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# FACTORS AFFECTING THE PRICE OF RICE

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## DEVELOPMENT OF THE RICE-GROWING INDUSTRY

Rice growing was an important part of Colonial agriculture as early as 1700. The surplus production during the Colonial period was a significant part of the exports of South Carolina. Both production and export trade increased steadily for more than a century and a half. At the beginning of the War between the States production dropped to almost nothing and, in spite of the relatively high level of prices, did not regain pre-war proportions until 1880. It was not until 1914 that production caught up with domestic consumption and exportation was again resumed.

Prior to 1860 rice was grown mainly in South Carolina and Georgia. Prices were favorable for expansion in production, but because of the crop's peculiar physical requirements of soil and climate, production was restricted to certain sections of those States. The Civil War resulted in disaster for the South Carolina rice-growing industry. The very slow recovery of that industry, together with the relatively high level of prices prevailing after the war, stimulated experimentation in rice growing in other sections of the South. Improvement in cultural practices and the introduction of machine

methods of harvesting were also responsible for increases in acreage and production after 1884. But it was not until after the discovery that rice could be grown successfully on a commercial scale in Louisiana, Texas, and Arkansas that the United States production began to increase rapidly.

Production in the Southern States has been increasing at a much lower rate since 1920 than during the period 1900 to 1920. Favorable prices stimulated production from 1900 to 1905; from 1905 to 1910 prices were declining, but production continued to increase except for a temporary setback in 1905 and 1906. Better prices beginning with 1911 stimulated the rate of increase in production, so that by 1914 the Southern States alone were producing enough to satisfy the demand of the United States. Had normal conditions prevailed from 1914 to 1920, and if the rate of increase in production which obtained from 1900 to 1914 had been continued, it is probable that production would have been fairly well adjusted to demand. Normal conditions, however, did not prevail during this period, war prices caused the rate of increase in production to rise again, resulting in a 44,000,000-bushel crop in 1920–21. The subsequent low prices caused relatively low production for the next five years, but the higher prices of 1924 and 1925 again stimulated production during the following three years.

The southern rice belt of the United States is producing between 30,000,000 and 35,000,000 bushels of rough rice annually. Approximately three-fourths of this production is consumed by the United States and its possessions, the other one-fourth being sold in foreign markets.

## ACREAGE CHANGES AS AFFECTED BY FARM PRICES

Rice farmers react to price in the same general way in which all producers react to the prices of their commodities; that is, following a year of relatively high prices there will be a tendency toward an increase in acreage, while a year of relatively low prices precedes a certain decrease in acreage. There are, however, certain peculiarities of change in rice acreage, as affected by price, that require explanation.

Growing rice under irrigation—and a very large percentage of it is grown by that method—requires a large amount of capital in addition to land and labor. Before rice can be grown profitably on most of the rice land, wells must be dug, canals built, or some other source of water provided, and expensive pumping machinery installed. As nearly as is practicable, the watering equipment is adjusted to the farm acreage so that the optimum watering capacity of the equipment can be used each year. That is, a farm on which 160 acres of land were prepared for rice growing probably would have a plant capable of supplying water to 120 acres.[2]

Generally speaking, the rice farm is not a very elastic unit in so far as rice acreage is concerned. If a farmer having the above-mentioned farm and equipment wants to expand his rice acreage for a certain year following a year of favorable prices, he finds that 120 acres is his limit unless he increases his watering equipment or can rent water. In some sections the latter course is possible and results in some

[2] It is a practice in many rice sections to grow rice on only two-thirds or three-fourths of the land each year, the remainder being dry-farmed or fallowed for control of red rice.

expansion of acreage. In the former case, however, there is likely to be no expansion if he grew 120 acres the previous year. One year's favorable prices are usually not sufficient stimuli to induce a farmer to add to his watering equipment. There is some opportunity to expand the entire rice section because not all farmers having units of this size will have been growing rice on three-fourths of the land. Some farmers will grow rice on two-thirds of their rice land, allowing one-third to lie fallow. In such a case the acreage could be expanded from two-thirds to three-fourths without increasing the watering equipment.

On the other hand an unfavorable price may not result in a great reduction the following year because a material decrease in acreage would mean operating only a part of the watering plant or operating all of it only part of the time. In either case the watering cost for the farm as a whole would not be reduced in the same proportion as the acreage of rice, and quite likely the acre cost of the crop would be greater.

Therefore, within the close limits of elasticity of acreage on most rice farms, prices can be expected to effect the usual changes; high prices will be followed by increases in acreage the next year, and low prices will be followed by decreases in acreage.

As has been shown, acreage can be expanded by keeping land in rice an extra year and thus postponing the time when it should be dry-farmed or fallowed. But if this is done this acreage can be maintained the next year only at the expense of quality. That explains in part why two successive years of high prices usually result in an actual decrease in acreage as compared with the acreage of the first year following high prices. There is, however, another effect of two successive years' high prices; under this stimulus some farmers will begin preparing new land for rice, and if the next year should bring favorable prices (three successive years of high prices) new watering equipment is likely to be installed and acreage thus increased as a result of the third year of high prices. In fact, this last increase is likely to be greater than the past prices justify. The reason for adding pumping equipment and thus increasing acreage is that the farmers interpret three successive years of high prices as an upward trend in demand which justifies permanent increases in production. Watering equipment can not economically be added in small units; therefore the farmer increases his production unit to take care of anticipated future demands rather than merely the demand evidenced by the past three years' prices. Experience has shown that the increase in acreage the third year is too great and the resulting production is too large, causing prices to fall. During the next three years falling prices are experienced because of overproduction.[3]

This completes the 6-year cycle—three years up and three down. (Fig. 1.)

Because so much depends upon the way in which farmers interpret prices, it can not be said just how long this rice cycle will continue. Since there is a relatively small number of rice farmers in the United States as compared with total rice acreage, a change of policy on

[3] It is recognized that not all farmers would follow this reasoning and react together. There is, however, a tendency for credit organizations loaning capital to rice farmers to extend credit for purchase of equipment and encourage increases in acreage only after prices have continued to rise for two or three years.

the part of a comparatively few farmers might cause the cycle to change or even to disappear.

Results of the study of effect of prices on acreage changes confirm the above reasoning. Prices of rice for three previous years influence the rice acreage for any given year. The most important of these three factors is price one year previously, the next factor of importance is price in the third previous year, and price in the second previous year had the least influence of the three. It should also be noted that prices one year and three years previously have a positive effect on acreage changes, whereas price in the second previous year is usually associated with an opposite change in acreage. This apparent negative relationship between price two years ago and change in acreage is due to certain farm-management practices inherent in rice farming.
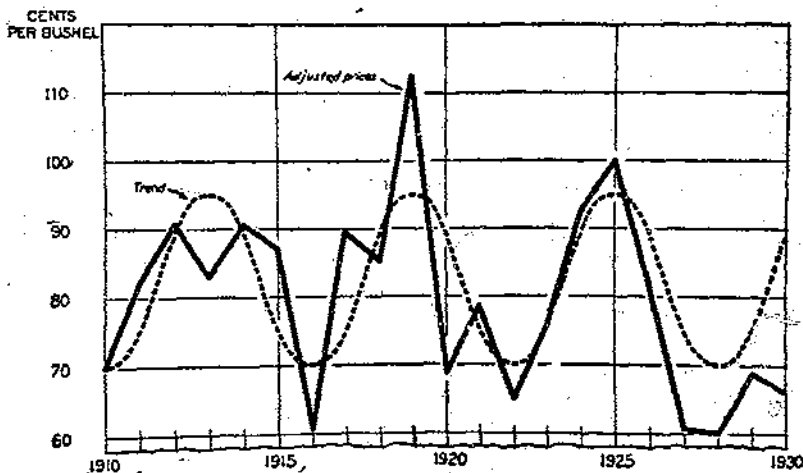


FIGURE 1.—ADJUSTED DECEMBER 1 FARM PRICE OF RICE AND CYCLICAL TREND, UNITED STATES, 1910-1930

There has been a tendency for December 1 farm prices to follow a cyclical trend. There is, however, no assurance that this trend will continue.

The reason for the influence of the most important of these factors, price one year previously, is that the farmer anticipates similar prices the next year and adjusts his acreage to take advantage of the anticipated price. An inspection of Figure 1 will serve to show that price very rarely remains the same two years in succession; in fact, it tends to follow a fairly definite cyclical trend, rising three years and falling three years.

## DEMAND FOR SOUTHERN-TYPE RICE

A large part of the southern-grown rice is consumed in the United States and its possessions. Prior to 1860 the domestic demand was less than the production; from 1860 to 1914 the United States demand was too great for local production and imports of foreign rice were necessary to satisfy it. Since 1914 production has exceeded domestic consumption and each year has left an exportable surplus; therefore foreign demand has again become vitally important to the rice industry in the United States.

An analysis of domestic demand for rice shows that within continental United States the annual consumption of rice does not vary a great deal with changes in price. Total consumption within the United States has gradually increased during the last 15 years, but per capita consumption during the same period has shown little change. This small influence of price on consumption may partially be accounted for by the fact that during the period studied nominal wages advanced more rapidly than retail rice prices. Thus, apparently, an advance in real wages also affects consumption and tends to modify the statement of effect of price on consumption.

The conclusions regarding the effect of wages on consumption were based upon the assumption that the consumption of rice within the groups depending upon wages for the major part of their incomes, was greater than that within nonlaboring groups. This assumption appears to be substantiated by a limited study of consumption of various foods within a certain labor group.[4]

This study shows that the rice consumption by the laborer himself, as well as the per capita consumption by his family, was much greater than the per capita consumption for the United States as a whole. Another significant fact revealed by this study was that the per capita consumption of rice in the Southern States was much greater than that in the Northern States. Different food habits probably are responsible for the greater part of the difference between per capita consumption in the two sections.

Competition of other foods with rice to satisfy the demand for carbohydrates might be expected to reduce the consumption of rice when such other foods were relatively low in price. An increase in the supply of sweet potatoes and corn meal appears to have affected only slightly the consumption of rice in the South, while for the United States as a whole the effect was so small that it was practically negligible.

An increase in demand may occur as a result of increases in population with no change in per capita consumption, or by per capita consumption increasing while price and population remain the same, or by a combination of both. The most dependable of these factors is increase in population, which accounts for an average annual increase of approximately 10,000,000 pounds of cleaned rice in the demand in continental United States.

Porto Rico and Hawaii are important markets for the rice crops of continental United States. The population of these possessions consumes much more rice per capita than does the population of continental United States. The per capita consumption in Porto Rico in 1929–30 amounted to 125.7 pounds, in Hawaii 229.4 pounds, and in continental United States only 5.3 pounds. (Fig. 2.) The total consumption of these island possessions is about 40 per cent of the amount consumed in continental United States.

Porto Rico is a very important market for the southern rice. Although price variations have a more pronounced effect on consumption there than in the United States, that effect still does not cause great variations in consumption. The demand for rice in Porto Rico is increasing not only because of the growth in population but also

[4] UNITED STATES DEPARTMENT OF LABOR, BUREAU OF LABOR STATISTICS. CONSUMPTION OF FOOD IN SHIPBUILDING DISTRICTS. U. S. Dept. Labor, Mo. Labor Rev. 7 (6): 115–146. 1918. [See also vols. 6 and 8, and v. 7, nos. 2, 3, and 4. Data are included in U. S. Dept. Labor, Bur. Labor Statistics Bul. 357, Cost of Living in the United States, 1924.]

because of the increase in per capita consumption. The net effect of growth in population and increase in per capita consumption in the last 10 years has been to increase the annual average consumption by about 7,000,000 pounds.

Thus we find that the demand for rice in both continental United States and Porto Rico is relatively inelastic; that is to say, price increases or decreases within fairly wide limits have little effect upon the amount of rice consumed within the United States and its possessions. The most important factor affecting an increase in domestic consumption is increase in population. It can be assumed, therefore, that this relatively small annual increase of the last 10 years probably will continue for the next few years.

Foreign demand for southern-type rice is more elastic than the domestic demand, but the quantity exported has not been sufficiently large during the last 10 years to provide a good measure of this elas-
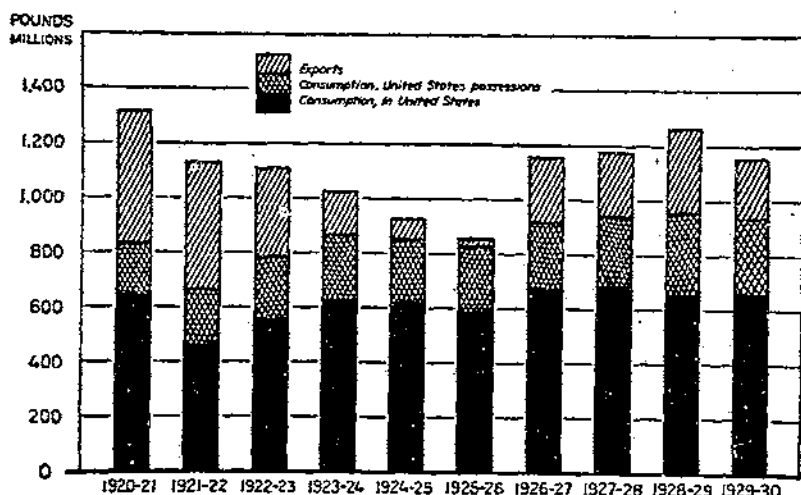


FIGURE 2.—CONSUMPTION IN THE UNITED STATES AND POSSESSIONS, AND EXPORTS OF UNITED STATES GROWN RICE 1920–21 TO 1929–30

There has been an upward trend in consumption in continental United States and insular possessions, during this 10-year period.

ticity. The exports of southern rice go to a large number of foreign markets. The quantity going to any one foreign market usually represents only a small part of the total amount of rice sold at that market, and therefore probably satisfies a demand which, though small, has a preference for that particular type of rice. That being the case, this rice does not to any great extent enter into competition with foreign rices in satisfying the foreign demand. This fact helps to explain why the price of Blue Rose in London is determined more by the supply of southern rice in the United States than it is by the supply of foreign rice available to satisfy the English demand. (Fig. 3.) The same is true in a lesser degree in other foreign markets. Cuba, however, is an exception to this general statement. In the Cuban market the competition between Blue Rose and Burma or other Asiatic rices is very keen. If, however, the supply of Blue Rose for export should become so large that a part of it would be forced onto less discriminating consumers, the competition of Indian and

other rices would be reflected in the price of Blue Rose not only in foreign markets but also in New Orleans and other United States markets. The magnitude of this preferential demand is difficult to determine, but experience shows that about 200,000,000 pounds can be absorbed annually in foreign markets when the price is 4 cents per pound for Fancy Blue Rose at New Orleans.

## FACTORS AFFECTING THE PRICE OF SOUTHERN-TYPE RICE

Rice prices change from time to time because supply and demand, the factors which determine prices change with respect to each other. The relative importance of certain parts of demand and supply and their respective influences on prices is of most concern to the farmer.

