

The Development of Agricultural Statistics in Japan*

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This paper deals briefly with the history, scope and categories that comprise Japan's agricultural statistics, and the problems which demand attention when using the data. Particular attention will be given to problems such as (1) the underestimation of the agricultural production statistics by the government before World War II, (2) the conceptual discrepancy in definition between the Farm Household Economy Survey and the Census of Agriculture and Forestry over what constitutes full-time and part-time farm households, and (3) the role of marketing information in raising producers' prices of agricultural products.

I. Introduction

Agricultural statistics have been greatly enlarged and enriched in Japan during the span of a hundred years since the Meiji Restoration (1868). Throughout this period, government agricultural policies and methods of agricultural data collection have been closely related, mutually influencing each other. The first part of this paper will present Japan as one of the countries which have set up a well-developed estimation method for agricultural statistics by considering a brief history of the development of agricultural statistics which mainly focus on rice production cost survey. The scope and categories of agricultural statistics which are now carried out by the Ministry of Agriculture, Forestry and Fisheries will also be discussed.

Secondly, the problems that arise when using Japan's agricultural statistics will be discussed, particularly the underestimation of the agricultural production estimated by the government before World War II, in relation to the rate of technological progress in rice production. In this regard, the rice production cost survey data were the most appropriate for time series analysis.

Thirdly, besides the rice production cost survey, there are two other main agricultural statistical series in Japan — the Farm Household Economy Survey (FHES) and the Census of Agriculture and Forestry (CAF). Both supply the data necessary to analyse the agricultural development of Japan in terms of the social and economic aspects. The development history of both surveys will be explained, as well as the problems associated with the conceptual discrepancy in definitions of full-time and part-time households which were

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visible in both surveys.

Finally, as a new direction for the future development of agricultural statistics, the role of marketing information in stabilizing agricultural producer's prices and increasing producer's income will be discussed. Also, two programs based on the development of telecommunication, data processing technology and the arrangement of market information will be presented.

II. A Brief History of the Development of Agricultural Statistics in Japan*

1. Pre-war Period

The Ministry of Agricultural and Commercial Affairs was initially responsible for statistics beginning in 1883 with the enforcement of the "Agricultural and Commercial Affairs Communication Regulation". After several revisions, the Ministry of Agriculture and Forestry took over the task of compiling agricultural statistics in 1925. The responsibility of conducting the survey was substantially transferred from the prefectural governors to the mayors and headmen of the towns and villages in 1926. The transfer of responsibility at the time of the tenancy dispute improved the accuracy of the survey. However, as no personal interviews or field surveys often took place, the farmers' reports were ill-documented and misleading in their figures.

In order to correct this inaccuracy at the time of the agricultural crisis, the following revisions were made in the rice field survey of 1933:

- (1) The land used for rice production in a village was divided into three classes : upper, middle and lower. In each class a sample inspection was taken by reaping paddy per "tsubo" in more than three spots. (One tsubo is equivalent to 3.3 square meters.)
- (2) Interviews were held with more than five farmers in each village.
- (3) An inspection survey group was established.

As a result, the rice yield recorded for 1933 came to 10.44 million mt. This record was not surpassed until 1955 when the yield reached 12.07 million mt.

Although there were some problems in selecting samples of farmers and fields, the fact remained that the rice yield estimated rose suddenly in 1933. This indicated that the former surveys underestimated the rice yield per 10 ares (1a=.01 ha). However, the Ministry of Agriculture and Forestry was able to execute these recommended revisions for only one year because the farmers refused to cooperate (Hara[3], Tsumura[23]).

After the outbreak of the Manchurian Incident in 1931, the wartime-controlled economy was strengthened year after year. In this regard, it became necessary to accurately collect data on production, productive means and labour force.

In 1940, the Ministry promulgated the "Regulations concerning Statistics and Survey of Agriculture, Forestry and Fisheries", which came into force in 1941. At that time, the rice

* The discussion in this section is based on publications of the Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries[12]-[15].

yield was estimated by adjusting the food control reports and those statistics were not collected directly. Also, the responsibility for making the annual agricultural report shifted from the village headmen to the individual farmers(Statistics and Survey Department [14]).

2. Post-war Period

Following World War II, due to the shortage of food, an inadequate reporting system, and a food control system which was unfavorable to the farmers, it was difficult to obtain correct figures from the farmers' reports. Therefore, a major revision was carried out in the survey organizations and survey methods according to the recommendations of the General Headquarters of the Occupation Forces in 1947. The survey organizations become responsible for reliable statistics independently of other administrative organizations. A small random sampling technique was introduced as well as the establishment of the Statistical Survey Bureau (presently the Statistics and Information Department). Crop Reporting Offices and their Branch Offices (presently the Statistics and Information Office and their Branch Offices) were simultaneously established in each prefecture as subordinate organizations to the Bureau.

A few years later, the Bureau took on added duties such as the Farm Household Economy Survey and production cost surveys on agricultural products.

Since 1955, Japan's economy has rapidly developed. New economic changes created a disparity in the standard of living between urban and rural districts, an increasing gap in income between the agricultural and non-agricultural sectors, changes in the consumption of agricultural products, and an outflow of agricultural labour force into the non-agricultural sectors.

It was under these circumstances that the "Agricultural Basic Law" was enacted in 1961. The government greatly favoured projects that were aimed at reconstructing the agricultural sector toward higher productivity. Among them, the selective expansion of agricultural production in the line with the rising national income, stimulated investment in underdeveloped areas, and the improvement of marketing and distribution of agricultural products were important.

In 1967, a market information service on fresh foodstuffs was established with the view of stabilizing the price of fresh foodstuffs and improving the marketing structure by providing information on agricultural production, shipment, and marketing conditions to governmental agencies, producers (such as Agricultural Cooperatives), distributors (such as wholesalers), mass media, and major consumers.

With the partial reorganization of the Ministry of Agriculture and Forestry in June 1970, the 45 Prefectural Statistics and Survey Offices (excluding the Hokkaido Office) were merged into seven Regional Agricultural Administration Offices. The purpose of this merger was to simplify the collection of data and information at the field level by attaching the Prefectural Statistics and Survey Offices to the Regional Agricultural Administration Offices.

