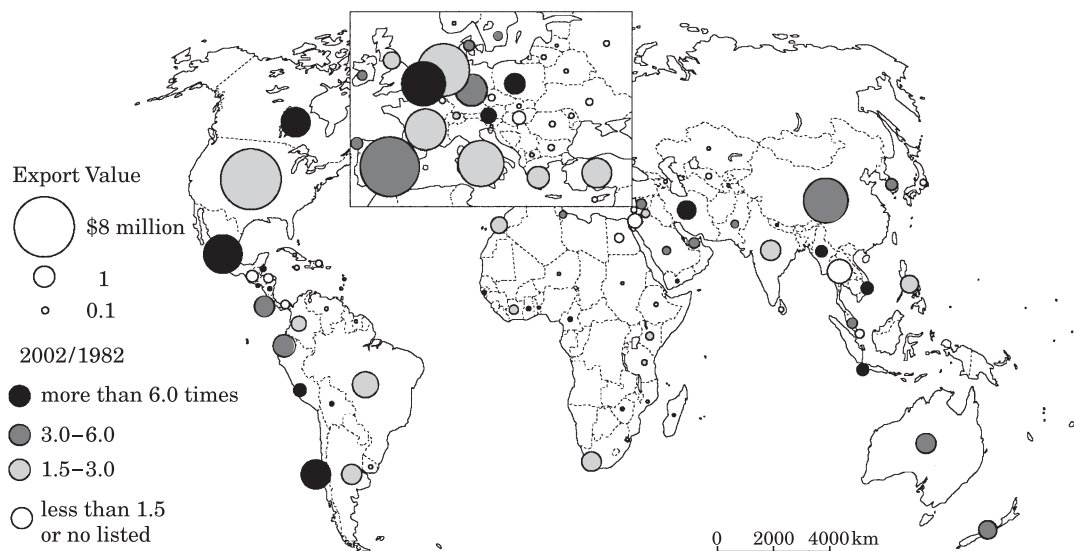
### 1. Increasing Fruit and Vegetables Trade

Agricultural trade has globally expanded in not only durable products but also perishable fruit and vegetables. While the production volume of fruit and vegetables in 2002 was 2.0–2.5 times as much as that in 1962, the trade volume has increased more than fourfold in those 40 years. Fruit and vegetables have become the most massive sector in agricultural trade based on nominal value, outgrowing the meat or grain sectors (Fig. 1). The world trade value of fruit and vegetables was the prominent amount of \$101 billion as of 2004 in comparison to grain (\$76) or meats (\$55 billion). Fruit and vegetables had played second fiddle in world agro-food systems until recently, because they were considered as side dishes or snacks rather



**Fig. 1** World agricultural trade value by selected sectors

Source : FAOSTAT.



**Fig. 2** Export value of fruit and vegetables (2002)

Notes : 1) Countries whose export value is more than \$20 million are shown.

2) This map is illustrated by the Winkel Tripel projection (inset map : Bonne projection).

Source : FAOSTAT.

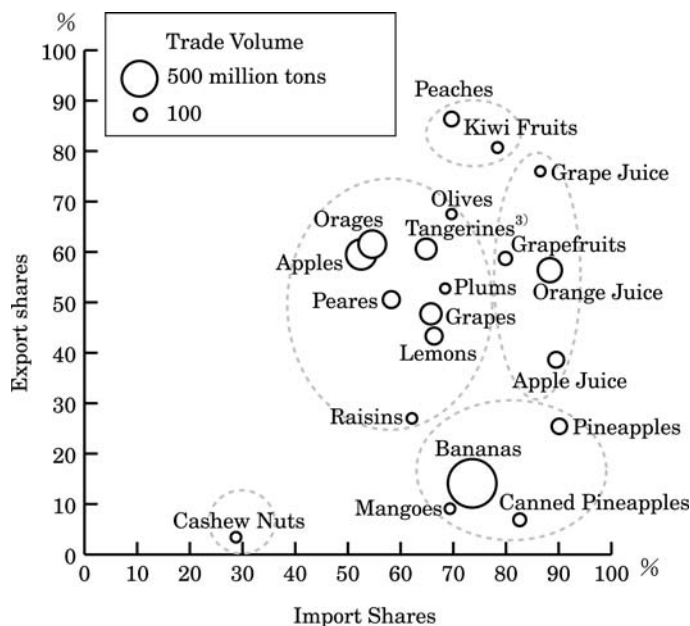
than staple foods. However, fruit and vegetables are growing in importance in the globalizing world economy.

Western Europe is the centerpiece of world fruit and vegetable trade. Figure 2 shows export of fruit and vegetables in value<sup>3)</sup> by countries. Spain, the Netherlands, Italy, Belgium, and France are remarkable in size, whereas countries in Eastern Europe (except Poland) or the former Soviet Union do not export many horticultural products.

In Africa, a considerable number of countries have increased their export value of fruit and vegetables for the last 20 years. Ghana (64.0 times), Guinea-Bissau (35.6 times), Nigeria (21.1 times), Zimbabwe (13.9 times), and Cameroon (9.6 times) are the top 5 countries to do so. Nevertheless, each export value stays within the range from merely \$2.0 million to \$4.8 million and is even less than Japan (\$9.8 million), because exports from these countries were next to nothing in the 1980's. Thus, some African countries have sharply increased their exports of fruit and vegetables to wealthy Western Europe, but gross value of export in most African countries is far less than that in Europe or the Americas.