Production in the United States from 1900 to 1914 was too small to satisfy domestic demand. During this period rice from India, Siam,
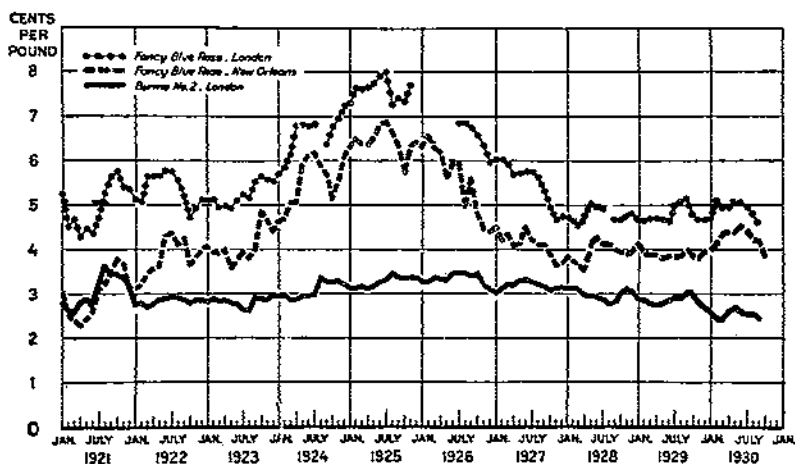
FIGURE 3.—WHOLESALE PRICE OF CLEANED RICE, FANCY BLUE ROSE, AT LONDON AND NEW ORLEANS, AND BURMA NO. 2 AT LONDON, 1921–1930

These two varieties and grades are representative of the American and Burma rices, respectively, sold in London and other European markets. Other Asiatic rice prices usually fluctuate with Burma prices in European markets.

and French Indo-China was consumed in large quantities in the United States. These foreign rices were cheaper than our own southern-type rice. Much of this cheap rice was consumed by people who do not eat rice when it is relatively high in price and in meeting this demand the foreign rice did not compete with the more expensive southern rice. There are, however, some people who will buy high-priced rice if cheap rice is not available, but if lower-priced rice can be obtained they buy it in preference to the higher. It was for this class of trade that the oriental rices competed with the southern-type rice and resulted in lower prices of southern rice than would have been obtained without foreign competition.

During this period, therefore, the supply factors affecting price were production in the United States and surplus production in Asia, mainly India. United States production was the more important of these two factors. Demand, which also must be taken into account

when determining price, was increasing at a rate of about 20,000,000 pounds annually.

With 1914 came a change in the status of the rice industry of the United States. (Fig. 4.) Prices improved through the period 1910 to 1914, and this improvement, together with the introduction of a better yielding variety, Blue Rose, resulted in a marked expansion of production which in turn brought lower prices. In fact, the expansion in production was nearly sufficient to meet domestic requirements.

Before 1914 the import duty on rice was effective. Since the demand for rice in continental United States is quite inelastic, the imposition of a duty probably had very little effect upon imports or consumption in the United States, and consequently most of the duty was added to the price the consumer had to pay for imported rice and also to the price the domestic producers received. The expansion in production reduced the dependence of the domestic market upon
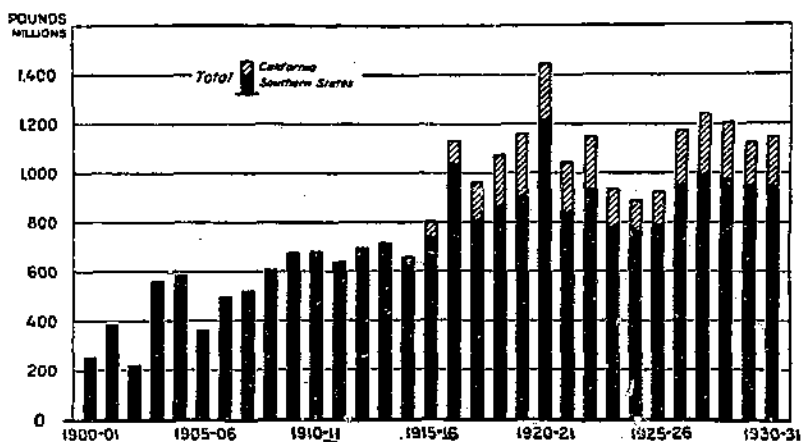


FIGURE 4.—DISTRIBUTION BETWEEN CALIFORNIA AND SOUTHERN STATES OF RICE PRODUCED IN THE UNITED STATES, 1900–1901 TO 1930–31

There was an upward trend in production from 1900 to 1920. From 1920 to 1930 the trend was practically level.

foreign supplies. This reduction in dependence was indicated by the great reduction in the importation of foreign rices. The expansion also brought domestic prices more closely into line with prices in foreign markets.

A new supply factor affecting the price of southern rice also became operative about this time. (Fig. 4.) California production reached sufficient size about 1914 to represent a significant competitive supply. In fact, by 1920 it had become so important that production in California, plus carry-over, affected prices of southern-type rice as much as southern production plus carry-over affected them. (Fig. 5.)

### MONTHLY PRICES

The principal supply factor affecting average price of southern rice for the crop year is production in the United States plus carry-over. The supply factors affecting prices for various months of the year require a certain amount of additional explanation. It is known that factors of supply exert varying degrees of influence at different

times throughout the year.   Since the first three or four months of the crop year constitute the transition period, or the period of adjustment between the supplies of the previous year and those of the new, the total supplies for the current year have little influence on prices during this period.

Beginning with November the total annual supplies exert an influence of some importance.   This influence becomes stronger through December and January, reaching its peak in February. After February these supply factors begin to lose their influence. This loss is slow at first, but by June and July much of their influence has gone.   This should not, however, be construed to mean that they have lost all their influence by July, because the current annual supplies have much more importance as price-determining factors during the latter part of the season than during the first three months.
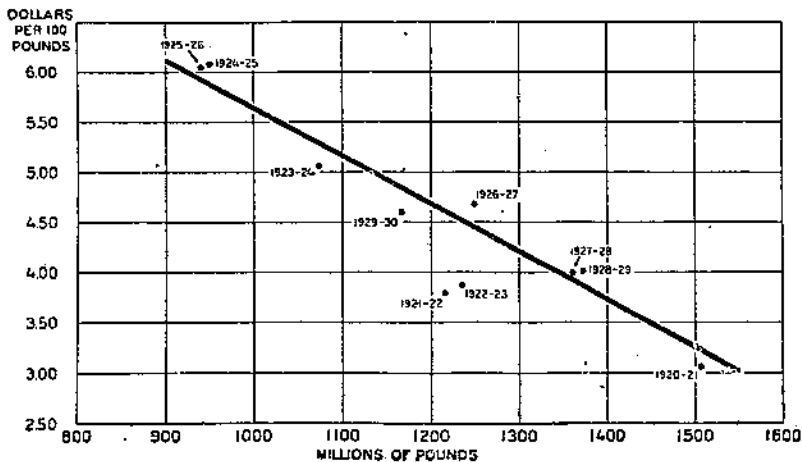


FIGURE 5.—RELATION OF PRICE OF FANCY BLUE ROSE CLEANED RICE AT NEW ORLEANS TO UNITED STATES SUPPLY, 1920-21 TO 1929-30

The line in this figure shows the average relationship between the price of Fancy Blue Rose at New Orleans (deflated by Bureau of Labor Statistics all-commodity index, 1926=100) and United States production plus carry-over for the crop years 1920-21 to 1929-30.

One reason why the current annual supply affects prices so little during the early part of the season is that its amount is not definitely known to the trade until a large part of the rough rice has been delivered to the mills.   By the end of November normally about one-half of the year's crop is in the hands of millers and serves as a basis for an estimate of the entire production.   This estimate apparently is accepted by the trade and influences prices.   During September and October both buyers and sellers appear to be confused about the supply which will be available for the year.   The result is that they pay much more attention to visible supply as determined by the carry-over from the previous year and the current receipts of rough rice.   It is not supply but buyers' and sellers' information regarding supply that affects prices; therefore during this period, when information varies widely in accuracy, price may not behave as it would if accurate information on the prospective new crop were available to buyers and sellers.

Another factor which, because of the above-mentioned situation, appears to have an effect on price prior to November, is the experience of previous seasons. Many millers on the one hand and wholesale buyers of rice on the other let their trading practices be guided by their experience of the previous year. The influence of this factor is especially noticeable the first year following three successive years of rising or falling prices, causing prices during August, September, and October during those years to be closely related to previous years' prices.

After the annual domestic supply becomes definitely known to both miller and wholesale buyer, it can be relied upon practically to control price as long as it is used or disappears at a normal rate. If the disappearance is above the normal rate during the early part of the season and below the normal rate for the latter part, price will be affected accordingly. This factor affecting monthly prices is not peculiar to rice but has been observed in studies of other commodity prices.[5]

Visible stocks at any particular period indicate the extent to which the annual supply has disappeared. This factor is, however, a more reliable criterion of disappearance after a large part of the rough rice is in millers' hands. Not much attention is paid to disappearance during the heavy marketing period, but as soon as receipts of rough become small or stop altogether the visible stocks available as a supply until next harvest become relatively more important. Beginning with April and continuing throughout the remainder of the crop year, stocks are an influential price-determining factor.

## FARM PRICES

The price paid to the farmer for his rice is determined largely by the same factors that affect cleaned-rice prices.

The miller is practically the only buyer to whom the farmer can sell his rice.[6] This market, fortunately for the farmer, is competitive and therefore price is practically free from monopolistic influences. If this were not true, rough-rice prices would not be expected to reflect consumer demand so completely as they do.

The price which a miller will pay for rough rice is determined largely by his milling costs and the price he receives for the rice and by-products after milling. The f. o. b. mill price paid for rough rice on any given day tends to be the same throughout the rice belt, because of the competition among millers. Occasionally a few mills may for short periods pay prices which are out of line with the price generally prevailing in other sections of the belt, but this does not disprove that there is a tendency toward a uniform price for a given quality of rough rice. Prices which are out of line often can be explained by local supply conditions.

Cleaned-rice prices were compared with prices of rough rice for each month during the marketing seasons of the years 1920 to 1928, inclusive. The farm price represented a smaller percentage of the price of cleaned when the latter was above the average for the 9-year period, and a larger percentage when below. This may be explained in part by the fact that millers considered their chances of losing to

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[5] WORKING, H. FACTORS DETERMINING THE PRICE OF POTATOES IN ST. PAUL AND MINNEAPOLIS. Minn. Tech. Bul. 10, 41 p., illus. 1922.
[6] This statement does not apply to those farmers who are members of a cooperative association which mills the rice and makes returns to the farmer on a basis of the price received for cleaned rice.

be less when cleaned-rice prices were below the average and greater when above.

Although the current price of cleaned rice is used as a basis for determining the price of rough rice, it is obvious that the cleaned price one or two months in the future would be far more valuable. It is possible to forecast the price of cleaned rice one or two months in the future, but it is just as satisfactory to use the principal factor affecting that price, namely, production plus carry-over, to calculate the probable future price of rough rice.

Another factor which appears to be of importance during certain years is the rate of marketing rough rice. If farmers attempt to market their rice faster than at the normal rate (fig. 6) the tendency will be for the farm price to be less than if the normal rate of marketing had been followed. This is because mills have been built with milling and storage capacity to take care of normal receipts of rough rice, and if these capacities are taxed by abnormal receipts the price paid for rough probably will be lower. Furthermore, sales of cleaned rice are fairly well distributed throughout the year, and if the miller takes in more than the normal amount of rough rice early in the season he will necessarily have larger storage costs. The risk of price fluctuation between purchase of rough rice and sale of cleaned rice will be greater because the time interval will be longer. Cooperation among farmers selling rough rice should result in more economical marketing, which should enable the miller to utilize milling and storage capacities at a smaller cost per unit of rice handled and may be reflected in higher prices for rough rice.

## FACTORS INFLUENCING THE PRICE OF CALIFORNIA-JAPAN TYPE RICE

Since the rice grown in California, known as California-Japan type, has a shorter and thicker kernel than that of southern rices and resembles that grown in Japan, the Japanese prefer it to the southern rice. Therefore a large part of the demand for California-grown rice comes from the Japanese who live in the western United States and in Hawaii. California, however, produces more rice than is normally demanded by that group of consumers. A portion of the remaining production is sold in other sections of the United States, but the greater part is exported to foreign countries, principally Japan.

When the price differential between Tokyo and San Francisco is sufficiently large, Japan takes practically all the California exportable surplus. During years when the spread between these two prices will not cover transportation costs and import duty very little California rice is exported to Japan. When Japan is not in the market for California rice, California must either seek other markets for its surplus or carry over a large percentage of the crop into the next year. (Figs. 7 and 8.)

California has been an important rice-producing State for a relatively short period. Only since the war has production exceeded domestic consumption and disposition of the surplus become one of the vital problems of the California rice-growing industry.

The consumption of California rice within the United States increased slightly during the nine years 1920–1928. The consumption in Hawaii during the same period increased relatively more than
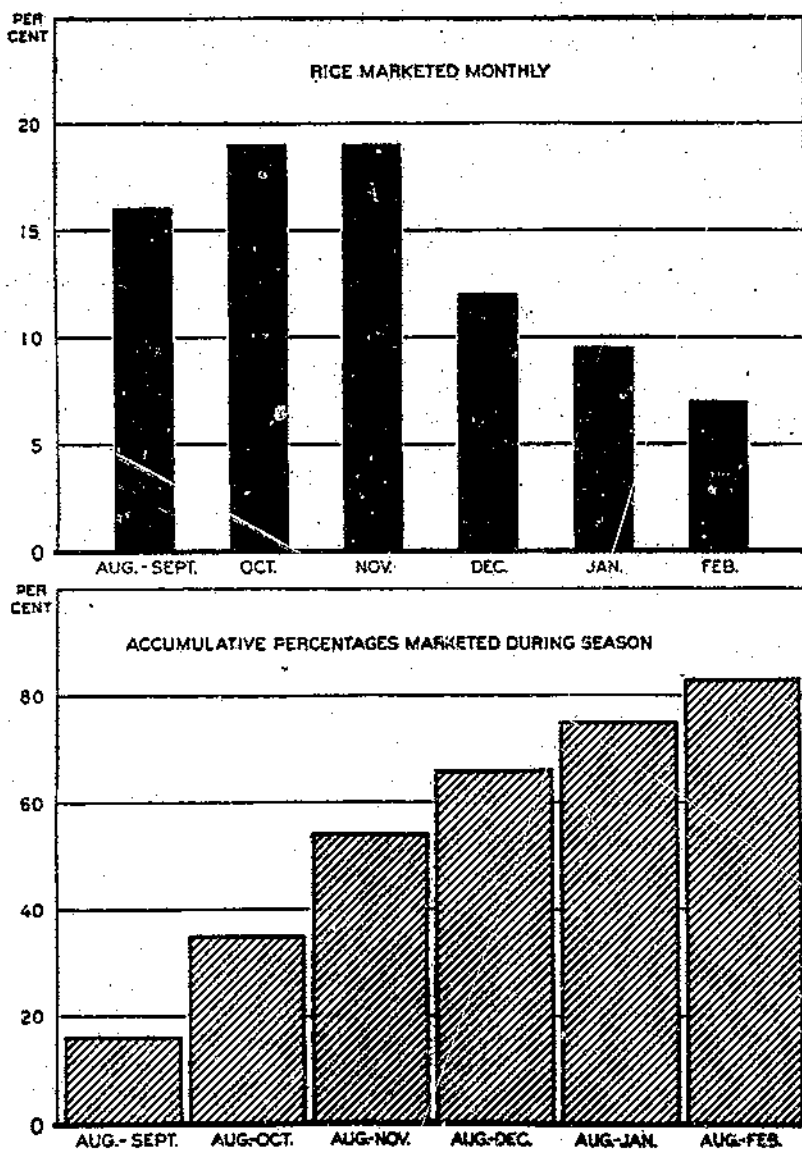
FIGURE 6.—PERCENTAGE OF ROUGH RICE MARKETED EACH MONTH AND ACCUMULATIVE PERCENTAGE MARKETED DURING MARKETING SEASON AVERAGE 1920-21 TO 1929-30