Despite the administrative merger, nationally, statistical data were still collected by the

Statistics and Survey Department without any modification in survey methods.

In 1971, the Statistics and Survey Department was reshaped, and renamed the Statistics and Information Department in order to answer the needs of today's society where information availability is very important. By 1972, the collecting and analyzing of the statistical information had reached a highly effective stage.

3. Present Governmental Agricultural Statistics

With the expansion of Japan's economy during the past 30 years, the statistics compiled by the Statistics and Information Department covered many diverse fields in order to comply with the frequent changes in agricultural planning. The surveys currently conducted by the Department are basically divided into the following four categories: basic structure, production and crop damage, farm household economy, and marketing. The details of each category of major surveys are as follows.

Category	Title of Survey
(1) Basic Structural Surveys	Census of Agriculture and Forestry, Annual Sample Census of Farm Households, Annual Sample Census of Forestry Holdings, Basic Survey of Livestock, Census of Fisheries.
(2) Production and Crop Damage Surveys	Crop Survey (Yield and Area Survey), Horticulture Survey, Livestock Survey, Cocoon Survey, Forestry Production Survey, Fisheries Production Survey.
(3) Farm Household Economy Surveys	Farm Household Economy Survey, Production Cost Survey of Agricultural Products, Survey of Price and Wages in Rural Areas, Forestry Household Economy Survey, Fishery Household Economy Survey, Fishery Company Survey.
(4) Marketing Surveys	Marketing Survey of Fresh Fruits and Vegetables, Marketing Survey of Livestock, Marketing Survey of Timber, Marketing Survey of Fishery Products.

Recently, some traditional statistics have become inappropriate and obsolete since those statistical data have been collected without any fundamental revision of their conceptual base. Therefore, the conceptual base should be improved to meet the present agricultural situation. For example, the FHES excludes corporate organizations engaged in chicken raising, and marketing information has become more necessary. At the moment, the Japanese government is forced to reduce the number of offices and officers in agricultural statistical organizations in order to comply with the Administrative Reform Project aimed at the decreasing of Japan's financial deficit.

Under such a serious condition, a restructuring of the existing organization and the early introduction of computer networks are a vital necessity toward increasing the efficiency and maintaining the independence and neutrality of the agricultural statistical organization necessary to produce an accurate statistical survey.

III. The Agricultural Production Statistics before World War II and Their Usage Problems

In the above section, a brief history of the development of Japan's agricultural statistics was given to explain how the country was able to develop a highly systematic estimation method. For example, data on the import and export of food have been systematically collected since 1868. Data on rice, wheat, potatoes and sweet potatoes, miscellaneous cereals, beans and rape-seed have been collected since 1874 (Kayo [6]). Even in the early stage, Japan had a highly sophisticated process for collecting statistical data as far as long term statistics were concerned. However, some problems which demand attention arose when using the data because statistical data was influenced by government policy and farmers' behavior. One was the underestimation of agricultural statistics compiled by the government before World War II. By carefully scrutinizing the research done on Japan's agricultural growth rate and the rate of technological progress, the following section will clearly show that agricultural statistics compiled before the war were underestimated.

1. The Rate of Economic Growth in Japanese Agriculture

The rate of economic growth can be divided into the rate of increase in production factor inputs and the rate of technological progress. The rate of technological progress in agriculture, particularly in the production of rice, the staple product of Japanese farming, is a good index in measuring the growth rate of Japanese agriculture. Two points must be considered in discussing this subject (Tsuchiya[19]).

The first concerns the difference in growth rate between the agricultural and manufacturing sectors. (In this sense, manufacturing is assumed to be a representative of all non-agricultural sectors.) The growth rate in the agricultural sector is very low in the Japanese economy. The difference in growth rate between the agricultural and manufacturing sectors is extremely wide. The measurement of technological progress will help to clarify whether the low growth rate in agriculture is due to the low rate of technological progress in rice production or a small increase in production factor input.

The second point centers on the accuracy of data that is used for measuring the rate of technological progress. Modern Japanese economic growth has been spectacular. Studies by Ohkawa and Rosovsky [10] show that in 1880 the area of cultivated land and the rice yield per 10 areas suddenly started to rise, and that the annual rate of growth of net farm products (1878-1917) was as high as 2.3 percent. For countries that are attempting to economically "take off", this phenomenal growth of Japanese agriculture must have seemed mysterious and incomprehensible.

Nakamura [9] challenged the Ohkawa-Rosovsky findings by pointing out that the official statistics of the early Meiji era used in the study by Ohkawa and Rosovsky were based on data which were underassessed. Underassessment was a common method used by farmers to evade land taxes, and the government's figures did not accurately represent the real yield. Accordingly, Nakamura reexamined the governmental statistics of that period.

Nakamura's new estimates of agricultural production for the fifty years between 1873

and 1922 showed an annual economic growth of 0.8-1.2 percent which contradicted the Ohkawa-Rosovsky theory of an economic surge in the early Meiji period. In his hypothesis, Nakamura explained that Japan's industrialization in the Meiji era was made possible only by high agricultural productivity that had existed since the Tokugawa era (before the Meiji era). This kind of phenomenon is also common in other developing countries. Nakamura's hypothesis is quite interesting and has been widely discussed among scholars coming out both in favour of and against it. Hayami and Yamada [4] support Ohkawa-Rosovsky's research while Shoda [11] supports Nakamura's study. In Yamaji's study [24], he quotes Robert Scott who noted that in general the governmental official statistics in the Meiji era show yields that are 15 percent lower than the actual amount produced. The discrepancy before the Meiji era was 20 percent. This was due to the practice of evading land taxes by understating the harvest. Nakamura, too, showed in various examples that the statistics on Japanese agricultural production are underestimated.