## 2. World Export Volume by Items

Leading export items have not changed in the fruit sector or the vegetable sector, but various items have been recently traded in the global arena of the market. In the 1960s, export vegetables were long-life items such as potatoes, tomatoes and their processed foods, onions, and leguminous vegetables, accounting altogether for 70% of the world total volume. Potatoes, tomatoes, and onions remain the top 3 items in vegetable export, but newly popular vegetables such as watermelons, melons and cantaloupes, cucumbers and gherkins, as well as



**Fig. 3** Major fruit trade volume and total shares for developed countries (2002)

Notes : 1) Developed countries are 22 members of Development Assistance Committee, OECD.

2) Top 20 items are shown.

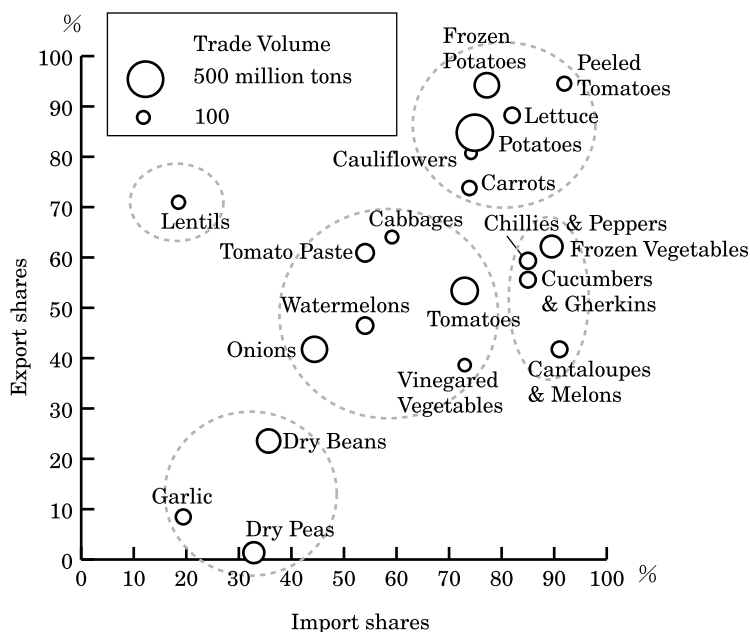
3) Including their allied species such as clementines and satsumas.

Source : FAOSTAT.

various peppers have been more rapidly increasing in the world trade market. Additionally, export items have been diversified in the last decade. Recent exploding items are cranberries (8.7 times), garlic (4.2 times), frozen potatoes (3.0 times), taros<sup>4</sup> (2.9 times), and mushrooms<sup>5</sup> (2.6 times). Top 4 items in fruit export have not changed for 40 years, but export volume of various juices processed from oranges, apples, and grapes is more remarkable than fresh items because juice is consumed more conveniently. Also, there are newly emerging fruit export items, such as papayas (3.8 times), plantains (3.0 times), quinces (2.9 times), mangos (2.8 times), miscellaneous fresh tropical fruits (3.1 times), and miscellaneous dehydrated tropical fruits (12.4 times).

Most fruit items are exported from developing countries to developed countries. Figure 3, showing that most items are placed on the right, indicates that the rates of developed countries are significant. Bananas, pineapples and mangoes are typical items exported from tropical developing countries to developed countries. Moreover, developed countries import 89.5% of apple juice, 88.3% of orange juice, and 86.7% of grape juice, that is, fruit juice is exported almost exclusively to the North. However, there are a few exceptions : peaches and kiwi fruits are traded among temperate developed countries ; and cashews are traded among developing countries.

Vegetable items can be classified into 5 categories (Fig. 4) : ① flows mostly among



**Fig. 4** Major vegetable trade volume and total shares for developed countries (2002)

Notes : 1) Developed countries are 22 members of Development Assistance Committee, OECD.

2) Top 20 items are shown.

Source : FAOSTAT.

developed countries, including peeled tomatoes, frozen potatoes, lettuce, potatoes, cauliflowers, and carrots, ② flows mostly among developing countries, including garlic, peas, and beans, ③ flows mostly from developed countries to developing countries, including lentils whose major exporter is Canada exporting to Turkey, Algeria, Colombia, and Morocco, and whose second most exporter is Australia exporting to Egypt, Pakistan, Turkey, and Sri Lanka, ④ flows from both developing countries and developed countries to developed countries, including melons/cantaloupes, frozen vegetables, peppers and cucumbers/gherkins, ⑤ flows among both developing and developed countries.

All statistical analyses mentioned above verify several Anglophone scholars' findings that the exports of less familiar fruits have recently increased drastically from the tropics to developed countries (Friedland, 1994 ; Le Heron & Roche, 1995). However, actual volume or value of vegetable flows from developing countries to developed countries are not as large as they emphasized ; and there are many items traded within developed countries or within developing countries. In general, while regionality in preference for fruits is unclear because they are consumed as snacks or desserts, vegetable trade has diverse patterns, because vegetables are cooked or prepared before eating and thus traditional dietary culture determines what kind of vegetables are imported.

### III. Trade Flow Patterns of Fruits and Vegetables

#### 1. Extracting of Factors

To delve into details for the international flow of fruits and vegetables, two matrices<sup>6)</sup> were constructed in which each cell contains total import volume (i.e. items are summed up into the group of vegetables or fruits), and then Q-mode factor analysis was applied to the matrices, yielding factor scores as import countries (i.e. destinations) and factor loadings as export countries (i.e. origins). Using the non-weighted least-squares method, 15 factors with an eigenvalue greater than 1.0 were extracted from the matrix of vegetable trade and 16 factors from the matrix of fruit trade. The first 11 factors of vegetable trade and the first 9 factors of fruit trade were worth consideration in light of convincing possibility. Cumulative contributions for vegetables and fruits are 68.4% and 76.4% respectively, which can explain trade patterns to a considerable extent. After varimax rotation, I recognized factor loadings over 0.25 on the basis of absolute value as export countries and factor scores over 4.0 as import countries, and then analyzed and explained flow patterns.