The data from which these figures were constructed were taken from the southern belt only. Rate of marketing is influenced by weather conditions at threshing time, percentage relationship of Early Prolific and Blue Rose to total crop, creditor control of sales, storage capacity available on farms, and farmers' predictions as to future prices.

in the continental United States. This increase in domestic demand has been due to a number of factors of which the two outstanding are (1) increase in population and (2) the tendency toward increased consumption of California rice by Japanese in the United States and

PRICE DIFFERENTIAL
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PER
POUND

EXPORTS IN MILLIONS OF POUNDS
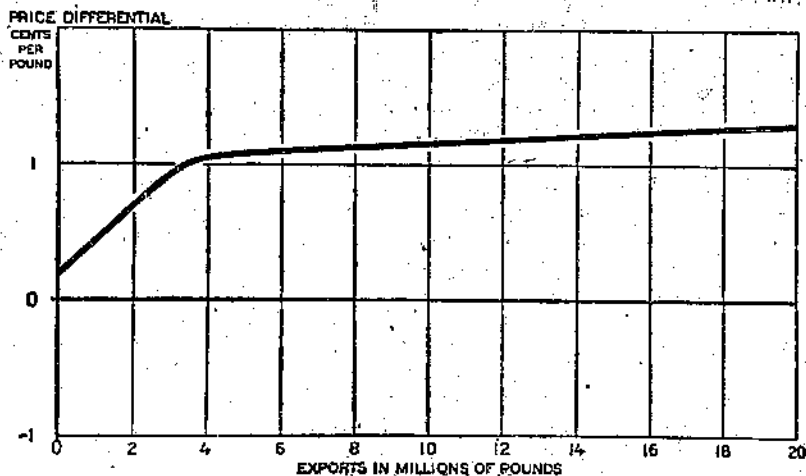
FIGURE 7.—RELATION OF BROWN-RICE PRICE DIFFERENTIAL (TOKYO ABOVE SAN FRANCISCO) TO EXPORTS FROM CALIFORNIA TO JAPAN, 1920–21 TO 1929–30

California exports to Japan are very small so long as the Tokyo price is less than 1 cent per pound above the San Francisco price.

CENTS
PER
POUND
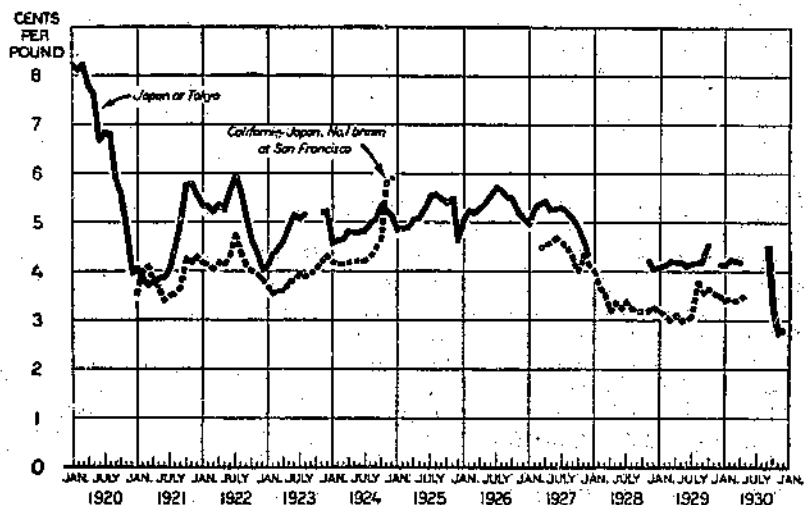
FIGURE 8.—WHOLESALE PRICE OF JAPAN RICE IN TOKYO AND CALIFORNIA-JAPAN RICE IN SAN FRANCISCO, BY MONTHS, 1920–1930

California Brown rice is sold principally to Japan. When Japan is out of the market, Brown-rice prices usually are not quoted on the San Francisco market.

Hawaii. It should be noted that the Japanese living in Japan prefer Japanese-grown rice to all other; those emigrating from that country carry that preference with them and demand rice imported from Japan. Children born of Japanese parents in the United

States and Hawaii do not retain this preference for Japanese rice and usually eat rice of a quality equal to the Japanese rice but costing less and grown in California. Since the prohibition of Japanese immigration and the relative increase of locally born in proportion to immigrant Japanese, the domestic demand for California rice has increased at the expense of rice imported from Japan. The per capita consumption of all rice among the Japanese in the United States and Hawaii has not increased; in fact, there is a tendency toward greater diversification in diet among the younger generation and a corresponding decrease in per capita consumption within that group.

A relatively small percentage of the California crop is normally consumed in continental United States and, unlike the domestic demand for Blue Rose, the consumption of California-Japan rice in the United States seems to respond readily to price changes. Another factor which affects domestic consumption of California rice is the competition of substitute rices. When the spread between the price of California-Japan and Blue Rose becomes wider than normal, Blue Rose rice, instead of California-Japan rice, will be used by a large number of consumers who normally eat the California rice. This explains why the supply of Blue Rose rice is an important factor affecting the price of California-Japan rice at San Francisco.

The influence of foreign demand is one of the important factors determining prices at San Francisco. It is rather difficult to measure accurately the foreign demand for California-grown rice. If only the grade Fancy Japan were under consideration, it might be possible to determine more accurately the increase or decrease in foreign demand. During many of the years under consideration very little Fancy grade was exported, but large quantities of Brown rice and low grades of milled rice were sold to Japan. The demand for lower grades or for any of the by-products of the rice-milling industry is an important factor affecting the representative price of rice for any particular year. [7]

These lower grades represent a substantial part of the California supply which, taken as a whole, is one of the supply factors affecting San Francisco price. If the quantities of all grades of California-Japan rice exported are taken into consideration for this 9-year period it will be seen that the largest quantities sold to Japan were in 1921, 1926, and 1922, in the order named. For all practical purposes foreign demand and Japanese demand can be used synonymously. The fact that Japan purchased relatively large quantities of California rice in 1921 and 1922 and that the amount sold to Japan diminished during the next three years, reaching almost nothing in 1925, does not indicate that Japanese demand was decreasing during that period. It merely is evidence of the fact that the Japanese demand for California rice is elastic; that is to say, Japan will buy large quantities when the price is relatively low and materially decrease her purchases as prices advance. The Japanese demand is of sufficient significance to California rice growers to justify a special study of the factors affecting price in the Japanese rice market.

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[7] The average yearly price of Fancy Japan at San Francisco was chosen as the representative price of the total California production.

### RICE PRICES IN JAPAN

Japan consumes more rice per capita than does any other country. A large percentage of the rice grown in Japan is consumed at or near the farm where it is produced. The remainder of the crop each year finds its way to the large rice markets of Osaka, Tokyo, and Kobe. The consumption of rice in Japan far exceeds the production in Japan proper. Large quantities are shipped in from the Japanese colonies of Taiwan (Formosa) and Chosen (Korea) and imported from Siam, French Indo-China, India, and the United States. (Fig. 9.)

About 55 per cent of the tillable land, 8,111,950 acres, was devoted to the production of rice in 1928. In spite of the fact that the consumption far exceeds production, the rice acreage, as well as production, has changed very little during the last eight years. Rice prices have not been a sufficient stimulant to cause a greater per-
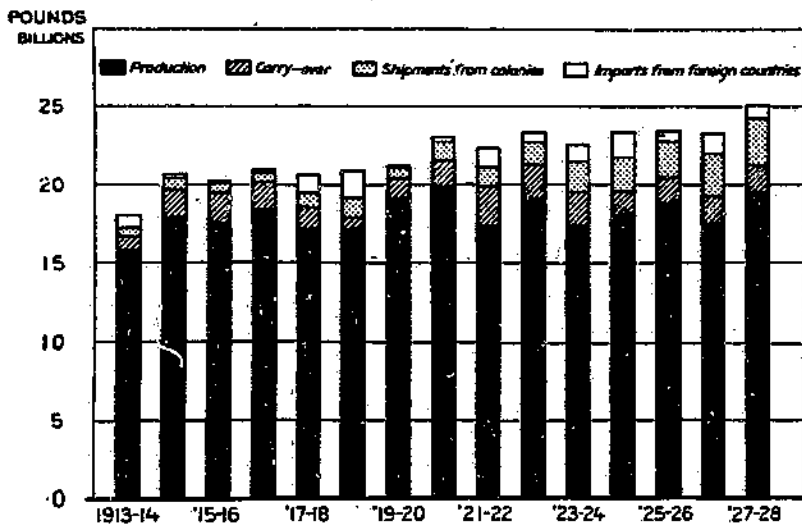


FIGURE 9.—ANNUAL SUPPLY OF RICE FOR JAPAN, 1913–14 TO 1929–30

Imports and inshipments from colonial possessions have tended to increase faster than production in Japan proper.

centage of the cultivable land to be used in rice growing nor to bring new land into rice production. The yield per acre, however, has been increased slightly. One of the principal reasons that Japanese rice prices have not risen high enough to stimulate increased production is the relatively low prices for which foreign and provincial rices can be purchased. There is, however, a preference for Japanese-grown rice, and foreign rices are purchased only at a substantial discount.

Since to eat Japanese rice is considered by the middle classes an evidence of social position, to eat foreign rice is to be degraded socially. The lower classes are more concerned about price than about social status and will buy foreign rice if it is much cheaper than Japanese rice. The order of preference for rice grown outside Japan appears to be as follows: Chosen-Japan, Taiwan-Japan, California-Japan (California-Japan and Taiwan-Japan types of rice

are about on a parity) and, least desired of the imported rices, those coming from southeastern Asia.

In the Japanese market California rice has an advantage over the rices from Siam, French Indo-China, and India so far as demand is concerned, but the Asiatic rices are much cheaper and consequently are sold in much larger quantities. In 1927 less than 8 per cent of the Japanese imports came from California, the remainder coming from Siam, India, and French Indo-China. The largest amount exported from California to Japan in any one year was 110,000,000 pounds in 1922, or 11 per cent of Japan's total importation.

California rice in Japan represents a relatively high percentage of the total value of imported rice because of its advantage in price over the Asiatic rices in the Japanese markets. California rice sells at about the same prices as Taiwan-grown Japanese rice. When California rice has been quoted on the Japanese markets it sold at a relatively small discount under Japanese-grown, middle-quality rice. The average discount was ½ cent per pound.

California rice is demanded for use in blending with Japanese rice. This fact enables it to sell at higher prices than if it were sold directly to consumers as California rice. This demand for California rice for blending exists at all times but only at certain discounts under Japanese rice. If, for example, middle-quality Japanese rice is selling in Tokyo at 1 cent per pound above California-Japan No. 1 Brown at San Francisco, there usually is some Japanese buying; and if the Tokyo price reaches 1.2 cents per pound above the San Francisco price, conditions are favorable for buying in relatively large quantities. (Fig. 7.)

The bulk of the Japanese buying in San Francisco has been at a price from 1.25 to 1.50 cents below the current price for Fancy California-Japan, thus making the differential between price paid in California and price of California rice selling on Kobe exchange between 0.31 and 0.47 cent per pound and from 0.83 to 0.97 cent per pound under the quotations of Japan rice in Japanese markets.[8]

The Japanese demand for rice can be described briefly by stating that in the past few years it has increased at a rate of about 450,000 koku (141,400,000 pounds) per year, mainly because of increases in population, with practically no increase in per capita consumption. Diversification of the diet of certain classes is resulting in greater consumption of foods other than rice, thus causing the per capita consumption of rice to remain stationary at about 330 to 340 pounds annually. A study of the influence of wages on price of rice leads to the following conclusions: An increase in the prosperity of the manufacturing industry, assuming a subsequent increase in wages, probably would result in an increased consumption of wheat and foods other than rice, whereas there probably would be no change or possibly a slight decrease in per capita consumption of rice. On the other hand a decrease in wages is likely to result in increased consumption of rice.

Japan has found it unprofitable to supply its own rice needs by home production. Therefore she has encouraged the production of Japanese-type rice in her colonies, Taiwan and Chosen. The com-

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[8] The commission appointed in 1921 to regulate the price of rice in Japan has the power to buy and sell in any of the Jap.   se markets, to store rice, to require reports on stocks of both public and private warehouses, and to encourage or discourage imports. Exercising the last authority causes import duties to vary from time to time and thus influence the differential between San Francisco and Tokyo prices. The fluctuations of the rate of exchange of the yen also affect the differential.

bined production of Japan proper, Taiwan, and Chosen represents the Japanese-controlled supply and, as should be expected, is the most influential supply factor affecting the price of Japanese rice. In view of the fact that foreign rices must be imported to satisfy the Japanese demand the supply of these substitute rices, made up of production in Siam, French Indo-China, and India, is next in importance as a supply factor influencing the price of Japanese rice. The California supply has been too small as compared with these other supplies to exert any appreciable influence on Japanese price.

Japanese rice prices also tend to fluctuate with general wholesale prices.

## STATISTICAL ANALYSIS OF FACTORS AFFECTING THE PRICE OF RICE

The first problem in this study was the selection of a price or prices representative for the rice industry. A series of either rough or cleaned rice prices could have been selected for the first analysis because the same factors were involved in either case. A series of cleaned-rice prices representative of the southern rice belt was chosen.

Although highly desirable, it would have been impracticable, if not impossible, to obtain a weighted average price of all southern rices passing through any one wholesale market. Therefore, a variety and grade which was representative of southern rices and for which it was possible to get reliable price data, was selected. For the period 1914 to 1930 Fancy Blue Rose was used; prior to 1914 Fancy Honduras. The prices studied were monthly and yearly averages as reported by the New Orleans Board of Trade, deflated by the Bureau of Labor Statistics all-commodity index of prices—base 1926 = 100.

The deflated price series was selected for analysis because it is that price rather than actual price which more nearly represents unit value of rice. The actual price of rice tends to change with the general level of prices of all commodities. The level of prices of all commodities changes because of one of two reasons or a combination of both: (1) The supply of currency changes, thus tending to change the quantity of other commodities for which a unit can be exchanged; (2) the relation of the supply of the commodities, representing the bulk of the sales of all commodities, to the demand for these commodities may change, so that the level of prices of all commodities may change. If the all-commodity price level advances because of the first reason, rice will tend to advance in price in approximately the same proportion. If the all-commodity price level advances because of the second reason, the price of rice will tend to rise because of the competition with other commodities selling at relatively higher prices. In either case the advance in rice prices due to advances in the all-commodity price level must be eliminated before an analysis of rice prices will reveal the price-making factors peculiar to rice.