The argument put forth by Scott and Nakamura is not completely free of criticism. For instance, their usage data are fragmented. (Arashi [1] criticized Nakamura's study but the examples used in his study are limited to two.) However, I agree with Nakamura's hypothesis, because the rice yields per 10 ares in the Ministry of Agriculture and Forestry Statistical Yearbook for the years before 1933 are all underestimated. Therefore, when measuring the rate of technological progress, the examination of the accuracy of data is required (Tsuchiya [19]).

2. The Rate of Technological Progress in Rice Production

The rate of technological progress in rice production was measured by using the rice production cost survey, which was the best source from the viewpoint of accuracy (Tsuchiya [19]).

At the time of the enactment of the "Rice Control Law" in 1921, those surveys were conducted separately by government and a private organization—the Rice Department of the Ministry of Agriculture and Forestry (which later became the Food Administration Bureau and presently the Food Agency) and the Imperial Agricultural Association (which later became the National Agricultural Association). This survey was conducted until 1947.

In 1948 the Statistical Survey Bureau began the rice production cost survey, and the scale of this survey was expanded in 1960 to serve as a basic material for deciding the producer's price of rice by "the cost and income compensation formula" (Statistics and Information Department [14]).

The following point was made clear by the analysis:

The annual rates of technological progress in Tohoku (North Japan)(1922-1960) and Kyushu (South Japan)(1932-1963) were 0.8 percent and 0.2 percent, respectively. These figures are extremely low when compared with the technological progress undergone in the manufacturing sector, i. e., 1919-29: 4.6 percent ; 1930-39: 1.1 percent ; 1940-55: 10.3 percent (Isomura [5]). The growth rate of income can be attributed to the rate of technological progress, and the increased rate in input. The low rate of

technological progress brought about the relatively stagnant rate of growth in agriculture. The phenomenon is by no means common to all other countries. Some countries exhibit a higher rate of technological progress in the agricultural sector rather than in the manufacturing sector. One of these countries is the United States. Human investment in education, research and extension is said to be instrumental in making such advancement possible. In Japanese agriculture, government investment in land improvement has played an important role in increasing the rate of technological progress (Tsuchiya [19]).

IV. Two Main Agricultural Statistics and Their Usage Problems

Besides the rice production cost survey which was mentioned in the previous section, there are two other main agricultural statistical series in Japan —the FHES and the CAF. Both supply the data necessary to analyze the social and economic aspects of Japanese agricultural development.

In the following section, I will explain the purpose and development history of both surveys and discuss the problems associated with the use of both sets of data.

1. The Development of the FHES

1) *Purpose and Brief History*

(1) Purpose

The purpose of the FHES is to make clear the common trend shown by the farm household economy, in order to analyze the changes in the agricultural structure. Also, the surveys provide data for the estimation of the national agricultural income and the standard of living of farm households.

The results of this survey serve as a basic reference not only for the drafting and planning of agricultural policies, but also for an assessment of a policy's effectiveness. It also serves as an important reference point in estimating the national farm income from the farm consumption level.

The survey results are also utilized widely by a large number of researchers and scholars as a reference to help solve the many problems that exist in Japan's agriculture.

(2) Brief History

The first FHES held in Japan was in 1889. The bookkeeping was introduced in 1913. The survey has been held annually except for the years between 1916 and 1920.

Until 1948 the selection of sample farm households for the survey was done on a voluntary basis. Consequently, the survey failed to give an accurate representation of the farm households. The farm households sampled nationwide were 1,400 at most, but the average size of the sample was only 500. Compared with contemporary methods, these surveys were unsatisfactory in many points.

In 1949 drastic improvements were made for the first time in the sampling tech-

nique. The Purposive Sampling Method was replaced by the Stratified Random Sampling Method which is based on modern statistical theory. The latter was used until 1956. Also, the number of sample farm households was increased to 5,500. After 1957, the stratified two-stage random sampling with probability proportional to size was adopted. The number of sample farm households surveyed remained the same.

In 1962, the number of sample farm households was increased to 15,200 in order to obtain more detailed data necessary to pursue the new agricultural policies (the Agricultural Basic Law) envisaged.

In 1967, rapid economic change set new demands for the gathering of agricultural statistics. To meet this demand data collecting and processing was reorganized. The number of farm households surveyed decreased from 15,200 to 11,300. In 1982, the number of sample households was further decreased by 200 to 11,100.

In the meantime, to increase survey efficiency and to speed up the publication of survey results, a revolutionary, fully mechanized compiling system was introduced to process daily bookkeeping entries directly into input cards in 1971.

2) *Problems Associated with the Use of the FHES*

- (1) The FHES has undergone many revisions since it was established. Adjustments in the data were necessary to maintain continuity. Kayo [6] and Toyo Keizai Shinposha [17] have made the necessary adjustments to the long-term statistical series in order to render them reliable.
- (2) According to FHES and the Family Income and Expenditure Survey conducted by the Statistics Bureau, Management and Coordination Agency, the living expenditure per capita of a farm household has been larger than that of a workers' household since 1972. However, this comparison is rendered meaningless, unless the necessary adjustments to the data as depreciation and rent are not dealt with in the same way. When the FHES is used in combination, or in comparison with data obtained from other surveys, it is important to realize that the FHES excludes all corporate organizations and deals only with the individual farm households. For example, it ignores corporate organizations dealing in chicken raising. Consequently, total cost of the national agricultural production and the value of capital accumulation in the agricultural sector cannot be obtained simply by multiplying the agricultural production cost and capital accumulation per farm household by the total number of farm households in Japan. The most comprehensive statistics which deal with the whole agricultural sector are the statistics of Agricultural Income Produced and the Social Accounts of Agriculture and Farm Households. These two series were compiled by the Ministry of Agriculture, Forestry and Fisheries coordinating the FHES with other statistics such as production cost survey and crop survey (Egaitsu [2]).
- (3) Since the same farm household is used as the sample unit for five years, the survey results do not indicate the periodical continuity in the FHES. Therefore, precautions are necessary when these data are used for time series analysis (Yoshida [25]).