#### 2. Flow Patterns of Vegetable Trade

Factor I accounts for 12.9% of all the vegetable flows. It can be considered as 'flows to the United States', since its factor score is well above 8.2<sup>7)</sup>. Countries with a high factor loading, Honduras (0.992), Mexico (0.988), Dominican Republic (0.984), Costa Rica (0.983), Canada (0.933), Peru (0.896), Guatemala (0.811), and so on, indicate close ties between the U.S. and Latin America and the importance of NAFTA. Mexico is the largest exporter to the U.S., shipping a great amount of fruit vegetables such as tomatoes, cucumbers, cantaloupes, and watermelons. Other than the Americas, India attracts a lot of attention, although its factor loading (0.374) is less considerable.

Factor II is also important, accounting for 11.1%, slightly lower than the first factor. It can be considered as 'flows to Germany', since its factor score (7.9) is by far the highest of the origins. Flows from European countries are conspicuous, as high degree countries in factor loadings are the Czech Republic (0.901), Italy (0.855), Austria (0.854), Hungary (0.776), the Netherlands (0.755), and so forth. Also, Turkey (0.647) is noteworthy, because it aspires to join the EU, and labor migration called *Gastarbeiter* from Turkey is in common in Germany.

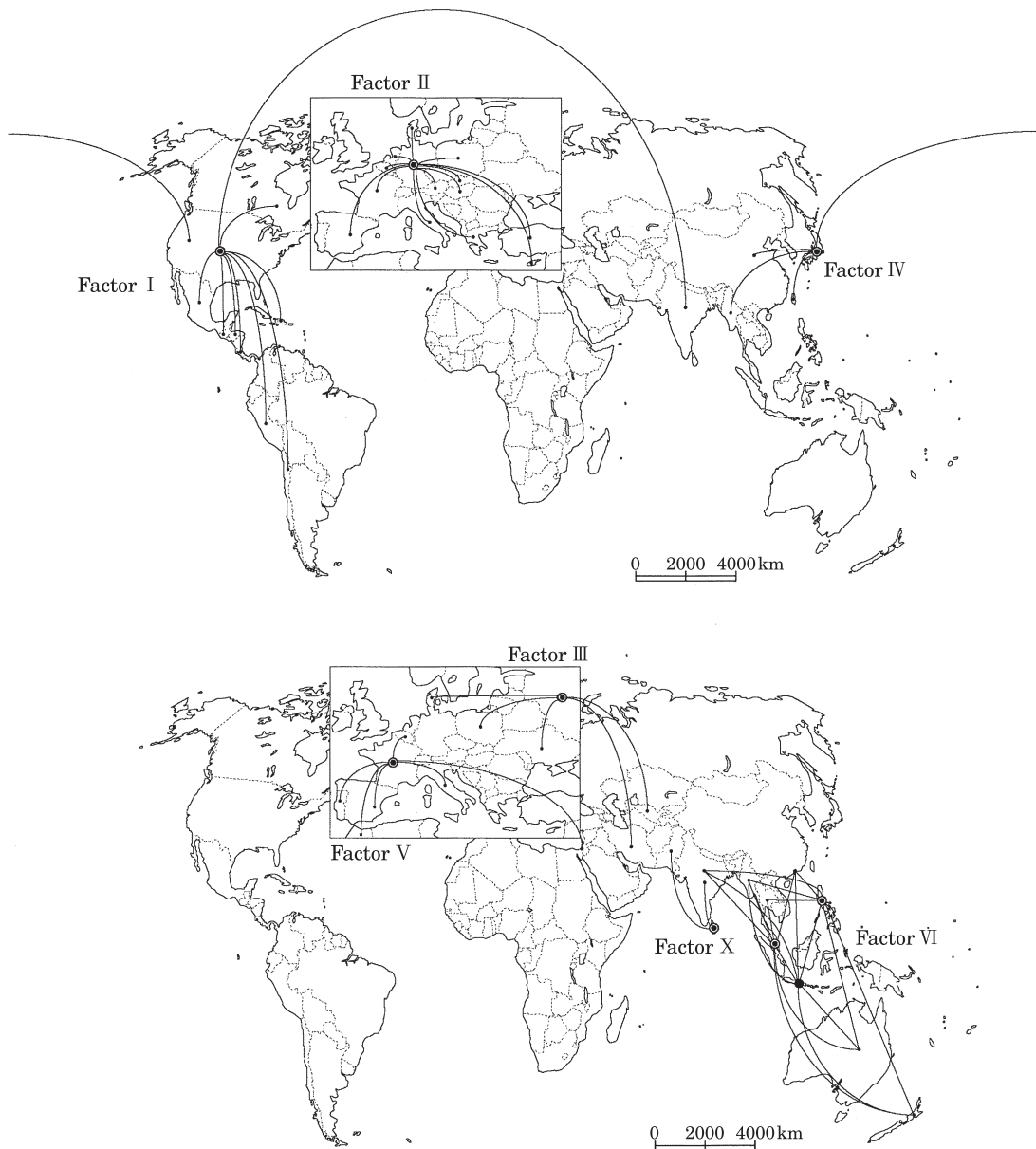
Factor III accounts for 8.8%. It can be considered as 'flows to Russia', since its factor score (8.3) is highest. Countries with a high factor loading are Uzbekistan (0.998), Kazakhstan (0.998), and Ukraine (0.983), which constituted the former Soviet Union. Although their exports are not very large, onions and tomatoes from Uzbekistan, onions from Kazakhstan, and peas from Ukraine make up the majority of exports to Russia. Accordingly, Russia is still the chief trading partner for them.