Large quantities of the southern rices are exported annually, but the demand satisfied by this exportable surplus is not of sufficient importance to become a significant factor affecting price. If, however, the production of southern rices is materially increased in the future, the exportable surplus is quite likely to become an important price-making factor. Anticipating the need for world price-making information, a brief study of factors affecting the price of southern rices

in a world market was made. London was selected as a market in which world price-making factors operated and where large quantities of American southern-type rice are sold. The particular price studied was the yearly average for Fancy Blue Rose.

The study of rough-rice prices began with what had been learned of cleaned-rice prices and proceeded from that point. Inadequate price data prevented a study of rough-rice prices in each of the principal farmers' markets in the southern rice belt. Although they were the most nearly complete, New Orleans rough-rice prices were not used because it was felt that the price-making factors were not reflected in them so completely as in prices at markets nearer the producing centers; consequently a series consisting of the average of prices as of December 1 at a number of Louisiana markets was analyzed.

## CALIFORNIA-JAPAN TYPE

In the California-Japan type study, as in the case of that of southern rices, the wholesale price of cleaned rice was analyzed first. Since practically all the California rice is of one variety the problem of choosing a representative variety was solved accordingly. The prices used were monthly and yearly averages of Fancy California-Japan at the San Francisco market, obtained from weekly reports in the Pacific Rural Press.

A relatively large percentage of the California crop normally is exported. It was therefore assumed that the San Francisco price probably was influenced by conditions existing in the foreign markets. Japan, being the principal purchaser of California rice, was logically the country in which one should look for conditions affecting the price of California rice. Tokyo was selected as a representative market. It was observed that there was a close relationship between the wholesale price of California-Japan rice in San Francisco and the price of certain rices in Tokyo. It was therefore necessary to find the factors affecting the price of a variety and grade of Japanese rice in Tokyo that was representative of the bulk of the rice consumed in Japan. For this study the average yearly price of Japan (brown) middle quality was selected.

## PRELIMINARY ANALYSIS

The supply of rice to satisfy the domestic demand comes largely from the southern rice belt. The California production satisfies a certain portion of the domestic demand and is a potential substitute where Blue Rose is preferred. Therefore New Orleans prices are affected not only by the southern production but by the supply of California-Japan rice grown in California.

Since Blue Rose is consumed largely in certain sections of the United States, and California-Japan principally in other sections, a superficial analysis might lead to the conclusion that the New Orleans price would reflect the effect of all of the southern supply but little of the effect of the California supply. This however did not prove to be true. The New Orleans price reflects mill prices in the southern belt, which are affected by both southern and total United States supply.

In reality the supply of rice exerts an influence on the New Orleans price through information in the minds of buyers and sellers of rice on the stocks available or to be made available for satisfying their

demands. Therefore not only do the United States stocks and potential supply have to be considered, but the available supply and the probable future production of countries outside of the United States, all taken together, constitute supply factors affecting rice prices.

During the period 1900–1914, when large quantities of rice were being imported, the supplies in certain exporting countries exerted a pronounced influence on the United States price. By 1914 increases in United States production had practically driven foreign rices out of the domestic market.

Other supply factors affecting rice prices are supplies of substitute carbohydrate foods. Supplies of wheat, corn meal, and potatoes appeared to have an influence only when rice prices were extremely high, whereas no effect was detected when rice prices were low.

One of the first steps taken to determine the nature and magnitude of demand affecting price at New Orleans was to construct a curve representing as nearly as possible the relation of demand to price. It is impossible to construct an accurate demand curve from available data, since an accurate demand curve shows graphically the demand schedule for any given market for any given time during which supply and demand do not change, usually designated as an "instant of time."

Each price is represented by a point on the demand curve where the supply curve crosses. The ordinate of this point measures the price, while the abscissa measures the amount of the commodity demand. The yearly average price is represented by a point located on the total annual demand curve representing the average demand schedule for the year. It, however, gives no idea of the direction nor the curvature of the curve on which it is located. If it were possible to obtain similar data for other points on this total annual demand curve, a segment of the curve could be constructed.

The problem of constructing a demand curve for a period of years is probably more difficult. Using data for price and amount demanded, it is observed that for two successive years the price is the same, but for the latter year the amount sold is greater. It is quite obvious that it is impossible to construct a demand curve which will pass through both of these points, since the latter is located on a curve which presumably illustrates an increase in demand. Since the exact shape of the demand curve for the former year is unknown, it is impossible to measure the extent of increase in demand from the increase in length of the abscissa of a point on one demand curve over that of one located on another. This merely indicates the increase in demand at a given point on the curve and tells nothing about the distance between the two respective demand curves at their extremities. If there were some reason for assuming that the respective demand curves of the various years studied were parallel,[9] it would be more nearly correct to use the increased amount demanded at a given price as a measure of increase in demand. The general direction and curvature of the demand curve of a food commodity is due, in a large degree, to the food habits of those consuming the commodity.[10] If the food habits of these consumers have not changed materially during a certain period, it is only fair to assume that the demand curves during this same

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[9] The term "parallel" is used in connection with two demand curves which have the same coefficient of elasticity and which do not coincide.
[10] Food habits are affected by many factors, one of which is the comparative prices of competing foods.

period have changed very little as regards their general direction and curvature; that is, they tend to be parallel.

For the above reason it is assumed that the difference in amounts demanded, price being held constant for the period studied (1914–1930), was a fair measure of increase or decrease in demand. The problem of getting the respective demand curves for the various years to coincide approximately is one of eliminating the effect of a general increase or decrease in demand. Observation showed that there was a general increase in demand during the period. By adjusting for annual increases in demand for the period 1914–1930 it was possible to determine the abscissas of various points assumed to be located on or near a curve representing the demand for the entire period.[11] The ordinates of these points had previously been adjusted by deflating
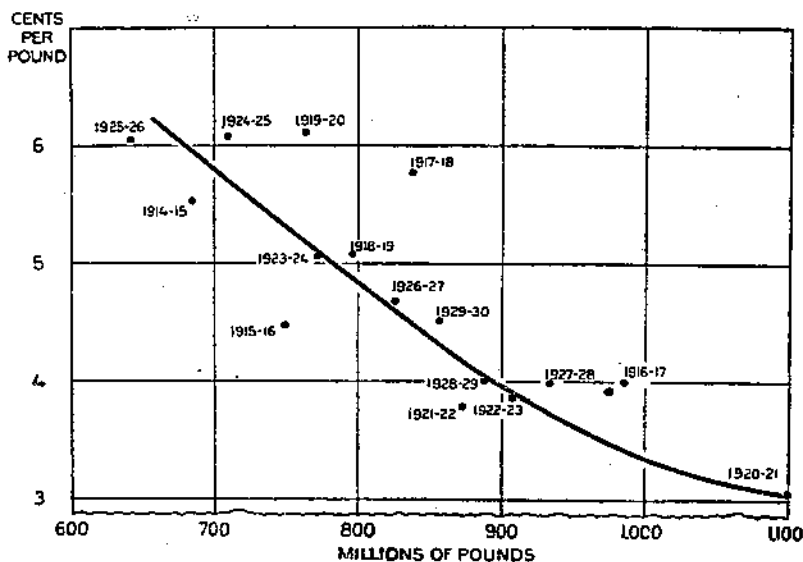


FIGURE 10.—RELATION BETWEEN DEFLATED PRICE OF FANCY BLUE ROSE RICE AT NEW ORLEANS AND SALES OF SOUTHERN RICE (TREND REMOVED). 1914–15 TO 1929–30

This curve shows the average effect of changes in rice prices upon sales of southern-grown rice.

the yearly average prices with the Bureau of Labor Statistics' all-commodity index of prices. A smoothed curve fitted to these points gives an approximation of a demand curve for rice at New Orleans as close as it was possible to obtain.

The "demand-approximation" curve shown in Figure 10 is only a portion of a curve which would illustrate the demand schedule of rice at the New Orleans market. It is, however, the only arc of the curve that is of significance in this study, since it explains the nature of the relationship between price and amount demanded for the period (1914–1930.) If it is desired to estimate the amount that would be demanded

[11] Because per capita consumption in the United States remained practically stationary from year to year during this period when yearly average prices changed very little, it was assumed that annual increases in sales or amounts demanded were due to increases in population and that an adjustment for increases in demand could be made by eliminating the effect of a trend fitted by the method of least squares to the annual sales.

at a price falling beyond the limits of the demand-approximation curve, this curve would be of little assistance.

It was necessary to construct this demand-approximation curve in order to obtain a perspective of the relation of demand to price, from which perspective it was possible to determine the methods that should be used in analyzing the effect of demand on price.

### DETAILED ANALYSIS

It was observed that prices of Blue Rose in the foreign markets, where most of the southern-belt rices are sold, tended to fluctuate with domestic prices of Blue Rose rather than with prices of foreign-grown rices being sold in those markets. It was also noted that United States exports of southern-belt rices were influenced more by changes in domestic prices of Blue Rose than by changes in prices of foreign rices. From these two facts it was concluded that supplies of foreign rices did not influence prices of Blue Rose very much in either foreign or domestic markets. The supply factor which appeared to have the greatest influence on New Orleans price was domestic supply, consisting of United States production plus carry-over.

Domestic supply for the period 1914–1930 was adjusted by eliminating trend, fitted to the series by the method of least squares, so that the relation of this supply factor to price would be approximately the same as it would have been under conditions of no increase in demand.

From a preliminary scatter-diagram of adjusted domestic supply and price for the period 1920–21 to 1929–30 [13] it appeared that the normal relationship existed between supply and price, being represented by a function having a slight curve, similar to a logarithmic curve. The domestic-supply series, in millions of pounds, was changed to logarithms and correlated with yearly average price of Fancy Blue Rose at New Orleans for the period 1920–21 to 1929–30, with the results shown in Figure 11.

A supply factor representing the foreign rices which appeared to have a small influence on New Orleans prices of Blue Rose was introduced into the correlation. Indian production, unadjusted and expressed in billions of pounds, was used for the foreign supply factor.[13] The multiple correlation of yearly average price of Fancy Blue Rose at New Orleans $(X_1)$ with the logarithms of domestic supply $(X_6)$ and India production $(X_7)$ resulted in a correlation coefficient of 0.985, which, when corrected for number of observations and independent variables, became 0.97. The average error of estimate was 12.7 cents per 100 pounds, or 2.82 per cent of the mean. (Fig. 12.) The regression equation was:

$$X_1 = 46.772 - 13.1997X_6 - 0.0273X_7$$

A series of prices was constructed by averaging the monthly prices of Fancy Blue Rose at New Orleans from November to July, inclusive,

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[13] Because of the abnormal conditions existing during the war years the correlation study was confined to the postwar period.
[13] Burma actually supplies the greater part of the foreign rice competing with Blue Rose; but in view of the fact that deficit-producing Provinces of India buy principally from Burma and these purchases represent a relatively large percentage of all rice shipped out of Burma, it was concluded that the production in all India represented the foreign-supply factor affecting Blue Rose prices.
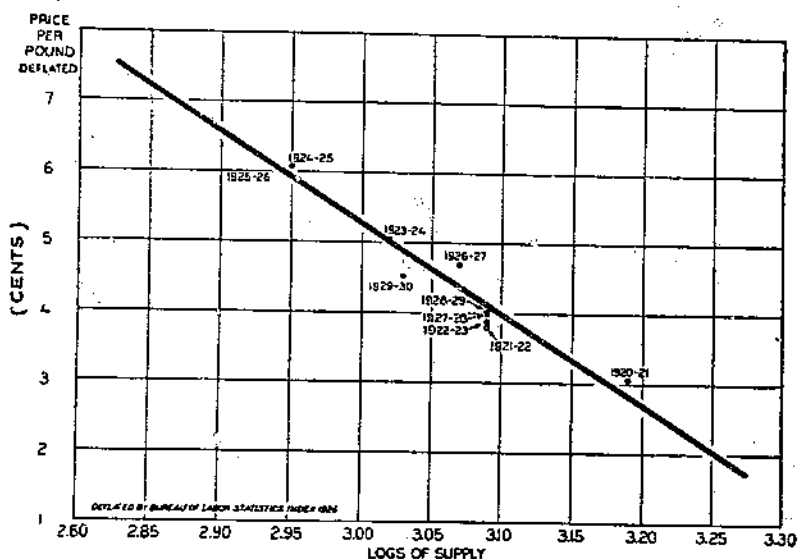
FIGURE 11.—RELATION BETWEEN AVERAGE PRICE OF FANCY BLUE ROSE CLEANED RICE AT NEW ORLEANS AND LOGARITHMS OF ADJUSTED SUPPLY IN THE UNITED STATES, 1920–21 TO 1929–30

The relationship between price and supply is shown by the regression of yearly price, Fancy Blue Rose at New Orleans, on logarithms of United States production plus carry-over, with trend (least squares) removed.
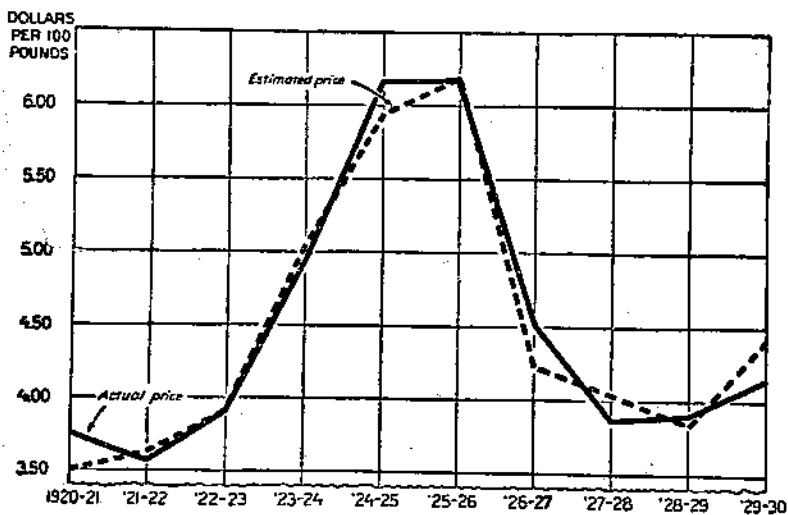


FIGURE 12.—ACTUAL AND ESTIMATED AVERAGE PRICE OF FANCY BLUE ROSE RICE AT NEW ORLEANS, 1920–21 TO 1929–30

Prices were estimated by the estimating formula developed in the correlation.

for each year (1920–21 to 1929–30).   This price series was then used to replace the dependent variable in the yearly average-price correlation with the following results: Coefficient of correlation 0.9916, average error of estimate 11.2 cents per 100 pounds or 2.49 per cent. (Fig. 13.)   The regression equation was as follows:

$$X_1 = 51.347 - 14.768X_6 - 0.024X_7$$

Two other periods, December-April and May-July were used and a price series was constructed for each.   The results of correlating the December-April price series with the same independent variables used in the yearly correlation were as follows: Correlation coefficient 0.986, average error 15.4 cents per 100 pounds, or 3.51 per cent. and regression equation $X_1 = 51.324 - 15.2117X_2 - 00.0566X_7$.