2. The Development of the CAF

1) *Purpose and Brief History*

(1) Purpose

The purpose of the census is to clarify the future development of Japan's agricultural sector in the context of the challenge of a rapidly changing national economy. Special interest is paid to the existing conditions and the future development of the fundamental agricultural structure, the exchange of labour between the agricultural and other sectors, the employment structure of farm household members, and the execution of agricultural administration.

2) *Brief History*

The first agricultural and forestry census survey planned in Japan was the Survey of Agriculture in 1929. This survey was carried out in compliance with the proposal made by the International Institute of Agriculture. However, this survey dealt only with the arable land area. It did not give any statistics on the labour force and production data. A more comprehensive agricultural census that included all these principal items was the Complete Survey of Farm Households conducted in 1938.

In 1941 a decision was made to begin a Survey of Agriculture (one taken in the summer and another in the winter) as a census survey. By the end of World War II, however, the domestic economy was in such confusion it had become impossible to carry out any census survey.

Since shortage of food supply was one of the most critical problems faced immediately after World War II, various agricultural censuses were conducted. For instance, the Census of Farm Population was conducted in 1946, and the Extraordinary Census of Agriculture in 1947. In order to assess the effects of the Land Reform, the Survey of Farm Land which covered all farm households was conducted in 1949.

In 1950, Japan joined the World Census of Agriculture inaugurated by the United Nations Food and Agriculture Organization (FAO). This activity laid the foundation for Japan's administration of the agricultural and forestry census.

The Ministry of Agriculture and Commerce began the Agricultural Statistical Survey in 1884 to estimate the total number of farm households. At that time the farm household was defined as a household which depended on agricultural earnings for its living. That definition has been used until 1949 in spite of its ambiguity. In 1950, the Ministry of Agriculture and Forestry redefined the farm household as follows:

“Farm holdings are defined as those household and holdings which are engaged in agriculture, and which fall under either of the following categories:

- (1) Households having 10 ares or more of arable land on a farm in eastern Japan, or households having 5 ares or more of arable land on a farm in western Japan.
- (2) Households having 10 thousand yen or more (after 1982, 100 thousand yen or more) of total sale of agricultural products during the year before the date of survey” (Yoshi-

mura [26]).

Since 1950, at ten-year intervals, Japan has participated in the World Census of Agriculture and Forestry (WCAF) affiliated with the World Census of Agriculture. In addition, Japan has held its own Census of Agriculture between the WCAF surveys, i. e., in 1955, 1965, 1975 and 1985.

In the case of forestry surveys, Japan started the Census of Forestry independent of the World Census in 1960. Both censuses of agriculture and forestry have been carried out every ten years.

The Census of Rural Communities started in 1955, and was conducted in 1960, 1970 and 1980.

2) *Problems Associated with the Use of the CAF*

(1) The changes in the definitions of full-time and part-time farm households in the CAF

Until 1940 the CAF defined a full-time farm household as a household which depended mainly on agricultural earnings for its living. A part-time farm household was defined as a household which was engaged in both agriculture and non-agricultural work.

From 1941, the distinction between full-time and part-time farm households was redefined as follows:

The households where all the members were engaged in agriculture were defined as full-time farm households. Households where one or more members were engaged in non-agricultural work were defined as part-time farm households. In addition, part-time farm households were subdivided into households which were mainly engaged in agriculture (first category part-time farm households) and households which made a living primarily from non-agricultural work (second category part-time farm households).

Up to 1942 the distinction between the two types of part-time farm households was made by comparing the ratio of the gross agricultural income as against the gross non-agricultural income for an individual farm household. From 1943 to 1959, the ratio of labor input in agriculture and non-agricultural work was compared. Since 1960, the criteria for comparison has been the ratio of the net income obtained from agricultural and non-agricultural work. These changes in the definition of part-time farm households must be taken into consideration when using the CAF. These changes reflect the obsolescence of the conceptual base of the CAF. Unfortunately this problem can be amended only a little. The conceptual base may undergo more fundamental change in the future (Kayo, Oyama and Mitsunaga [7]).

(2) The different definitions of farm households in the FHES and the CAF

The definition of full-time and part-time farm households differs between the FHES and the CAF. It is necessary to be aware of these differences when classifying full-time and part-time farm households. When farm households are analyzed, the change in the number of households is usually taken from the CAF data, while the overall change in farm management and agricultural economic structures is usually based on

Table 1. The Comparison of the Number of Full-time and Part-time Farm Households by the Farm Household Economy Survey and the Census of Agriculture (1985)

(Unit : Percentage)

	Farm Household Economy Survey	Census of Agriculture
Total farm households	100.0	100.0
Full-time farm households	18.4	14.3
First category part-time farm households	5.5	17.7
Second category part-time farm households	76.1	68.0
Having permanent non-farm job	64.1	50.2
Having casual non-farm job	5.1	6.4
Others	4.8	11.4

Note : In 1985, the CAF does not include Forestry Census. Therefore it is called Census of Agriculture.

Source : Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries (1987), Farm Household Economy Survey, The Census of Agriculture, Tokyo : Association of Agriculture and Forestry Statistics.

the FHES data. The FHES and the CAF are different in their concepts of farm household income and employment.

For example, the first category part-time farm households classified by the CAF are often defined as full-time households in the FHES. This is clearly shown in Table 1. In the CAF, first category part-time farm households accounted for 17.7 percent of the total farm households in Japan for 1985, but in the FHES they accounted for only 5.5 percent. In addition, Table 1 shows that the ratio of second category part-time farm households is higher in the FHES than in the CAF.

According to the definitions given by the FHES, households which were chiefly engaged in farming were classified as full-time farm households, no matter how much non-agricultural work they were engaged in. On the other hand, in the CAF, households which had a member, or members, employed in non-agricultural work were classified as part-time farm households, despite the household head being engaged in farming. Therefore, it is obvious that the latter type of households are engaged more in farming than the former FHES example. In Table 2 the agricultural income of the first category part-time farm household is larger than that of the full-time farm household, especially in the case of small-scale farm households, except for the 2.0 ha and over category. When an economic comparison is made between full-time and part-time farm households using the data of the CAF and the FHES, an allowance must be made for the difference in the definition between full-time and part-time households in the two surveys (Egaitsu [2], Kita [8], Tsuchiya [22]).