Factor IV accounts for 5.9%. It can be considered as 'flows to Japan', since its factor score (8.2) is highest. Asia-Pacific economies export vegetables to Japan, as factor loadings of Taiwan (0.984), China (0.930), and New Zealand (0.866) are especially high, and Thailand's loading (0.480) is also substantially high. Although the U.S. exports an enormous volume of



vegetables, its factor loading greater than 0.25 is found only in the Factor IV, which proves Japan is relatively significant for a U.S. export destination.

Factor V accounts for 5.7%. It can be considered as 'flows to France', since its factor score (7.9) is highest. Countries with a high factor loading are Morocco (0.968), Belgium (0.794), Israel (0.765), and so on. From Morocco, tomatoes are the major export vegetable, shipping 80% of exports to France. Belgium is a potato exporting country, and particularly ships 80% of



**Fig. 5** World vegetable trade flows (Factor I-VI, X)

Notes : 1) Indonesia is both an origin and a destination in the factor VI.

2) These maps are illustrated by the Winkel Tripel projection (inset maps : Bonne projection).

frozen potatoes to France. Vegetables flow over the Mediterranean Sea, as Israel exports potatoes, peppers, and tomatoes.

Factor VI accounts for 5.2%. As the highest factor scores are 7.5 to Malaysia, 5.4 to the Philippines, and 4.7 to Indonesia, and a high degree loading is 0.893 of Thailand and 0.848 of Indonesia, this factor can be considered as 'flows in Southeast Asia'. In addition, it is notable that neighboring economies such as Hong Kong (0.592), India (0.466), Australia (0.456), and New Zealand (0.277) have strong nodes with Southeast Asia. The major import vegetable in Malaysia is the onion mainly from India and Myanmar. In Indonesia, garlic is a main trading vegetable, importing from China through Hong Kong<sup>8)</sup>. On the other hand, Indonesia exports cabbages and potatoes to Malaysia. In addition, Australia exports beans to the Philippines and peas to Malaysia. Also, Thailand exports onions to Malaysia and peas to Malaysia and the Philippines. The aforementioned shows that intricate flows are found in Southeast Asia and its neighbors such as India and Australasia.

Factor VII accounts for 5.1%. It can be considered as 'flows to the U.K.', since its factor score (7.9) is highest. Countries with a high factor loading are Ireland (0.969) and Cyprus (0.607), which build historically close relationships with the U.K., and Portugal (0.713), Israel (0.523), Italy (0.319), and Spain (0.312). Main import vegetables to the U.K. are potatoes (780 thousand tons combined with frozen) and tomatoes (700 thousand tons combined with processed).

Factor VIII accounts for 4.1%. It can be considered as 'flows to Saudi Arabia', since its factor score (7.9) is highest. International vegetable flows are found within the Middle East, as factor loadings of Syria (0.984), Egypt (0.910), and Turkey (0.521) are high. Although Saudi Arabia imports many kinds of vegetables, the imported item with the largest volume is the tomato, which is mainly from Syria and Turkey. In addition, onions are also a major imported vegetable, chiefly imported from Egypt.

Factor IX accounts for 3.3%. It can be considered as 'flows to Belgium', since its factor score (8.0) is highest. Countries with a high factor loading are France (0.810) and Cyprus (0.719). France exports potatoes and peas ; and Cyprus exports potatoes.