A third independent variable ($X_8$), visible stocks of rough and cleaned rice as of May 1 (Table 20), was added to the two used in the
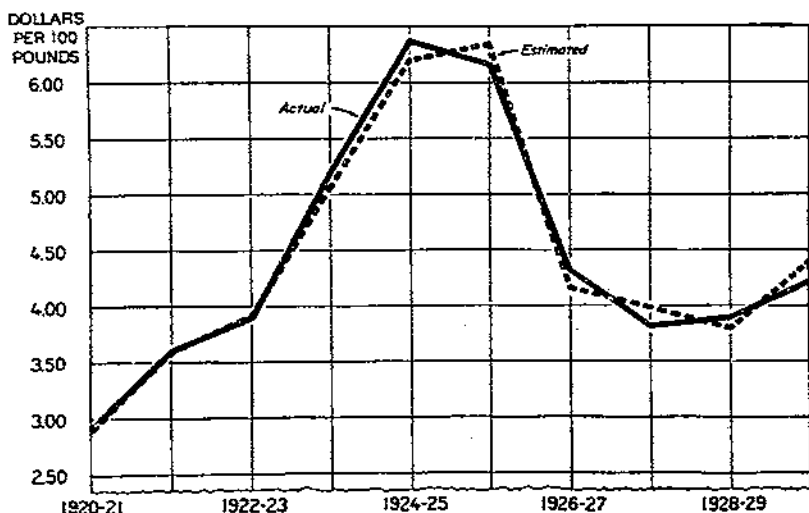


FIGURE 13.—ACTUAL AND ESTIMATED NOVEMBER-JULY PRICE OF FANCY BLUE ROSE RICE AT NEW ORLEANS, 1920–21 TO 1929–30

Price estimated from estimating formula developed in November-July price correlation.

yearly average price correlation and used in the May-July correlation.   The following results were obtained: Coefficient of correlation 0.9828, average error of estimate 18.9 cents per 100 pounds or 3.99 per cent, regression equation $X_1 = 47.602 - 12.5687X_6 - 0.0454X_7 - 0.091X_8$.

### MONTHLY PRICES

In the analysis of seasonal price fluctuations an attempt was made to isolate seasonal trends in monthly prices, characteristic of certain supply and demand combinations.

The average seasonal trend of prices was studied for each of three groups of years, each group being characterized by certain supply conditions.

(1) The first group consisted of those years in which a small crop followed a large crop.

(2) In the second group were those years in which a large crop followed a small crop.

(3) The third group was made up of years in which the crop was similar in size to the previous year's crop.[14]

The data used to construct the curve showing the characteristic seasonal trend of prices for each group were obtained as follows: The percentage relationship of each monthly price to the average price of the respective year was determined. From an arithmetic average of the percentages for each month a curve was constructed illustrating the average seasonal fluctuation of prices for the group.

A curve constructed from the modes of these percentages would be more representative of the group, but owing to the small number of years in each group a true mode was practically impossible to obtain. Because of the wide deviations of the percentages from their average, the average falls considerably short of being characteristic of the group. For purposes of forecasting the seasonal trend for any given year, more satisfactory results can be obtained if the seasonal trend of a previous year having similar supplies is used as a criterion. This method may be satisfactory for determining the general movement of prices during the year, but not for determining the amount of the price for any particular month.

After trying a number of methods of estimating monthly prices, it was concluded that a multiple correlation of the price-making factors with each monthly price was the most reliable.

The effect of demand on price was accounted for by the same method as in the study of yearly prices. Demand (not the quantity sold) was assumed to be the same for each of the various months of the year, and accordingly exerted an influence on monthly prices. A preliminary observation of the factors affecting monthly prices brought out the fact that the crop year was divided into three periods, each period being characterized by a set of price-making factors peculiar to it alone. The first four months, August to November, might well be termed the "transitional period," during which monthly prices are only to a slight degree affected by the current crop year's annual supply, whereas previous years' price experience, amount of carry-over on August 1 and rate of marketing rough rice, and prices of other commodities are most important in affecting price.

As a price-determining factor the importance of domestic supply for the current year advances with the season. It is the most influential factor during the second period, December to April. Domestic supply, however, is made up of southern-belt production plus carry-over in the South, added to California production plus California carry-over, and each of these exerts its own peculiar influence on price. In the case of the analysis of yearly average price, both of these supply factors can be combined into one factor, domestic supply, because practically all of the influence of each is exerted on price some time during the year. But when the price for each month from November to February is being analyzed these factors must be considered separately. During these months both southern supply and California supply are relatively significant in determining Blue Rose prices at New Orleans. Beginning with March, however, the California supply factor has lost the greater part of its influence, most of which has been gained by the southern-supply factor. In fact their respective influ-

ences on price from March to July are in about the same proportion as their relative contributions to the domestic supply, thus making it possible to combine the two into the domestic-supply factor to be used in the correlations with monthly prices from March to July, inclusive.

During the last period, April to July, inclusive, visible supply for the remainder of the year is a relatively important factor affecting prices. The same foreign-supply factor used in the yearly average price correlation was also used in each monthly price correlation, March to July, inclusive. It can be noted from Table 1 that the foreign-supply factor was of very little significance in any of the correlations. Table 1 gives the results of the correlations in which the dependent variable in each case was a deflated monthly price series (1920–1930) of Fancy Blue Rose at New Orleans. (Fig. 14.)
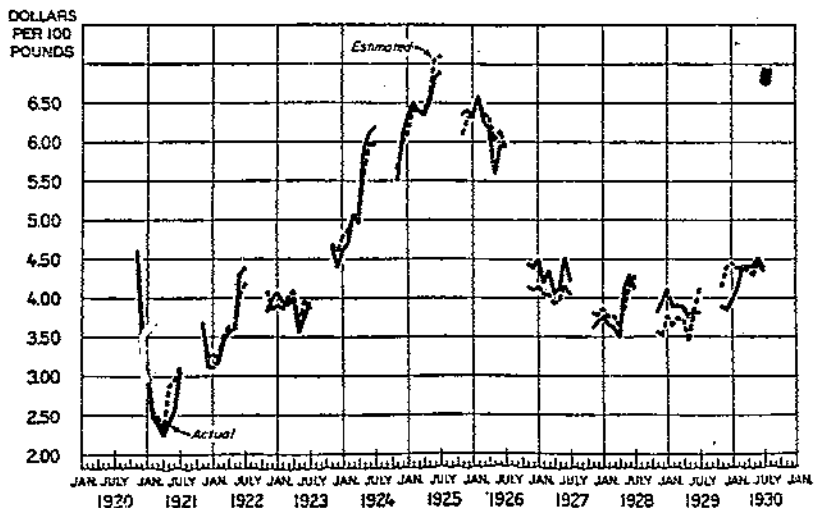


FIGURE 14.—ACTUAL AND ESTIMATED MONTHLY PRICE OF FANCY BLUE ROSE RICE AT NEW ORLEANS, 1920–1930 ,

Prices were estimated from estimating formulas in Table 2. August, September, and October prices were not estimated.

The following independent variables were used: Logarithms of California production plus California carry-over expressed in millions of pounds represented by $X_{12}$ in each of the correlations, November to February, inclusive; logarithms of southern production plus southern carry-over expressed in millions of pounds represented by $X_{13}$ in each of the correlations, November to February, inclusive. A time series was used as an independent variable in each of the correlations, November to February, to account for the constant increase in demand. It consisted of a series of consecutive numbers beginning with 1 for 1920. The time series was represented by $X_{14}$ in the correlations. Logarithms of total United States production plus carry-over expressed in millions of pounds, with trend (fitted by method of least squares) removed. This factor was represented by $X_6$ in all correlations from March to July, inclusive. Indian production expressed in millions of pounds and represented by $X_7$ was used in each correlation from March to July. Visible stocks of rough and cleaned rice expressed

in terms of pockets (100 pounds) or their equivalent and reported by the Rice Millers' Association as of the 1st day of each month, was used in each of the monthly correlations, respectively, from April to July. This factor was represented by $X_8$.

TABLE 1.—*Results of price correlations, November to July*

| Month | Coefficient of correlation (actual) | Average error of estimate | |
|---|---|---|---|
| | | Cents per 100 pounds | Per cent |
| November | R    0.967 | 18.1 | 4.13 |
| December | R    .964 | 22.1 | 5.05 |
| January | R    .971 | 22.0 | 5.01 |
| February | R    .992 | 12.4 | 2.84 |
| March | $r_{17} =$ .111  $R_{1.678} =$ .993 | 10.3 | 2.32 |
| April | $r_{17} =$ .168  $R_{1.678} =$ .995 | 9.8 | 2.21 |
| May | $r_{17} =$ .0782  $R_{1.678} =$ .973 | 22.5 | 4.97 |
| June | $r_{17} =$ .0481  $R_{1.678} =$ .978 | 21.4 | 4.46 |
| July | $r_{17} =$ .0056  $R_{1.678} =$ .987 | 14.8 | 3.05 |

TABLE 2.—*Regression equations*

$$X_1 = \text{Constant} + b_{12.3} \ldots _n X_2 + b_{13.3} \ldots _n X_3 + b_{14.3} \ldots _n X_4 + b_{n.3} \ldots _{(n-3)} X_n$$

| | | | | |
|---|---|---|---|---|
| November | $X_1 = 32.698$ | $-6.165 X_{12}$ | $-4.292 X_{13}$ | $+0.041 X_{14}$ |
| December | $X_1 = 38.066$ | $-7.305 X_{12}$ | $-5.293 X_{13}$ | $+ .097 X_{14}$ |
| January | $X_1 = 40.021$ | $-8.852 X_{12}$ | $-4.449 X_{13}$ | $+ .129 X_{14}$ |
| February | $X_1 = 47.22$ | $-10.643 X_{12}$ | $-5.018 X_{13}$ | $+ .141 X_{14}$ |
| March | $X_1 = 54.285$ | $-16.055 X_6$ | $- .01 X_7$ | |
| April | $X_1 = 52.836$ | $-15.849 X_6$ | $+ .006 X_7$ | $- .019 X_8$ |
| May | $X_1 = 50.327$ | $-13.449 X_6$ | $- .052 X_7$ | $- .077 X_8$ |
| June | $X_1 = 45.892$ | $-11.859 X_6$ | $- .052 X_7$ | $- .113 X_8$ |
| July | $X_1 = 44.171$ | $-11.408 X_6$ | $- .048 X_7$ | $- .136 X_8$ |

## FARM PRICES

Prices paid for rough rice are affected by the same factors as are cleaned-rice prices. A simple correlation between Fancy Blue Rose prices and prices paid to producers during the same period for rough rice (an average of all grades) gave a correlation coefficient of 0.99.

The supply factors affecting rough-rice prices are the same as those affecting cleaned-rice prices. The quality factor which changes the ratio of a given supply of rough rice to the subsequent supply of cleaned rice tends to prevent these supply factors having the same effect on their respective prices. The demand for rough rice is in the nature of a derived demand, and because of this fact might have a slightly different effect on rough-rice prices than it has on cleaned-rice prices.

The only reliable series of prices for rough rice that could be obtained was that as of December 1, issued by the Division of Crop and Livestock Estimates, Bureau of Agricultural Economics, and published in the United States Department of Agriculture Yearbook. These prices are for an average of all grades of rough rice selling at that time.

A multiple correlation of the same independent variables used in the November-to-February monthly cleaned-rice price analysis, with Louisiana rough-rice prices as of December 1 deflated with Bureau of

Labor Statistics all-commodity price index (1926 = 100), yielded the following results:

Correlation coefficient 0.979. Average error of estimate was 3.9 cents per bushel, or 3.7 per cent of the mean. (Fig. 15.) The regression equation was:

$$X_1 = 7.746 - 1.323 X_{12} - 1.201 X_{13} + 0.016 X_{14}$$

### ACREAGE CHANGES DUE TO PRICES

The first section of this bulletin explains how prices are related to changes in farm-management practices among rice farmers. It therefore remains to record only the remainder of the analysis of the influence of prices on acreage changes.
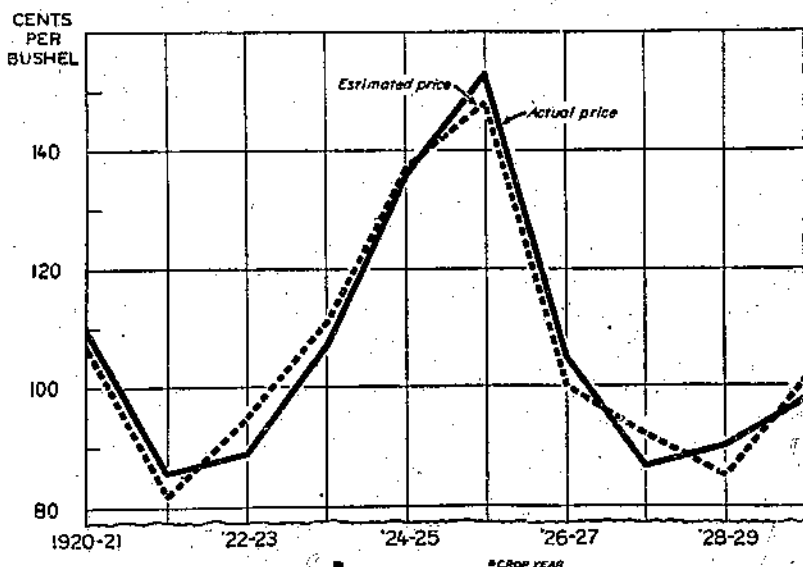


FIGURE 15.—ACTUAL AND ESTIMATED DECEMBER 1 PRICE PER BUSHEL OF ROUGH RICE RECEIVED BY PRODUCERS IN LOUISIANA, 1920–1929

Prices were estimated from estimating formula developed in farm-price correlation.

The prices used in the acreage study was United States farm price of rough rice as of December 1, divided by the Bureau of Labor's farm-products index. The index was used in part to reduce all prices within the series to a comparable basis. An increase in price in the adjusted series should indicate to the farmer that rice prices are higher as compared with commodities in general and that the spread between costs and price is greater. A number of farm crops are constantly competing for the use of farm land. Therefore, to determine the influence which rice prices have on changes in rice acreage, it is necessary to calculate the changes in rice prices with respect to other farm products. An increase in rice prices, for example, would not induce a farmer to keep land in rice the year it was scheduled for dry farming, if the price of the crops grown without irrigation had made a similar or greater increase. This comparison is made by dividing actual prices of rice by the farm-products index.

It was discovered that the adjusted series had a cyclical trend of the type illustrated in Figure 1. Therefore, it was concluded that the price factor affecting changes in acreage was deviations from this trend.

If the reasoning [15] is correct in regard to farmers' reactions to rice prices, changes in rice acreage can be accounted for as follows: Acreage will vary directly with prices one and three years previous and inversely with prices two years before.

A multiple correlation to test the accuracy of the above conclusions results in the following analysis:

The dependent variable was changes in rice acreage. Since it was necessary to take into account the effect of a secular trend, actual acreage changes were not used. In their stead link relatives were used, each year's acreage being expressed as a percentage of the previous year. Deviations from the cyclical trend of adjusted farm prices were used as independent variables. Three variables were constructed from this series of price deviations, one from previous-year prices, one from prices two years before, and one from prices three years before. This analysis covered the period 1910 to 1929 inclusive.