V. Marketing Information and Its Use

Recently countermeasures aimed at the stabilization of agricultural product prices and

Table 2. Agricultural Income by Full-time and Part-time Farm Households (Prefectural Average, 1985)
(Unit : 1,000 Yen)

Farm Size	Full-time farm household	First category part-time farm household	Second category part-time farm household
Less than 0.5 ha	291	5491	78
0.5—1.0	1193	3962	404
1.0—1.5	2425	3829	798
1.5—2.0	3200	4071	1335
2.0 ha and over	4404	4227	1921
Average	2344	4117	495

Source : Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries ed. (1987), Farm Household Economy by Type of Farming, F. Y. 1985, Tokyo : Association of Agriculture and Forestry Statistics.

increasing agricultural producers' income have been set forth based on the development of telecommunication and data processing technology and the arrangement of market information.

In the following section, high marketing cost of agricultural products and two countermeasures for decreasing marketing cost and increasing producer's income will be discussed.

1. High Marketing Cost

Considering Japan's agriculture for the 1980's, the most serious problems are the shortage of cereals for livestock feed, and the overproduction of rice, although the level of self-sufficiency in food in Japan is the lowest among all the advanced countries. In response to the over-production of rice, several countermeasures have been taken, such as the expansion of rice consumption and the conversion of paddy fields from rice production to other crops.

It had been observed that, in spite of various measures taken by the Ministry of Agriculture, Forestry and Fisheries and other agricultural organizations, rice consumption had been decreasing year after year (Table 3). This obliged the Ministry of Agriculture, Forestry and Fisheries to strengthen the policy of decreasing the area of rice fields by implementing the Paddy Field Use Rearrangement Program during the period from 1978 to 1987.

In 1988, 770 thousand ha (1 hectare = 2.47 acre) of paddy fields (27 percent of Japan's total paddy fields of 2.81 million ha) attempted to be converted from rice production to other crops under the Establishment Program of High Productivity in Paddy Farming. The converted fields increased by 170 thousand ha from the previous year. Rice is usually converted to currently profitable commodities such as vegetables, flowers and fruits, which causes overproduction and the rapid drop in prices of those products.

For example, lettuce showed the highest increase in annual quantity at central wholesale markets throughout Japan during the ten years from 1978 to 87. As a result, the wholesale

Table 3. Food Consumption per Capita per Year in Japan

(Unit : kg)

	Cereals	Rice	Vegetables	Fruit	Meat	Eggs	Milk and milk products	Fishes and shellfishes
1930-34	159.8	134.0	73.6	19.7	1.9	2.2	2.7	14.1
1946-54	146.8	102.4	62.7	12.7	2.0	1.6	6.4	15.4
1955-64	155.5	115.0	92.9	21.2	5.5	6.5	22.4	27.6
1965-74	132.1	97.9	116.2	37.5	12.7	13.3	47.3	32.0
1975-79	118.3	83.8	113.4	41.3	20.2	14.5	57.2	35.1
1980-84	111.3	80.3	110.8	39.3	21.7	14.3	61.4	34.7
1985-86	107.3	74.0	109.3	37.1	25.7	15.3	67.4	36.1

Source : Headquarters for Economic Stabilization (Food Situation before and after World War II), 1952.

The Ministry of Agriculture, Forestry and Fisheries (Food Balance Sheet), 1988.

price of lettuce in December 1986 dropped rapidly to one third of that in the same period of 1983, i. e., 1,000 yen per 10 kilograms in November 1986. The price received by producers was only 210 yen (retail price was 1,894 yen). The price of lettuce consists of the following marketing elements. If the retail price is 100 percent, 11.1 percent of the price is received by producers, 37.2 percent is for shipping expenses, 4.5 percent for wholesale margin (the wholesale price is the total of these three elements, i. e., 52.8 percent) and 47.2 percent for retail margin. Agricultural producers would think it unreasonable that they receive only 11.1 percent of the retail price of lettuce after lots of care while 51.7 percent constitutes the marketing margin (wholesale and retail). General consumers would also claim the necessity of the rationalization of marketing systems.

Then how rational are the marketing systems of foreign countries? For example, in 1984 in the U.S., only 11.6 percent of the retail prices for lettuce goes to producers, while 39.4 percent constitutes shipping expenses, and 49.0 percent wholesale and retail margins even in the case of its most rational marketing system. This is very much like Japan. Also, the other perishables in the U. S. have a similar marketing structure to Japan, that is, low price for producers and high marketing costs for the reason that employment problems in various marketing stages make the cutting of cost difficult.

Recently, in Japan, shipping standards have been unified. Selecting machines with a sensor and a micro-computer have been introduced and containers have been improved in order to reduce marketing costs. Nevertheless, the ratio of marketing costs necessary from the collecting and shipping of vegetables to sale at wholesale markets as reflected in wholesale prices has increased between 1970 and 1986, 2.2 times for white radishes and 1.8 times for lettuce.

The marketing costs consist of 1) collecting and shipping costs, 2) shipping transportation charge, 3) commission fees and various charges by regional and national bodies and 4) wholesale commission fees. The collecting and shipping cost, which is 60 to 70 percent of the whole marketing cost, consists of cost of packing materials and wages for selecting and

packing. Recently, prices of carton boxes have lowered while wages have risen, which resulted in a 4 to 9 percent increase in 1986 from the previous year in the collecting and shipping costs of fall-winter white radishes, winter Chinese cabbages and winter cabbages. The other three costs have remained at the same level or increased, which has increased marketing costs as a whole.

Under this mechanism, the increase in wholesale prices of agricultural products increases the price received by producers and vice-versa. As a result, an increase in wholesale prices is necessary to increase the producer price.

Many vegetables are necessities and have a low price elasticity of demand. Lettuce is not an exception. Its price elasticity estimated by the Central Union of Agricultural Cooperatives is 0.3 ; the reciprocal number of price elasticity is price flexibility, that is, 3.3 for lettuce. This indicates that a 10 percent decrease in the market supply of lettuce increases its wholesale price by 33 percent. That is, the price producers receive will increase 20 percent by reducing production.