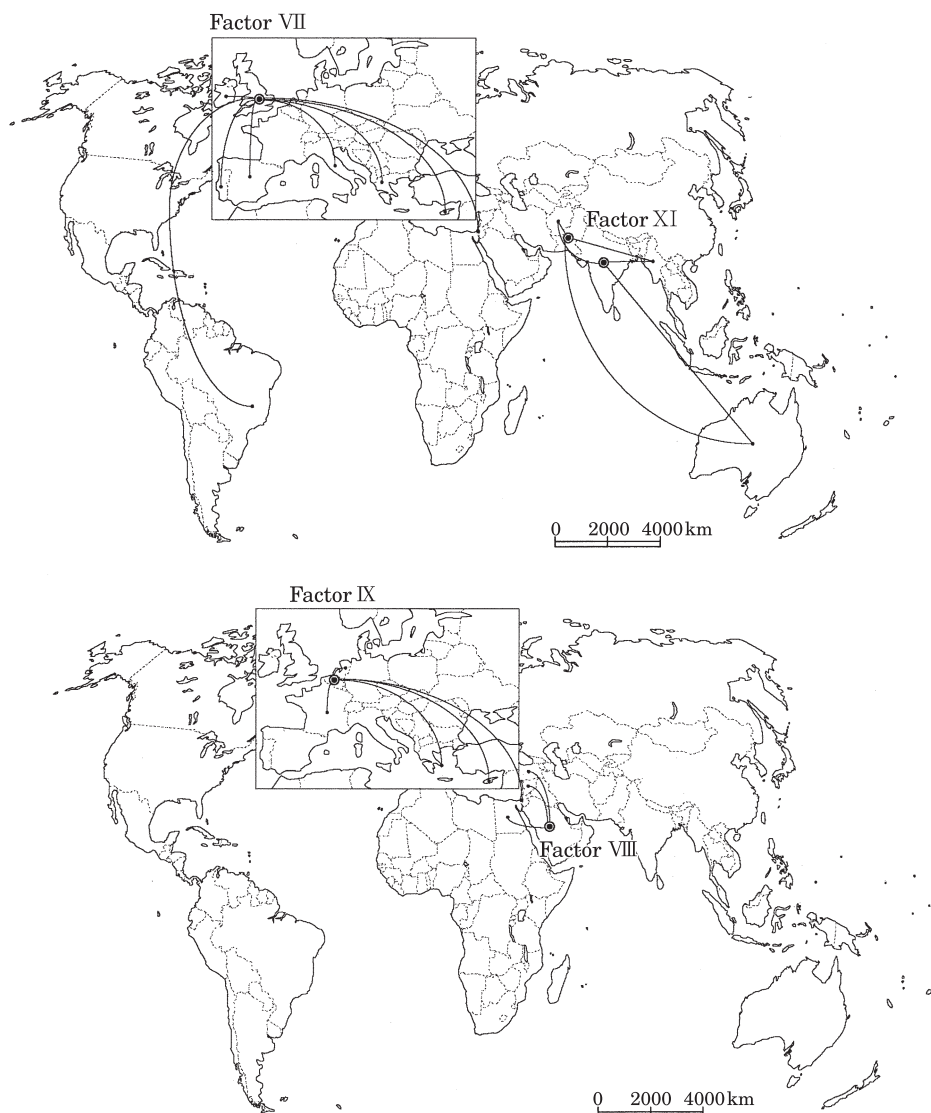
Factor X and Factor XI account for 3.1% respectively. As the factor score of Sri Lanka (8.0) is highest in the Factor X, vegetable flows from India and Pakistan are found. In the Factor XI, the factor score of India (6.3) is highest, and the factor score of Pakistan (5.5) is also considerable high points. Countries with a high factor loading are Afghanistan, Myanmar, and Australia. Myanmar exports peas, in particular black *matpe*<sup>9)</sup>. The export of peas from Myanmar significantly increased from 0.17 million tons in 1990 to 1.1 million tons in 2002. Bilateral trade between India and Australia has a long history, tracing back to the early 19th century, and has expanded rapidly for recent years. The main export item from Australia is chickpeas. These two factors indicate that South Asia has a trading sphere extending adjacent to Myanmar and Australia on the other side of the Indian Ocean.

### 3. Flow Patterns of Fruit Trade

Factor I accounts for 16.2% of all the fruit flows. It can be considered as 'flows to the

United States', since its factor score (9.3) is highest. Countries with a high factor loading, Mexico (0.987), Trinidad and Tobago (0.986), Canada (0.979), Guatemala (0.974), Honduras (0.963), Chili (0.951), and so on are located in the Americas. That suggests the U.S. is the important destination of fruit export for Latin American Countries and Canada. In addition, some Asian countries such as India (0.721), Indonesia (0.331), and Thailand (0.317) export fruits to the U.S., as well as vegetables.

Factor II accounts for 14.5%. It can be considered as 'flows to Germany', since its factor score (9.1) is greatly higher than the other countries. Germany has strong linkages with