$X_1$ = percentage changes in rice acreage.
$X_9$ = deviations from trend of prices lagged one year.
$X_{10}$ = deviations from trend of prices lagged two years.
$X_{11}$ = deviations from trend of prices lagged three years.

The coefficient of correlation was 0.826, which indicates that this factor, in its various forms, accounts for too little of the changes in acreage to give the results of this particular analysis much value in forecasting acreage. If, however, the problem be to determine the nature and extent of farmers' reaction to prices, and not primarily to forecast acreage, the above analysis contributes something toward its solution. An analysis of acreage changes that could be used as a basis for estimating acreage probably should include factors other than price.

The fault may lie in the fundamental assumption regarding the reaction of rice farmers to price and the subsequent treatment of the price data used in the analysis. It is true that some farmers' acreage is practically determined by certain interested credit organizations, which may account for that acreage remaining unchanged when the majority is changing in response to the price stimulus.

The regression equation evolved from this correlation is as follows:

$$X_1 = 102.40188 + 1.006877X_9 - 0.08136943X_{10} + 0.51903049X_{11}$$

It should be noted that the regression coefficients of $X_9$ and $X_{11}$ are positive, thus indicating that prices one and three years previous vary directly with acreage, whereas the minus coefficient of $X_{10}$ indicates an inverse relationship for prices two years before.

Another point of interest in this study is the closeness with which each independent variable is associated with changes in acreage, shown as follows:

$X_9$ price lagged one year     $d_{12 \cdot 34} = 0.507$.
$X_{10}$ price lagged two years     $d_{13 \cdot 24} = 0.0258$.
$X_{11}$ price lagged three years     $d_{14 \cdot 23} = 0.15$.

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[15] See discussion on relation of farm price to acreage changes in the first part of this study.

California-grown rice is consumed mainly in California, Hawaii, and in certain foreign countries, principally Japan. The quantity of rice purchased abroad by Japan is very large as compared to California's exportable surplus. Japan begins to buy California rice in rather large quantities when the differential between San Francisco and Tokyo price becomes favorable. It is therefore reasonable to assume that one of the factors affecting the price of California-Japan rice is the price of rice at Tokyo, Japan.

The competition of substitute rices, while an important factor at all times, assumes greater importance as the price of California rice rises; that is, the competition of Blue Rose, when Japan-type prices are relatively high, is such that demand for California-Japan falls off
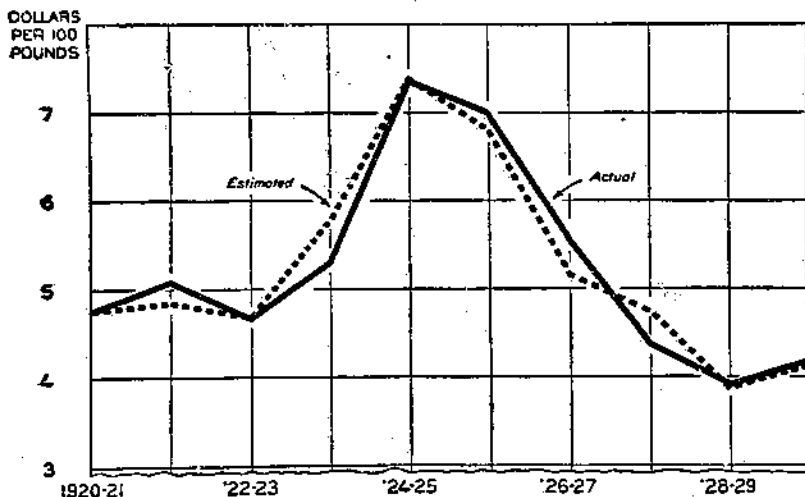


FIGURE 16.—ACTUAL AND ESTIMATED AVERAGE PRICE OF FANCY CALIFORNIA-JAPAN RICE AT SAN FRANCISCO, 1920–21 TO 1929–30

Price estimated from estimating formula developed in California-Japan price study.

rapidly when the differential between it and Blue Rose gets below normal. This suggests that the supply of the southern belt is another factor affecting California price. The supply of California-grown rice is obviously a factor affecting price.

A multiple correlation to measure the extent to which these factors affect San Francisco price for the period 1920–1930 gave a correlation coefficient of 0.9688, the average error being 18. 0 cents per 100 pounds, or 3.41 per cent. (Fig. 16.) The independent variables used were:

$X_5$ estimated yearly average price of middle-quantity Brown rice at Tokyo.
$X_{12}$ logarithms of California production plus carry-over, in millions of pounds.
$X_{13}$ logarithms of southern production plus carry-over, in millions of pounds.
$X_{14}$ a time series beginning with 1 at 1920.

The dependent variable was San Francisco yearly average price of Fancy Japan deflated by Bureau of Labor's index of wholesale prices—

1926 = 100.   The regression equation resulting from the above correlation was:

$$X_1 = 19.701 - 3.613X_{12} - 3.657X_{13} + 0.041X_{14} + 0.869X_5 \text{ }^{[16]}$$

### RICE PRICES IN JAPAN

The amount consumed tends to vary inversely with the price. The fact that consumption increases during a period of years is not, in itself, evidence of increasing demand.   If, however, it is found that the amount consumed increases during a period when the unit value or price remained constant, that is evidence of an increase in demand. Since demand exerts an influence on production through the medium of price, it is to be expected that production will increase as demand increases, of course with the lag inherent to the rice-growing industry. The law of increasing costs in rice production in Japan proper tends to prevent production from increasing so fast as demand.

During the period 1873 to 1927, inclusive, consumption increased at the rate of 450,000 koku (141,400,000 pounds) annually, whereas increase in production has been at the rate of 400,000 koku (125,700,-000 pounds) annually.   The line representing trend in consumption, beginning in 1873, is only a little below the beginning of the trend in production, but crosses the trend in production in 1881 and remains above for the remainder of the period.[17]   It is obvious therefore that the elimination of the trend in production in Japan does not account for all the increase in demand.   That portion of Japanese demand not satisfied by local production must seek rice from outside sources.

Japan's colonies of Taiwan and Chosen [18] produce surpluses of rice of a type acceptable to the Japanese, at a slight discount under Japan-produced rice.   Rice from Taiwan and Chosen usually comes into Japan free of import duty;[19] therefore this source of supply is next in importance to rice produced in Japan proper.   The production of the Japanese Empire is, however, normally inadequate to satisfy the Japanese demand.   Imports of rice from Siam, French Indo-China, and India are next in importance in satisfying the Japanese demand. As a supply factor affecting price in Japan, production in these countries, rather than their exports to Japan, is the factor that exerts an influence on price.   This is true because not only that rice which is sold to Japan, but the potential supply not sold but available for sale, affects price.[20]

The supply factors found to affect Tokyo price were: (1) Production in Japan proper, to which was added production in Taiwan and Chosen and the carry-over of all rices in Japan; (2) production in Siam, French Indo-China, and India.   The latter factor was changed to logarithms in the correlation, because when a dot chart was made to show this supply factor and Tokyo price, the supply-price curve resembled a logarithmic curve.

[16] A somewhat better correlation was obtained by substituting California production plus mill carry-over in millions of pounds (excluding carry-over in farmers' hands) for $X_{13}$, and eliminating $X_{12}$.
[17] Both trends were fitted to the data by the method of least squares for the period 1873–1927, inclusive.
[18] Taiwan has been part of the Japanese Empire since 1895 and Chosen since 1905.   However, only since 1913 has Chosen enjoyed free trade with Japan proper.
[19] The price-stabilization commission may for short periods levy an import duty on colonial rice.
[20] Discussion of Indian production influence on New Orleans prices gives further reasons for using production rather than exports in the correlations.

The forces of supply and demand exert influences which determine the value of rice. However, because of the fluctuating value of money the price of rice, being value per unit expressed in money, may change while the value of rice remains constant. Rice prices may also change because of changes in the value of rice. This study is primarily for the purpose of measuring the changes in price of rice resulting from changes in the value of rice. The changes in price resulting from fluctuations in the value of money are accounted for in this correlation by using an index of wholesale prices in Japan as an independent variable.[21]

The period studied was from 1900 to 1927, inclusive, that being the longest period for which the data used were available. The price series studied was a yearly average price of middle-quality brown rice obtained by averaging monthly prices for the year October to September, inclusive.

The linear multiple correlation of production of Japanese Empire plus carry-over of all rice with trend removed as $X_2$, production of Siam, French Indo-China, and India with trend removed as $X_3$, and the index of wholesale prices in Japan as $X_4$, with yearly average price of middle quality brown rice at Tokyo as $X_1$, resulted in a coefficient of 0.9855.[22] The average error was 0.26 cent per pound, or 6.92 per cent of the mean.

The regression equation derived from the above correlation was—

$$X_1 = 7.615 - 0.28175\ X_2 - 2.0647\ X_3 + 2.29203\ X_4$$

The total determinate shows that while a large percentage of the fluctuations of price have been accounted for, there are some unaccounted for.[23] No doubt the errors occurred partly because the method used assumed a linear relationship between price and the principal supply factor, whereas the normal relationship is a curve. It is often possible to account for this curved relationship by the use of logarithms. If, however, the true function has a coefficient of elasticity greater or less than that of a logarithmic curve, the analysis can be accomplished with greater accuracy by the method of successive graphic approximations. The method of determining the index of multiple curvilinear correlation developed by Mordecai Ezekiel, of the Bureau of Agricultural Economics, United States Department of Agriculture, was followed.[24]

Multiple curvilinear correlation analysis proceeds from the point where the linear analysis, explained above, stops. It is an attempt to account for the error of estimate in the multiple linear correlation. By using the estimating formula $X_1 = 7.615 - 0.28175 X_2 - 2.0647 X_3 + 2.29203\ X_4$ the estimating value ($X^1$) for each observation was obtained. $X_1 - X_1^1 =$ the residual values ($Z$) with which this method deals. To obtain the curvilinear function in each of the three cases

[21] Index of wholesale prices obtained from the Bank of Japan, base 1900.

[22] Trend fitted by method of least squares for period 1900-1927, inclusive.

[23] Fair results were obtained for a shorter period, 1914-1927, when the actual price in yen per koku was deflated by the Bank of Japan's all-commodity index of prices and correlated with (1) production of Japan, Taiwan, and Chosen plus carry-over in Japan expressed in millions of koku; (2) production in India, Siam, and French Indo-China expressed in billions of pounds; and (3) a time series. The correlation coefficient was 0.9362 with an average error of 0.61 yen per koku or 8 per cent.

[24] EZEKIEL, M. A METHOD OF HANDLING CURVILINEAR CORRELATION FOR ANY NUMBER OF VARIABLES. Jour. Amer. Statis. Assoc. 19: [431]-453, illus. 1924.

of independent variables the following steps were taken in the order named.[25]

On a piece of graph paper the net regression line of $X_1$ on $X_2$ was constructed, then the residuals were plotted on the figure with their $X_2$ value for abscissa and the value of $Z$ as ordinate from the net regression line as zero base.[26]   For convenience in drawing a new net regression line the residuals were divided into groups along the old net regression line and an average value calculated for each group. A smooth curve connecting these averages would obviously give a new regression line which would fit equally as well as the old regression line and probably better.   It was found, however, that any line that could be drawn through all of these average values would be a curve that did not correspond to the general shape of a function of price on this type of price-making factor.   Keeping in mind the limitations on shape of curve that could be used in this case, a curve was drawn as close to the average of the residual values as possible and thus a net regression curve was constructed.

By the same method a net regression curve was constructed for $X_1$ on $X_3$.   In the case of $X_4$ it was found that the linear net regression line fitted better than a curve.

The net regression curves referred to above are in reality only approximations to the true net regression curves.   Only the linear effect of the remaining two independent variables in each case has been eliminated.   It was necessary to make some adjustments in these first approximation curves to eliminate the curvilinear effect of the two remaining variables in each case.   To do that it was necessary to obtain new estimates for $X_1$ and the resulting residuals.[27] Table 3 gives the results of these computations.

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[25] Mordecai Ezekiel has said to the author: "The problem in its simplest outlines may be stated as follows: Given a series of paired observations of the values of a dependent variable $X_1$, and two or more independent variables $X_2$, $X_3$, $X_4$, etc., required to find the change in $X_1$ accompanying changes in $X_2$, $X_3$, and $X_4$, in turn, while holding remaining independent factors constant, so that for any given values of $X_2$, $X_3$, and $X_4$, etc., values may be estimated for $X_1$, according to the regression equation

$$X_1 = a + f_1(X_2) + f_3(X_3) + f_4(X_4) + \text{etc.}$$

The expression '$f_2(X_2)$' is used here simply as a general term meaning any regular change in $X_1$ for given changes in $X_2$, whether describable by a straight line or a curve."

[26] The equation for the net regression line is as follows:

$$X_1 = a + b_2 X_2 + b_3 M_3 + b_4 M_4$$

[27] New estimated values for $X_1$ ($X_1''$) based on curvilinear relationships were obtained by the formula—

$$X_1'' = a'_{1.234} + f'_2(X_2) + f'_3(X_3) + f'_4(X_4); \text{ the constant } a'_{1.234} = M_1 - \frac{\Sigma[f'_2(X_2) + f'_3(X_3) + f'_4(X_4)]}{N}$$

and the residuals by the formula $X_1 - X_1'' = Z''$.   Formulas developed by Ezekiel.