The supply of lettuce is subject to weather and its price fluctuates greatly according to the supply. The percentage that lettuce producers received out of the whole retail prices fluctuated from -10.9 percent to 39 percent between 1982 and 1987 as indicated in Table 4.

Under these circumstances, the Central Union of Agricultural Cooperatives launched the Adjustment Program of Supply and Demand in Agricultural Products.

2. Adjustment Program of Supply and Demand in Agricultural Products

In 1983, the National Council for the Adjustment of Supply and Demand in Agricultural Products was organized by the Central Union of Agricultural Cooperatives and other organizations. This Council then estimated the production areas required to meet demand, and production areas farmers actually wished to cultivate. For vegetables, the targeted production area was 625,700 ha, but the production area farmers wished to cultivate amounted to 667,700 ha. As can be seen in the third column of Table 5, the ratio of the two areas comes to 1.07, which means that vegetable production exceeded demand by 7%. As Table 5 shows,

Table 4. Percentage of Lettuce Producers' Prices in Wholesale Prices

Year	Ratio of Producers' Prices (%)
1982	-10.9
83	39.0
84	2.2
85	3.3
86	11.1
87	34.2

Source : Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries (1988).

Survey of Price Formation Tracing Investigation by Marketing Stages of Vegetables and Fruits, Tokyo : Ministry of Agriculture, Forestry and Fisheries.

Table 5. Targeted Agricultural Production Compared to that Planned by Farmers in 1983
(Unit : crops, 1,000 ha ; livestock, 1,000 head)

Commodity	Targeted Production (A)	Production Planned by Farmers (B)	(B)/(A)
Wheat and Barley	429	426	0.99
Potatoes	188	189	1.00
Pulses	330	317	0.96
Vegetables	626	668	1.07
Fruit	396	407	1.03
Beef Cattle	2,339	2,451	1.05
Pigs	10,865	10,737	0.99
Broilers	132,436	140,597	1.06
Layers	167,374	168,964	1.01
Dairy Cattle	2,142	2,205	1.03
Tea	61	63	1.03
Mulberry	112	114	1.02
Feed and Feed crops	1,112	1,096	0.99

Source : Estimation by National Council for Adjustment of Demand and Supply in Agricultural Products.

most agricultural products were overproduced, since the ratio is more than unity. It is obvious that overproduction will lead to a fall in prices, which will reduce farmers' incomes. For this reason, an adjustment program of production to meet demand has been adopted by the Council.

The program for fruits has been successful but that for vegetables has not been so, and is causing many problems. In order to succeed in production and sales measures, agricultural cooperatives need to:

- 1) grasp the accurate quantity of production and sales,
- 2) set appropriate import limitations on agricultural products,
- 3) control outsiders, and
- 4) promote producers' awareness.

In the U. S., the first marketing order of agricultural products was an adjustment program of supply and demand in 1937 because agricultural product prices dropped 52 percent during two years after World War I. That is, there is a fifty year history in the adjustment program for forty-seven vegetables and fruits. In England, an adjustment program of supply and demand for milk called the Milk Marketing Board has a history of fifty-five years starting in 1933, and has been quite effective.

These programs are so strongly protected by law that no outsiders are admitted, and hence, can make no inroads. In Japan, it will be difficult to bring about successful production and sales planning of agricultural products for price stabilization without legal measures (Tsuchiya [20]).

Large volumes of fall-winter vegetables arrived at markets in 1986 because of warm weather. In order to avoid a rapid drop in prices and stabilize producers' income, 8,900 mt

of cabbages, 5,500 mt of fall-winter radishes and 6,500 mt of fall-winter Chinese cabbages were discarded in the fields. This is a waste of resources and a regrettable outcome. It will be repeated again and again without the cooperation of agricultural producers in the planning of production and sales.

The overproduction of agricultural products will be a serious problem for agricultural policy toward the 1990's. Furthermore, the pressures for liberalization of the trade in agricultural products from the U. S. A. and other countries make this problem even more complicated.

In spite of the efforts made by the Ministry of Agriculture, Forestry and Fisheries, an increasing volume of agricultural products continues to be imported, and the surplus problems become more and more serious. As a result, countermeasures for the adjustment of production to meet demand have now become inevitable.

The Ministry of Agriculture, Forestry and Fisheries decided to carry out a general promotion project for the balance of vegetable supply and demand in July 1988 in cooperation with the Central Union of Agricultural Cooperatives.

3. Sales and Accounting Information System for Vegetable and Fruits

The Sales and Accounting Information System for Vegetables and Fruits was established taking advantage of NTT's (Nippon Telegram and Telephone Company) DRESS (Denden Kosha Real Time Management System) in order to provide daily sales and accounting information on vegetables and fruits from wholesalers in vegetable and fruit wholesale markets throughout the country to Prefectural Unions of Agricultural Cooperatives. At present, forty-four out of fifty prefectures in Japan have introduced this system (Figure 1).

Information exchanged between Prefectural Unions of Agricultural Cooperatives and wholesale companies using this system is classified into two types. One is sales information. This is the information regarding the sales of vegetables and fruits consigned to wholesale companies by Prefectural Unions of Agricultural Cooperatives, i.e., quantity and price by commodities and grades. The other is accounting information. The sales information is transmitted to Prefectural Unions of Agricultural Cooperatives by around two o'clock in the afternoon, as soon as auction sales are completed. The invoices of sales are sent to Prefectural Unions on the same day or the next day.