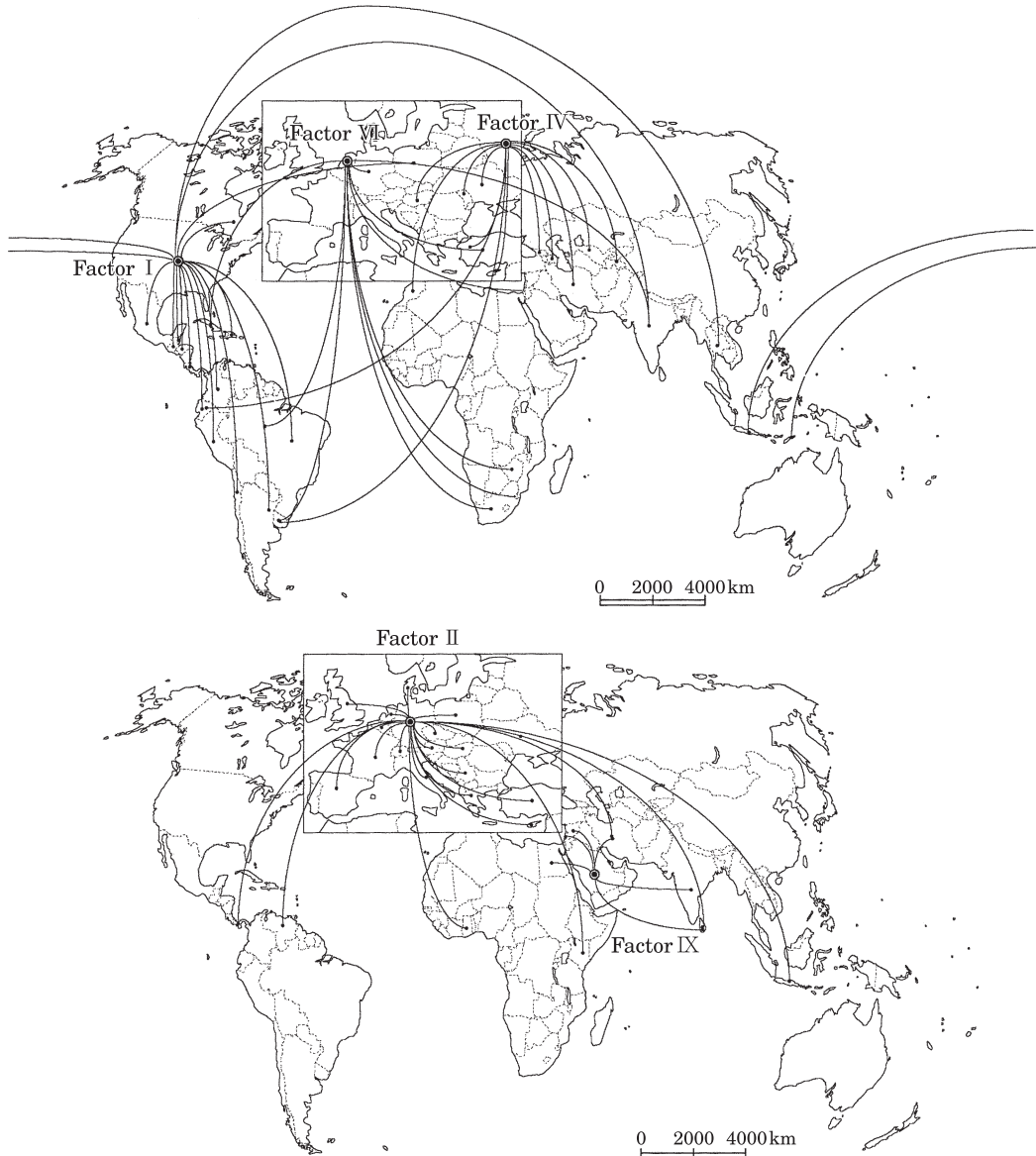


**Fig. 6** World vegetable trade flows (Factor VII-IX, XI)

Note : These maps are illustrated by the Winkel Tripel projection (inset maps : Bonne projection).

neighboring European countries, as high degree countries in factor loadings are Italy (0.952), Serbia and Montenegro (0.936), Poland (0.931), Austria (0.930), Switzerland (0.906), and the Netherlands (0.906). Italy exports apples and citrus fruits to Germany ; Poland exports apple juice ; Austria exports apples and apple juice ; Switzerland exports many kinds of juice ; the Netherlands exports diverse fruits.

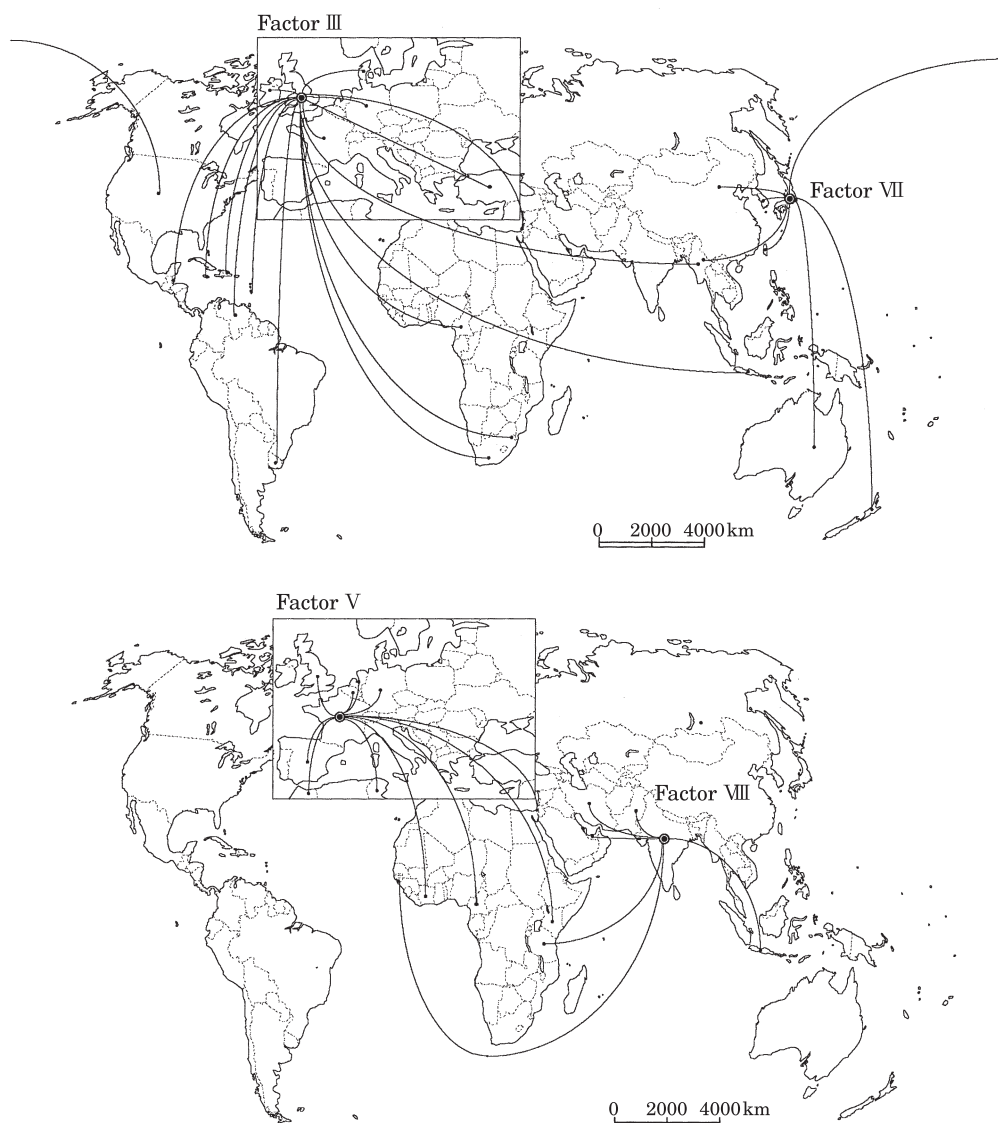
Factor III accounts for 9.3%. It can be considered as ‘flows to the United Kingdom’, since its factor score (9.4) is highest. Countries with a high factor loading are found in two areas.