TABLE 3.—*Results of computing $X''_1$ and $Z''$*

| Year beginning Oct. 1 | $f'_2(X_2)$ | $f'_3(X_3)$ | $f'_1(X_1)$ | $\Sigma$ | $X''_1$ | $X_1$ | $Z''$ |
|---|---|---|---|---|---|---|---|
| 1900–1901 | 3.95 | 3.92 | 1.89 | 9.76 | 2.21 | 1.89 | −0.32 |
| 1901–2 | 3.44 | 3.97 | 1.89 | 9.30 | 1.75 | 2.03 | +.28 |
| 1902–3 | 4.41 | 3.81 | 1.98 | 10.20 | 2.65 | 2.35 | −.30 |
| 1903–4 | 3.76 | 3.90 | 2.12 | 9.78 | 2.23 | 2.08 | −.15 |
| 1904–5 | 3.05 | 3.90 | 2.28 | 9.23 | 1.68 | 2.00 | +.32 |
| 1905–6 | 3.44 | 3.91 | 2.39 | 9.74 | 2.19 | 2.28 | +.09 |
| 1906–7 | 3.97 | 3.95 | 2.58 | 10.50 | 2.95 | 2.57 | −.38 |
| 1907–8 | 3.74 | 3.97 | 2.53 | 10.24 | 2.69 | 2.60 | −.09 |
| 1908–9 | 3.65 | 3.97 | 2.39 | 10.01 | 2.46 | 2.22 | −.24 |
| 1909–10 | 3.52 | 3.81 | 2.42 | 9.75 | 2.20 | 1.95 | −.25 |
| 1910–11 | 4.38 | 3.82 | 2.51 | 10.71 | 3.16 | 2.67 | −.49 |
| 1911–12 | 3.86 | 3.84 | 2.64 | 10.34 | 2.79 | 3.17 | +.38 |
| 1912–13 | 4.21 | 3.81 | 2.69 | 10.71 | 3.16 | 3.41 | +.25 |
| 1913–14 | 3.71 | 3.76 | 2.62 | 10.09 | 2.54 | 2.86 | +.32 |
| 1914–15 | 2.87 | 3.86 | 2.53 | 9.26 | 1.71 | 2.09 | +.38 |
| 1915–16 | 3.11 | 3.41 | 3.03 | 9.55 | 2.00 | 2.07 | +.07 |
| 1916–17 | 3.16 | 3.25 | 3.84 | 10.25 | 2.70 | 2.81 | +.11 |
| 1917–18 | 3.73 | 3.11 | 5.12 | 11.96 | 4.41 | 4.49 | +.08 |
| 1918–19 | 4.00 | 3.95 | 6.29 | 14.24 | 6.69 | 6.87 | +.18 |
| 1919–20 | 3.57 | 3.76 | 8.01 | 15.34 | 7.79 | 7.89 | +.10 |
| 1920–21 | 3.13 | 3.88 | 5.76 | 12.77 | 5.22 | 4.60 | −.62 |
| 1921–22 | 3.98 | 3.55 | 5.81 | 13.34 | 5.79 | 5.95 | +.16 |
| 1922–23 | 3.49 | 3.55 | 5.51 | 12.55 | 5.00 | 4.97 | −.03 |
| 1923–24 | 3.71 | 3.89 | 5.90 | 13.50 | 5.95 | 5.87 | −.08 |
| 1924–25 | 4.41 | 3.78 | 5.90 | 14.09 | 6.54 | 6.63 | +.09 |
| 1925–26 | 4.36 | 3.86 | 5.28 | 13.50 | 5.95 | 6.19 | +.24 |
| 1926–27 | 4.44 | 3.86 | 4.82 | 13.12 | 5.57 | 5.72 | +.15 |
| 1927–28 | 4.32 | 3.89 | 4.80 | 13.01 | 5.46 | 5.26 | −.20 |
| Total | 105.37 | 105.94 | 105.53 | 316.84 | 105.44 | 105.49 | ......... |
| Mean | 3.7632 | 3.7836 | 3.77 | 11.32 | 3.77 | 3.77 | ......... |
| $a'_{1.n4}$ | | | | −7.55 | | | |

The standard deviation of $Z''$ is 0.266, whereas it was 0.3076 cent for the residuals of the linear computation, thus showing that the estimate based on curvilinear functions was more satisfactory than was the estimate from linear functions.

A second series of approximation regression curves was then constructed to determine the change in the estimates when the net curvilinear effect of the remaining independent variables is eliminated. The same method used to construct the first approximation curves was employed. The first approximation curves were used as net regression curves (the zero base) from which the $Z''$ values were plotted. After constructing the second approximation curves the values of $X_1$ corresponding to given values of each of the independent variables were read off from the function in the same manner as in the case of the first approximation curves. Table 4 shows the results of computations in obtaining the values of $X_1$ ($X_1'''$) and the residuals ($Z'''$) based on the second approximation curves. (Figs. 17 and 18.)
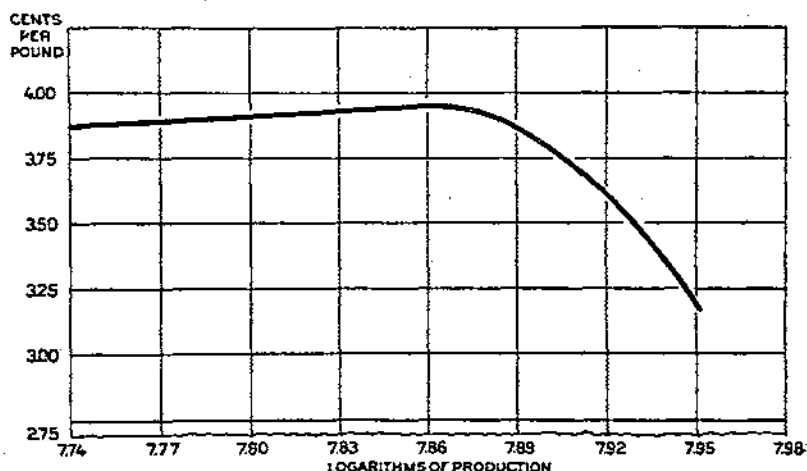
FIGURE 17.—RELATION BETWEEN PRICE OF MIDDLE-QUALITY BROWN RICE AT TOKYO AND PRODUCTION IN INDIA, SIAM, AND FRENCH INDO-CHINA, 1900–1901 TO 1927–28
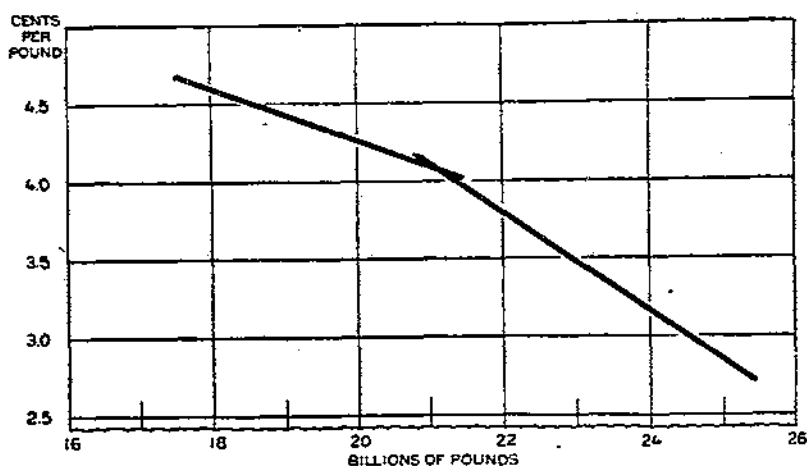


FIGURE 18.—RELATION BETWEEN PRICE OF MIDDLE-QUALITY BROWN RICE AT TOKYO, AND PRODUCTION PLUS CARRY-OVER IN THE JAPANESE EMPIRE, 1900–1901 TO 1927–28

Net regression of price of middle-quality Brown rice at Tokyo on two supply factors. Readings from these curves were used in making the price estimates shown in Figure 19.

TABLE 4.—*Results of computing $X_1'''$ and $Z'''$*

| Year beginning Oct. 1 | $f_2''(X_2)$ | $f_3''(X_3)$ | $f_4''(X_4)$ | $\Sigma$ | $X_1'''$ | $X_1$ | $Z'''$ |
|---|---|---|---|---|---|---|---|
| 1900–1901 | 3.87 | 3.87 | 1.89 | 9.63 | 2.07 | 1.89 | −0.18 |
| 1901–2 | 3.44 | 3.87 | 1.89 | 9.20 | 1.64 | 2.03 | +.39 |
| 1902–3 | 4.36 | 3.90 | 1.98 | 10.24 | 2.68 | 2.35 | −.33 |
| 1903–4 | 3.74 | 3.89 | 2.12 | 9.75 | 2.19 | 2.08 | −.11 |
| 1904–5 | 3.06 | 3.89 | 2.28 | 9.23 | 1.67 | 2.00 | +.33 |
| 1905–6 | 3.44 | 3.89 | 2.39 | 9.72 | 2.16 | 2.28 | +.12 |
| 1906–7 | 3.97 | 3.87 | 2.58 | 10.42 | 2.86 | 2.57 | −.29 |
| 1907–8 | 3.74 | 3.86 | 2.53 | 10.13 | 2.57 | 2.60 | +.03 |
| 1908–9 | 3.63 | 3.86 | 2.39 | 9.88 | 2.32 | 2.22 | −.10 |
| 1909–10 | 3.49 | 3.92 | 2.42 | 9.83 | 2.27 | 1.95 | −.32 |
| 1910–11 | 4.25 | 3.92 | 2.51 | 10.68 | 3.12 | 2.67 | −.45 |
| 1911–12 | 3.84 | 3.94 | 2.64 | 10.42 | 2.86 | 3.17 | +.31 |
| 1912–13 | 4.13 | 3.92 | 2.69 | 10.74 | 3.18 | 3.41 | +.23 |
| 1913–14 | 3.70 | 3.89 | 2.62 | 10.21 | 2.65 | 2.86 | +.21 |
| 1914–15 | 2.94 | 3.94 | 2.53 | 9.41 | 1.85 | 2.09 | +.24 |
| 1915–16 | 3.16 | 3.51 | 3.03 | 9.70 | 2.14 | 2.07 | −.07 |
| 1916–17 | 3.17 | 3.35 | 3.84 | 10.36 | 2.80 | 2.81 | +.01 |
| 1917–18 | 3.73 | 3.17 | 5.12 | 12.02 | 4.46 | 4.49 | +.03 |
| 1918–19 | 3.98 | 3.87 | 6.29 | 14.14 | 6.58 | 6.87 | +.29 |
| 1919–20 | 3.55 | 3.90 | 8.01 | 15.46 | 7.90 | 7.89 | −.01 |
| 1920–21 | 3.17 | 3.90 | 5.76 | 12.83 | 5.27 | 4.60 | −.67 |
| 1921–22 | 3.97 | 3.65 | 5.81 | 13.43 | 5.87 | 5.95 | +.08 |
| 1922–23 | 3.44 | 3.65 | 5.51 | 12.60 | 5.04 | 4.97 | −.07 |
| 1923–24 | 3.70 | 3.92 | 5.90 | 13.52 | 5.96 | 5.87 | −.09 |
| 1924–25 | 4.36 | 3.90 | 5.90 | 14.16 | 6.60 | 6.63 | +.03 |
| 1925–26 | 4.22 | 3.95 | 5.28 | 13.45 | 5.89 | 6.19 | +.30 |
| 1926–27 | 4.51 | 3.95 | 4.82 | 13.28 | 5.72 | 5.72 | +.00 |
| 1927–28 | 4.19 | 3.90 | 4.80 | 12.89 | 5.33 | 5.26 | −.07 |
| Total | 104.75 | 107.05 | 105.53 | 317.33 | 105.65 | 105.40 | .......... |
| Mean | 3.74 | 3.82 | 3.77 | 11.3332 | 3.77 | 3.77 | .......... |
| $\sigma_{1.24}'$ | | | | −7.56 | | | .......... |

The standard deviation of the last set of residuals ($Z'''$) was 0.2488 cent, being somewhat smaller than in either of the former computations. Further approximation curves failed to reduce the standard deviation of the residuals, therefore it was concluded that the values of $X_1$ derived from the second approximation curves were the best that could be obtained by that method. The "Bruce adjustment"[28] was also tried, but no better results were obtained.

The next step was to calculate the index of correlation from the computations based on the last approximation curves. Using the formula

$$P = \sqrt{1 \cdot \frac{-\sigma^2{}_{z'''}}{\sigma^2{}_{X_1}}}$$

the index of correlation was 0.9906 and the index of total determination was 0.9818. The average error was 0.201 cent per pound or 5.08 per cent of the mean of $X_1$. (Fig. 19.)

A larger part of the price fluctuations were accounted for during the latter half than during the first half of the period studied. (Fig. 19.) The greatest error of estimate for the latter half of the period was for 1920. The demand, owing to the post-war depression and falling off of employment, was less than normal and therefore caused estimated price, which was based on normal demand, to be higher than actual price.

The conclusions of the linear correlation were stated by means of the regression equation.

$$X_1 = 7.615 - 0.28175\,X_2 - 2.0647\,X_3 + 2.29203\,X_4$$

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[28] This method consists merely of finding the function for the equation $X_1'''' = \Theta\,[a + f_2'''(X_2) + f_3'''(X_3) + f_4'''(X_4)]$.

Since the regression curves used in the curvilinear correlation were of
free-hand construction and can not be expressed by a mathematical
equation, it is necessary to use some other form of expression.
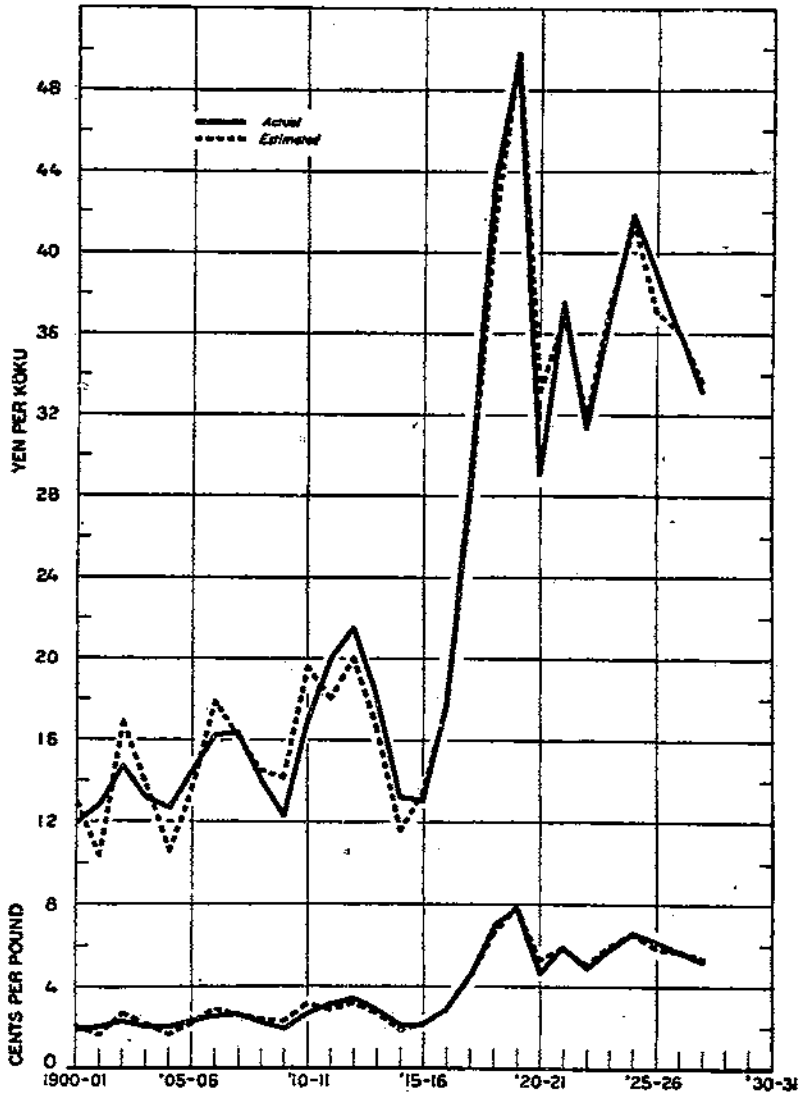


FIGURE 19.—ACTUAL AND ESTIMATED AVERAGE PRICE OF MIDDLE-QUALITY
BROWN RICE AT TOKYO, 1900–1901 TO 1927–28

Prices were estimated from net regression curves developed in Tokyo price correlation.

In the following manner each of the functions is stated to show the
value of $X_1$ associated with certain values of each independent variable
when the other two are held constant at their respective means.