Utilization effects of the system known through the investigation of Prefectural Unions of Agricultural Cooperatives are as follows:

- 1) Fast information service from Prefectural Unions of Agricultural Cooperatives to agricultural cooperatives.
- 2) Provision of precise and timely information for cooperative members by wire radio and newspapers.
- 3) Timely retrieval and provision of analyzed information necessary for Prefectural Unions of Agricultural Cooperatives, making strategically divided shippings possible.
- 4) Dissolution of excess work. About half of the workers in the Prefectural Unions of

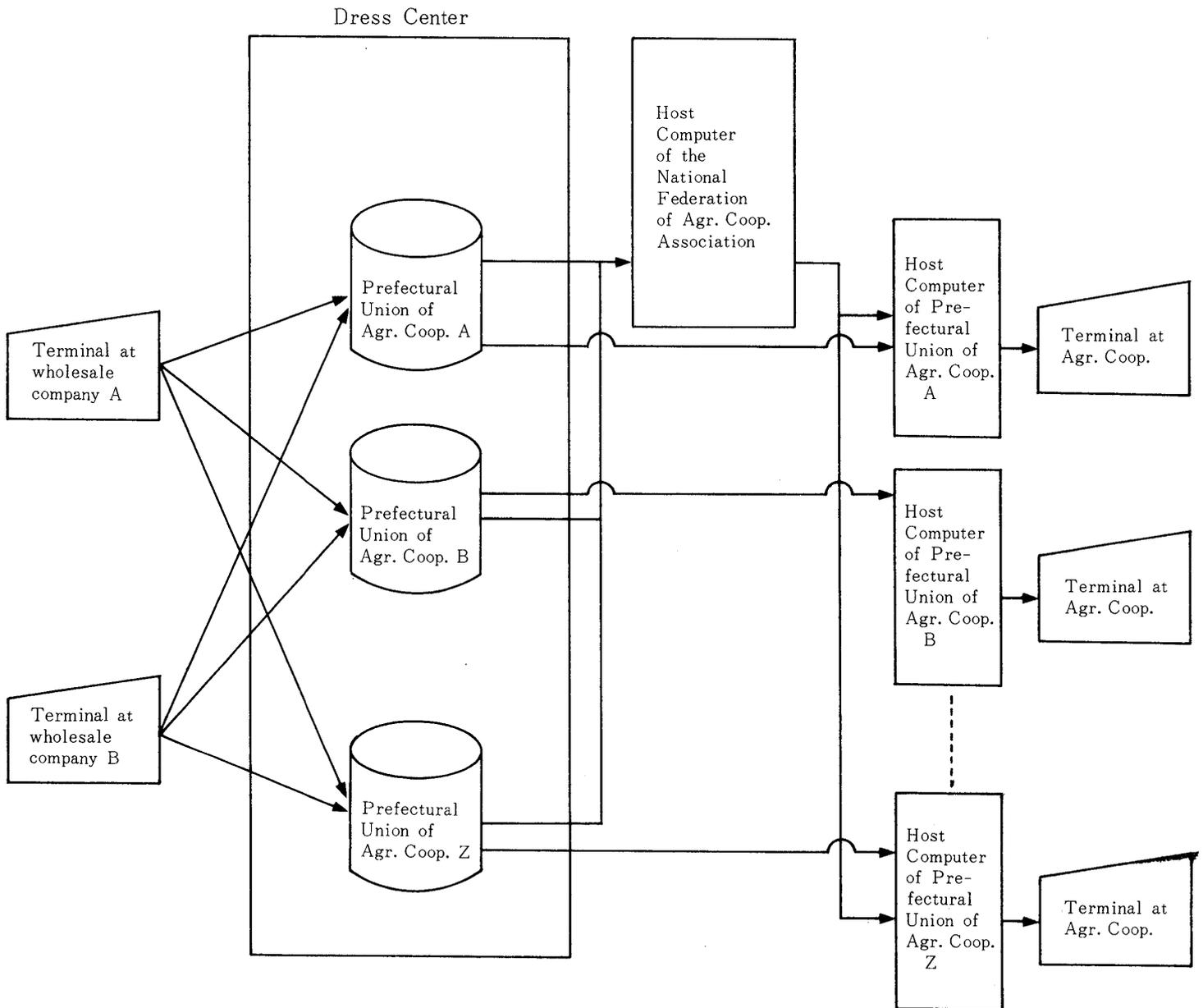


Fig. 1. Vegetables and Fruits Sales and Account Information System

Note : One case going through a host computer of the National Federation of Agricultural Cooperative Association is the System where a Prefectural Union of Agricultural Cooperative makes a contract exclusively with the National Federation of Agricultural Cooperative Association.
The other case is the system where prefectural Unions of Agricultural Cooperatives make contracts independently with wholesale companies.

Agricultural Cooperatives could be reassigned to their primary task, which involves realizing qualitative changes in the Unions.

- 5) Significant reduction in telephone charges and overtime pay. However, there is a disadvantage in that the information on price fluctuations given does not, for instance, in-

clude the reasons for the fluctuations and next day's shipping schedule cannot be provided besides through telephone service, whereby one can talk and ask people in charge (Tsuchiya [21]).

VI. Conclusion

The aim of this paper was to present Japan as one of the countries which has developed a highly systematic method for estimating agricultural statistics by firstly considering a brief history of the development of agricultural statistics. Secondly, the scope and categories of agricultural statistics which are now generated by the Statistics and Information Department, the Ministry of Agriculture, Forestry and Fisheries, were presented.

Thirdly, problems that arise when using Japan's agricultural statistics were discussed. Particular emphasis was placed on problems such as (1) the underestimation of the agricultural statistics compiled by the government before World War II and (2) the conceptual discrepancy in definition found between the Farm Household Economy Survey and the Census of Agriculture and Forestry over what constitutes full-time and part-time farm households. Fourthly, it was noted that agricultural statistics should be scrutinized carefully due to the variance of data collecting methods and the statistical definitions.

Finally, as a new direction for the future development of agricultural statistics, the role of marketing information in stabilizing agricultural producer's prices and increasing producer's income was discussed. Also, two programs based on the development of telecommunication, data processing, and arrangement of marketing information were presented.