**Fig. 7** World fruit trade flows (Factor I, II, IV, VI, IX)

Note : These maps are illustrated by the Winkel Tripel projection (inset maps : Bonne projection).

First is in Caribbean countries, such as Saint Lucia (0.993), Jamaica (0.985), and Belize (0.826). These countries principally export bananas, in addition to Jamaica exporting oranges and Belize exporting orange juice. Also, African countries, such as South Africa (0.559), Cameroon<sup>10)</sup> (0.372), and Swaziland (0.330), export fruits to the U.K., although factor loadings are lower. South Africa exports loads of citrus fruits, grapes, and grapefruits, yet the important item to be exported from South Africa is the apple, 40% of which are shipped to the U.K. The export item of Cameroon is the banana. All of these 6 African countries were formerly under control of the U.K in the colonial days, and are still members of the British



**Fig. 8** World fruit trade flows (Factor III, V, VII, VIII)

Note : These maps are illustrated by the Winkel Tripel projection (inset maps : Bonne projection).

Commonwealth. As for fruit trades, nodal regions that are historically formed are still found with neocolonialism under the third food regime<sup>11)</sup>. As for developed countries, Ireland is also an export origin to the U.K.

Factor IV accounts for 8.6%. It can be considered as 'flows to Russia', since its factor score (9.4) is highest. Countries with a high factor loading are Uzbekistan (0.998), Tajikistan (0.998), Azerbaijan (0.998), Georgia (0.992), Moldova (0.988), and Ukraine (0.625), with the former Soviet-bloc states having strong relations with Russia. Grapes and raisins from Uzbekistan and Tajikistan, oranges from Azerbaijan and Kazakhstan, peaches from Georgia, and apples from Moldova are exported.

Factor V accounts for 6.3%. It can be considered as 'flows to France', since its factor score (9.1) is highest. France has tight-knit relationships with African countries, as factor loadings of Cote d'Ivoire (0.972), Tunisia (0.953), Morocco (0.605), Kenya (0.506), Cameroon (0.493) are high enough to be considered. Main items are pineapples and bananas from Cote d'Ivoire and dates and oranges from Tunisia. These states excluding Kenya were former colonies ruled by France.

Factor VI accounts for 5.8%. It can be considered as 'flows to the Netherlands', since its factor score (9.2) is highest. Countries with a high factor loading are found in southern Africa, for example Zimbabwe (0.901), Swaziland (0.870), and South Africa (0.639), and in Latin American countries such as Cuba (0.967), Brazil (0.606), and Uruguay (0.479). The Netherlands has the most comprehensive gateway of fruit trade in Europe, as bananas, citrus fruits, oranges, grapefruit juice, and other things are flown into the port of Rotterdam and are distributed to the rest of Europe both by water and by land.

Factor VII accounts for 5.8%. It can be considered as 'flows to Japan', since its factor score (9.0) is highest. The Pacific Rim trade region centered on Japan is found, as economies with a high factor loading are Taiwan (0.976), South Korea (0.966), the Philippines (0.925), China (0.880), the U.S. (0.536), Australia (0.469), and New Zealand (0.283). Notably, Japan is also the only state for the U.S. export destination of fruit trade.

Factor VIII accounts for 5.8%, slightly lower than Factors VII and VI. It can be considered as 'flows to India', since its factor score (9.3) is highest. Some African countries show high value in factor loading, such as Tanzania (0.985) and Guinea Bissau (0.984), as well as southern and western Asian countries, Pakistan (0.964), United Arab Emirates (0.877), and Iran (0.794). Virtually all of the fruit exports from Tanzania or Guinea Bissau<sup>12)</sup> to India are cashew nuts, because India is a center for the world cashew nut processing industry. India is the second largest grower of the cashew nut<sup>13)</sup> (quite recently outproduced by Viet Nam), but faces an acute shortage of raw cashew. Therefore, India imports a large volume of raw cashew nuts from African countries, and then processes and exports mostly to the U.S., Europe, and Japan.

Factor IX accounts for 4.2%. It can be considered as 'flows to Saudi Arabia', since its factor score (8.9) is highest. Wealthy countries with oil money in the Middle East must import fruits because of their desert environment. Countries with a high factor loading are Syria (0.990), Lebanon (0.946), and Egypt (0.944), which export citrus fruits, mainly oranges.

#### 4. Discussion

Although the concept of FFV refers to both fruits and vegetables, there are some differences between fruits and vegetables in the spatial flow patterns. Fruit trade is more distinct in flows from developing countries to developed countries than vegetable trade. The tight-knit relationship between Latin America and the U.S. or Africa and Europe is shown in fruit trade rather than vegetable trade. In this study, factor loadings indicate relative dependence on import countries for export countries. Some African or Latin American countries have high values of factor loading to their former colonial ruler even after long period of political independence. In other words, spatial fruit trade patterns can be determined by social closeness rather than physical proximity in some cases.