In conclusion, I feel that there is a necessity for urgent solution of other serious problems. In relation to the expansion of Japan's economy during the past 30 years, the statistics compiled by the government have covered many diverse fields in order to comply with the frequent changes in agricultural policy. But some traditional statistics have become obsolete, since those statistical data have been collected without any fundamental revision of the conceptual base. The conceptual bases should be improved to meet the requirements of present agricultural policy decisions (for example, FHES excludes corporate organizations engaged in chicken raising). At the moment, the Japanese government is forced to reduce the number of offices and officers in agricultural statistical organizations in order to comply with the Administrative Reform Project aimed at decreasing Japan's financial deficit.

Under such a serious condition, a restructuring of the existing organization and the early introduction of a computer network are a vital necessity toward increasing the efficiency and maintaining the independence and neutrality of agricultural statistical organizations necessary to produce accurate statistical surveys.

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References

- [1] Arashi, K. (1975). *Kinsei Inasaku Gijutsushi (History of Modern Rice Cropping Technology)*, Tokyo: Noo Bun Kyo.
- [2] Egaitsu, F. (1985). *Nogyo Tokei Gaku (Agricultural Statistics)*, Tokyo: Meibun Shobo.
- [3] Hara, M. (1980). *Nogyo Tokei Hattatsu Shi (A Developmental History of Agricultural Statistics)*, Tokyo: Nihon Keizai Hyoronsha.
- [4] Hayami, Y. and Yamada, S. (1969). *Agricultural Productivity at the Beginning of Industrialization, Agriculture and Economic Growth: Japan's Experience* (Ohkawa, K., Johnston, B. F. and Kaneda, H., ed.). Tokyo: University of Tokyo Press.
- [5] Isomura, T. (1959). *Nihon Keizai no Seicho to Gijutsu Henka (Economic Growth and Technological Change in Japan)*, *Keizaigaku Zasshi (Journal of Economics)* 40-2, 65-89.
- [6] Kayo, N. ed. (1977). *Nihon Nogyo Kiso Tokei (Fundamental Statistics in Japanese Agriculture)*, Tokyo: Nousei Chosa Iin Kai.
- [7] Kayo, N., Oyama, S. and Mitsunaga, M., ed. (1978). *Norin Tokei no Mikata, Tsukaikata (Understanding and Using Agricultural Statistics) (New edition)*, Tokyo: Association of Agriculture and Forestry Statistics.
- [8] Kita, K. (1983). *Nogyo Mondai to Tokei (Agricultural Problems and Statistics)*, Matsudo: Azusa Shuppan Sha.
- [9] Nakamura, J. (1966). *Agricultural Production and the Economic Development of Japan, 1873-1922*, Princeton: Princeton University Press.
- [10] Ohkawa, K. and Rosovsky, H. (1960). *The Role of Agriculture in Modern Japanese Economic Development, Economic Development and Cultural Change*, 9-1, 43-86 (part II).
- [11] Shoda, K. (1971). *Nihon Shihon Shugi no Kindaika (Modernization of Capitalism in Japan)*, Tokyo: Nihon Hyoron Sha.
- [12] Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries (1984). *Agricultural Statistics in Japan*, Tokyo: Association of Agriculture and Forestry Statistics.
- [13] Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries (1984). *Outline of Farm Household Economy Survey*, Tokyo: Japan International Cooperation Agency.
- [14] Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries (1984). *An Outline of Survey of Agricultural Production Cost*, Tokyo: Association of Agriculture and Forestry Statistics.
- [15] Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries (1985). *Census of Agriculture and Forestry in Japan*, Tokyo: Japan International Cooperation Agency.
- [16] Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries (1988). *Seika Butsu Ryutsu Dankai Betsu Kakaku Keisei Tsuiseki Chosa Hokoku (Survey of Price Formation Tracing Investigation by Marketing Stages of Vegetables and Fruits)*, Tokyo: Ministry of Agriculture, Forestry and Fisheries.
- [17] Statistics and Survey Department, Ministry of Agriculture, Forestry and Fisheries ed. (1970). *Sengo Norin Tokei Shi (History of Agricultural Statistics after World War II)*, Tokyo: Association of Agriculture, Forestry Statistics, 613-646.
- [18] Tokyo Keizai Shinposha ed. (1975). *Showa Kokusei Yoran (The State of Japan in the Showa Era)*, Tokyo: Toyo Keizai Shinposha.

- [19] Tsuchiya, K. (1976). *Productivity and Technological Progress in Japanese Agriculture*, Tokyo: University of Tokyo Press.
- [20] Tsuchiya, K, ed. (1984), *Nosan Butsu no Kajyo to Jukyu Chosei (Overproduction and Adjustment of Demand and Supply for Agricultural Products)*, Tokyo: Association of Agriculture and Forestry Statistics.
- [21] Tsuchiya, K. and Yamanaka, M. (1985). *Nogyo Sentan Gijutsu Chosa Hokokusho (Report of an Investigation of Agricultural Advanced Technology)*, Fukuoka: Fukuoka City.
- [22] Tsuchiya, K. (1987). *The Development of Japan's Agricultural Statistics and Its Problems*. *Journal of Japan Statistical Society*, Special Issue, 49-61.
- [23] Tsumura, Y. (1953). *Nosakumotsu Chosa Hoho no Hensen (Historical Changes in the Survey Method of Farm Products)*. *Nihon Nogyo no Tokeiteki Bunseki (Statistical Analysis of Japanese Agriculture)*, (Kondo, Y., ed.), Tokyo: Tokyo Keizai Shinposha.
- [24] Yamaji, K. (1955). *Scotto no Nihon Noson Ki (Scotto's View of Japanese Agriculture)*, *Nihon Nogyo Hattatsu Shi (A Developmental History of Japanese Agriculture)* (Nogyo Hattatsu Shi Chosa Kai, ed.), Tokyo: Chuoo Kooron Sha.
- [25] Yoshida, T. (1981). *Suuri Tokei no Hoho (Method of Mathematical Statistics)*, Tokyo: Association of Agriculture and Forestry Statistics.
- [26] Yoshimura, H. (1986). *Noka Teigi no Hensen to Rekishiteki Kadai (Historical Change of the Definition of Farm Household and Its Problem)*, *Agricultural Statistical Survey*, October, 22-25.