The north-south trade is not minor for current agro-food systems, yet this study suggests other flow patterns are well worth consideration from the perspective of quantitative analysis. First, intracontinental flows among European countries still retain an overwhelming share of world trade. Vegetable trade volume in Western Europe accounted for 41% of the world total volume as of 2000. Germany, France, the U.K., and Belgium are the main importers whose 4 variances in total of vegetable trade is 27.4%. Second, vegetable and fruit trades are not one-way flow from developing countries to developed countries. Export volume of vegetables from Africa and developed Europe is no more than 600 thousand tons, and has not caught up with other flows like China-Japan. In addition, vegetable flows between Africa and Europe are not necessarily one-way trade, as export volume from Africa to Europe is almost equal to its counterflows. Similarly, the U.S. imports 120-250 thousand tons from each Central American country such as Guatemala, Honduras, and Costa Rica, but 76% of all vegetable imports are from Mexico and Canada. Canada imports 92% of its vegetables from the U.S. and Mexico; Mexico imports 97% of its vegetables from the U.S. and Canada. Accordingly, it is more accurate that this pattern is considered as NAFTA flow, rather than Latin America-North America flow. Third, this factor analysis identified flow patterns that are located among developing countries in Southeast Asia, the Indian subcontinent, and the Middle East. Huge volume of leguminous vegetables or nuts is currently traded among developing countries for their own consumption and export commodities. Also, some newly flourishing countries with industrialized economy or oil dollar import an enormous volume of fruits or vegetables.

#### IV. Conclusion

The international trade of fruit and vegetables, which has rapidly expanded in recent decades, is the most significant part of the global agro-food systems under the third food regime. This study statistically verified that FFV came to play an important role in world agricultural trade, with a particular increase in exotic tropical fruits export to developed countries.

Results from this study lead to the conclusion that global trade of fruit and vegetables has diverse patterns. Although it is true enough that the third food regime prompts more

active international flows of fruit and vegetables from developing countries to developed countries, particularly from Latin America to the United States and from Africa to Europe, other flow patterns should not be disregarded. Most fruit and vegetable trades are found within the advanced world in volume, and especially flows of vegetables from developing countries are nothing more than a part of global trade. In addition, some African, Asian, or Latin American countries import fruits and vegetables as much as they export. Moreover, some developing countries are increasing in importance as not only exporters but also importers because of their economic growth. Consequently, global trade of fruit and vegetables is in the process of multi-polarization.

### Notes

- 1) There are a few exceptions : ginger is listed in the spice group in the FAOSTAT, and hop is listed in the fruit group in the FAOSTAT but is supposed to be an industrial crop in Japan. Thus both of them were not included in fruits or vegetables in this study.
- 2) Although FAO statistics and the WATM have some flaws in classification of items or calculating data, no other resource is available for the sake of this research.
- 3) Aggregated data in volume are not available from the FAOSTAT.
- 4) Including what is called *satoimo* in Japanese.
- 5) Including *shiitake* mushrooms.
- 6) Countries of which vegetable export volume is less than 70 thousand tons or vegetable import volume is less than 50 thousand tons, and fruit export volume is less than 45 thousand tons or fruit import volume is less than 20 thousand tons were eliminated in order to extract commonality of flow patterns.
- 7) The factor score of Costa Rica was relatively high but its export volume was extremely negligible, one ninetieth of the U.S. Accordingly, Costa Rica was not regarded as a major import country in the factor I.
- 8) Although absolute volume of direct export from China is larger than by way Hong Kong, vegetable export from China to Japan is so enormous and so various that the factor score of China (0.160) is not high.
- 9) These agricultural products are also exported to Japan as the raw materials for beansprouts called *moyashi*.
- 10) Cameroon was ruled by Germany before World War I, and then divided into the eastern part ruled by the U.K. and the western part ruled by France.
- 11) This result corroborates the previous suggestion : some African or Caribbean states have trade orientation toward their ex-colonizer, although the position of the U.K. has weakened (Nierop & DeVos, 1988).
- 12) Shifting of foreign trade policy to liberalization encouraged planting cashew nut trees. Most farms are owned by domestic capital, but most shippers and traders are foreigners such as Senegalese or Guinean (Ito, 1999).
- 13) Mozambique was the largest producer of cashew nuts in the early 1970s. Although, its output has declined sharply, a moderate amount of cashew nuts are still exported to India (Cramer, 1999), but no data of Mozambique is available from the WATM.



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### 第3次フードレジームにおける世界の野菜・果物貿易の空間流動

高柳 長直（東京農業大学）

本稿は、FAOの統計を利用してQモード因子分析によって、世界の野菜・果物貿易の空間流動パターンを検出した。欧米の地理学や社会学において、野菜や果物が農業貿易の中で重要性を増しており、発展途上国から先進国への流動が強調されてきた。本研究はこのような傾向を統計的に確認するとともに、世界の野菜・果物流動は必ずしも南北貿易が主流ではなく、他の貿易パターンに着目することも重要であることを指

摘した。量的にはヨーロッパを中心に、先進国内の流動が圧倒的であり、豆類やナッツ類などは、東南アジアやインド亜大陸など発展途上国間で大量に流動している。したがって、現在の第3次フードレジームの下で、世界の野菜・果物貿易は多極化しつつあるといえる。

**キーワード：**農業貿易，フードレジーム，FFV（生鮮野菜・果物），空間流動パターン，因子分析