The most important independent variable is $X_4$; therefore it was
decided to state the value of $X_1$ associated with given values of $X_4$ in

terms of actual values, whereas in the case of $X_2$ and $X_3$ the associated values are stated as deviations from the values, otherwise expected. The following formula developed by Mr. Ezekiel was used to obtain the actual values of $X_1$ associated with given values of $X_4$ with $X_2$ and $X_3$ held constant at their respective means. Let $F_4(X_4)$ represent the above-mentioned values of $X_1$, then

$$F_4(X_4) = f_4(X_4) - M_{f_4(X_4)} + M_1.$$

In view of the fact the function of $X_1$ on $X_4$ was the same as the net regression line calculated from the linear multiple correlation, it is possible to calculate the values for $f_4(X_4)$ by the following formula:

$$f_4(X_4) = 12.44 - 0.557699(M_2) - 12.911915(M_3) + 0.1446\, X_4.$$

The first formula can be further simplified in this case since $M_{f_4(X_4)}$ and $M_1$ have the same values they cancel leaving $F_4(X_4) = f_4(X_4)$.

If we use $F_2(x_2)$ and $F_3(x_3)$ to designate the deviations from the expected values of $X_1$ in the case of $X_2$ and $X_3$ respectively, then $X'_1 = F_4(X_4) + F_2(x_2) + F_3(x_3)$. To determine the value of $F_2(x_2)$ the following formula was used;

$$F_2(x_2) = f_2(X_2) - M_{f_2(X_2)}$$

Table 5 shows the results of this formula for each of the observa tions. $F_3(x_3)$ also was calculated by this formula and the results are shown in Table 6.

TABLE 5.—*Deviations of prices from those otherwise expected for $X_2$*

| Year beginning Oct. 1 | $X_2$ | $f_2(X_2)$ | $M_{f_2(X_2)}$ | $F_2(x_2)$ | Year beginning Oct. 1 | $X_2$ | $f_2(X_2)$ | $M_{f_2(X_2)}$ | $F_2(x_2)$ |
|---|---|---|---|---|---|---|---|---|---|
| 1900–1901 | 21.7 | 3.87 | 3.74 | 0.13 | 1914–15 | 24.9 | 2.94 | | −0.80 |
| 1901–2 | 23.2 | 3.44 | | −.30 | 1915–16 | 24.0 | 3.16 | | −.59 |
| 1902–3 | 19.4 | 4.36 | | .62 | 1916–17 | 23.9 | 3.17 | | −.57 |
| 1903–4 | 22.0 | 3.74 | | .00 | 1917–18 | 22.1 | 3.73 | | −.01 |
| 1904–5 | 24.3 | 3.06 | | −.68 | 1918–19 | 21.4 | 3.96 | | .24 |
| 1905–6 | 22.8 | 3.44 | | −.30 | 1919–20 | 22.6 | 3.55 | | −.19 |
| 1906–7 | 21.4 | 3.97 | | .23 | 1920–21 | 23.9 | 3.17 | | −.57 |
| 1907–8 | 22.0 | 3.74 | | .00 | 1921–22 | 21.4 | 3.97 | | .23 |
| 1908–9 | 22.3 | 3.63 | | −.11 | 1922–23 | 22.8 | 3.44 | | −.30 |
| 1909–10 | 22.8 | 3.49 | | −.25 | 1923–24 | 22.2 | 3.70 | | −.04 |
| 1910–11 | 20.1 | 4.25 | | .51 | 1924–25 | 19.4 | 4.36 | | .62 |
| 1911–12 | 21.8 | 3.84 | | .10 | 1925–26 | 20.3 | 4.22 | | .48 |
| 1912–13 | 20.9 | 4.13 | | .39 | 1926–27 | 18.6 | 4.51 | | .77 |
| 1913–14 | 22.3 | 3.70 | | −.04 | 1927–28 | 20.5 | 4.19 | | .45 |

TABLE 6.—*Deviations of prices from those otherwise expected for $X_3$*

| Year beginning Oct. 1 | $X_3$ | $f_3(X_3)$ | $M_{f_3(X_3)}$ | $F_3(x_3)$ | Year beginning Oct. 1 | $X_3$ | $f_3(X_3)$ | $M_{f_3(X_3)}$ | $F_3(x_3)$ |
|---|---|---|---|---|---|---|---|---|---|
| 1900–1901 | 0.8041 | 3.87 | 3.82 | 0.05 | 1914–15 | 0.8751 | 3.94 | | 0.12 |
| 1901–2 | .7745 | 3.87 | | .05 | 1915–16 | .9289 | 3.51 | | −.31 |
| 1902–3 | .8363 | 3.90 | | .08 | 1916–17 | .9465 | 3.35 | | −.47 |
| 1903–4 | .8129 | 3.89 | | .07 | 1917–18 | .9513 | 3.17 | | −.65 |
| 1904–5 | .8149 | 3.89 | | .07 | 1918–19 | .7038 | 3.87 | | .05 |
| 1905–6 | .8136 | 3.89 | | .07 | 1919–20 | .8882 | 3.90 | | .08 |
| 1906–7 | .7875 | 3.87 | | .05 | 1920–21 | .8414 | 3.90 | | .08 |
| 1907–8 | .7466 | 3.86 | | .04 | 1921–22 | .9165 | 3.65 | | −.17 |
| 1908–9 | .7505 | 3.86 | | .04 | 1922–23 | .9180 | 3.65 | | −.17 |
| 1909–10 | .8902 | 3.92 | | .10 | 1923–24 | .8420 | 3.92 | | .10 |
| 1910–11 | .7785 | 3.92 | | .10 | 1924–25 | .8837 | 3.90 | | .08 |
| 1911–12 | .7768 | 3.94 | | .12 | 1925–26 | .8681 | 3.95 | | .13 |
| 1912–13 | .8808 | 3.92 | | .10 | 1926–27 | .8621 | 3.95 | | .13 |
| 1913–14 | .8915 | 3.89 | | .07 | 1927–28 | .8344 | 3.90 | | .08 |

Table 7 shows the result of computing the values of $X_1$ associated with given values of $X_4$ when the values of $X_2$ and $X_3$ were held at their respective means, and the deviations of $X_1$ values from those otherwise expected for given values of $X_2$ and $X_3$ respectively. $X'_1$ was computed by the following formula:

$$X'_1 = F_4(X_4) + F_2(x_2) + F_3(x_3).$$

TABLE 7.—*Computed values of $X_1$*

| Year beginning Oct. 1 | $F_4(X_4)$ | $F_2(x_2)$ | $F_3(x_3)$ | $X'_1$ | $X_1$ | $z$ |
|---|---|---|---|---|---|---|
| 1900–1901 | 1.89 | 0.13 | 0.05 | 2.07 | 1.89 | 0.18 |
| 1901–2 | 1.89 | −.30 | .05 | 1.64 | 2.03 | +.39 |
| 1902–3 | 1.98 | .62 | .08 | 2.68 | 2.35 | −.33 |
| 1903–4 | 2.12 | .0 | .07 | 2.19 | 2.08 | −.11 |
| 1904–5 | 2.28 | −.68 | .07 | 1.67 | 2.00 | +.33 |
| 1905–6 | 2.39 | −.30 | .07 | 2.16 | 2.28 | +.12 |
| 1906–7 | 2.58 | .23 | .05 | 3.86 | 2.57 | −.29 |
| 1907–8 | 2.53 | .0 | .04 | 2.57 | 2.60 | +.03 |
| 1908–9 | 2.39 | −.11 | .04 | 2.32 | 2.22 | −.10 |
| 1909–10 | 2.42 | −.25 | .10 | 2.27 | 1.95 | −.32 |
| 1910–11 | 2.51 | .51 | .10 | 3.12 | 2.67 | −.45 |
| 1911–12 | 2.64 | .10 | .12 | 2.86 | 3.17 | +.31 |
| 1912–13 | 2.69 | .39 | .10 | 3.18 | 3.41 | +.23 |
| 1913–14 | 2.62 | −.04 | .07 | 2.65 | 2.86 | +.21 |
| 1914–15 | 2.53 | −.80 | .12 | 1.85 | 2.09 | +.24 |
| 1915–16 | 3.03 | −.58 | −.31 | 2.14 | 2.07 | −.07 |
| 1916–17 | 3.84 | −.57 | −.47 | 2.80 | 2.81 | +.01 |
| 1917–18 | 5.12 | −.01 | −.65 | 4.46 | 4.49 | +.03 |
| 1918–19 | 6.29 | .24 | .05 | 6.58 | 6.87 | +.29 |
| 1919–20 | 8.01 | −.19 | .08 | 7.90 | 7.89 | −.01 |
| 1920–21 | 5.76 | −.57 | .08 | 5.27 | 4.60 | −.67 |
| 1921–22 | 5.81 | .23 | −.17 | 5.87 | 5.95 | +.08 |
| 1922–23 | 5.51 | −.30 | −.17 | 5.04 | 4.97 | −.07 |
| 1923–24 | 5.90 | −.04 | .10 | 5.96 | 5.87 | −.09 |
| 1924–25 | 5.90 | .62 | .08 | 6.60 | 6.63 | +.03 |
| 1925–26 | 5.28 | .48 | .13 | 5.89 | 6.19 | +.30 |
| 1926–27 | 4.82 | .77 | .13 | 5.72 | 5.72 | .00 |
| 1927–28 | 4.80 | .45 | .08 | 5.33 | 5.26 | −.07 |

## SUMMARY

The size of the United States rice crop, together with carry-over in the United States, is the most important factor affecting domestic prices of rice. The general level of prices of other commodities is also an influential factor. California production is as important as southern production during certain periods of the year on prices of southern rice. Rough rice prices tend to move with prices of milled rice when rough rice is being marketed at a normal rate.

Changes in rice acreage in the southern belt are affected by the prices of rice that have prevailed during the previous three years. The price one year before exerts the most influence. The practice of dry farming or fallowing land every third year to rid it of red rice makes it impracticable for changes in acreage to follow price changes more closely. Acreage changes in the California rice area are closely associated with prices of rice the year before and with the quantity of water available for irrigation.

Consumption of rice per capita in the United States is low. It does not seem likely that there will be any considerable change in the near future, but total national consumption will probably increase because of increases in population. The southern States supply from 80 to 85 per cent of the rice consumed in continental United States, and practically all of the remainder comes from California.

Imports supply about 2 per cent.    Porto Rico is a large buyer of rice grown in the United States.    About 90 per cent of the Porto Rican trade is supplied by the southern States; 10 per cent or less comes from California.    Hawaii takes relatively large quantities of rice grown in the United States each year; practically all of this is supplied by California.    The domestic market, consisting of continental United States and insular possessions, normally takes between 900,000,000 and 1,000,000,000 pounds of the United States crop each year.    The quantity is affected only slightly by the rise and fall of prices.

Rice grown in the United States is exported to a relatively large number of foreign countries.    The total quantity exported varies inversely with prices.    The largest yearly export during the 11-year period 1920–21 to 1930–31 was 511,000,000 pounds in 1921–22 when New Orleans price for Fancy Blue Rose averaged $3.57 per 100 pounds.    The smallest quantity exported during any year of this period was 28,000,000 pounds in 1925–26 when the New Orleans price averaged $6.18.    In foreign markets southern rice competes with rice grown in Burma, Siam, and French Indo-China; the lower grades of Blue Rose suffer most from this competition which is probably most keenly felt in the Cuban market.

California rice is exported mainly to Japan.    Japan normally produces less rice than it consumes.    The deficit is supplied in part from rice grown in Taiwan and Chosen and in part by importations from Asiatic surplus-producing countries and the United States.    Rice is imported from the United States (California) in relatively large quantities only when the price of middle-quality Brown rice at Tokyo is about 1 cent per pound higher than the price of No. 1 Brown at San Francisco.    Rice price changes in Tokyo are affected mainly by changes in supplies of rice grown in Japan, Taiwan, and Chosen and by changes in production of rice in Siam, French Indo-China, and India.    Price changes of California rice at San Francisco are influenced principally by production plus carry-over in California and by changes in prices of Blue Rose at New Orleans and changes in Japanese rice prices at Tokyo.

## APPENDIX

TABLE 8.—*Rice acreage, production, average price per bushel received by producers, and carry-over in the United States, 1904-5 to 1930-31*

| Year beginning Aug. 1 | Acreage | Average yield per acre | Production | | Average price received by producers Dec. 1 | Carry-over rough and cleaned Aug. 1 |
|---|---|---|---|---|---|---|
| | | | Rough | Cleaned | | |
| | *1,000 acres* | *Bushels* | *1,000 bushels* | *1,000,000 pounds* | *Cents* | *1,000,000 pounds* |
| 1904–5 | 662 | 31.9 | 21,096 | 586 | 85.8 | |
| 1905–6 | 482 | 28.2 | 13,607 | 378 | 95.2 | |
| 1906–7 | 575 | 31.1 | 17,855 | 496 | 90.3 | |
| 1907–8 | 627 | 29.9 | 18,738 | 521 | 85.8 | |
| 1908–9 | 655 | 33.4 | 21,890 | 608 | 81.2 | |
| 1909–10 | 610 | 33.8 | 23,607 | 572 | 79.6 | |
| 1910–11 | 723 | 33.9 | 24,510 | 681 | 67.8 | |
| 1911–12 | 695 | 32.9 | 22,934 | 637 | 79.7 | |
| 1912–13 | 723 | 34.7 | 25,054 | 696 | 93.5 | |
| 1913–14 | 827 | 31.1 | 25,744 | 715 | 85.8 | |
| 1914–15 | 694 | 34.1 | 23,849 | 657 | 92.4 | 11 |
| 1915–16 | 803 | 36.1 | 28,947 | 804 | 90.6 | 34 |
| 1916–17 | 869 | 47.0 | 40,861 | 1,135 | 88.9 | 38 |
| 1917–18 | 981 | 35.4 | 34,739 | 965 | 189.6 | 18 |
| 1918–19 | 1,119 | 34.5 | 38,606 | 1,072 | 191.8 | 1 |
| 1919–20 | 1,063 | 39.5 | 41,985 | 1,166 | 266.6 | 17 |
| 1920–21 | 1,338 | 39.0 | 52,066 | 1,446 | 119.1 | 61 |
| 1921–22 | 921 | 40.8 | 37,612 | 1,045 | 95.2 | 186 |
| 1922–23 | 1,055 | 39.2 | 41,405 | 1,150 | 93.1 | 90 |
| 1923–24 | 895 | 37.7 | 33,717 | 937 | 110.2 | 137 |
| 1924–25 | 850 | 37.9 | 32,206 | 895 | 138.6 | 48 |
| 1925–26 | 883 | 37.7 | 33,249 | 924 | 153.8 | 16 |
| 1926–27 | 1,034 | 41.1 | 42,477 | 1,180 | 109.6 | 90 |
| 1927–28 | 1,003 | 44.6 | 44,754 | 1,243 | 92.9 | 115 |
| 1928–29 | 953 | 45.4 | 43,440 | 1,207 | 88.5 | 171 |
| 1929–30 | 868 | 46.6 | 40,462 | 1,124 | 97.7 | 117 |
| 1930–31 | 960 | 43.1 | 41,367 | 1,149 | 76.4 | 80 |

Compiled from records of the Division of Crop and Livestock Estimates with the exception of carry-over, which was compiled from the annual report of the Rice Millers' Association.

TABLE 9.—*Rice acreage, yield per acre, production, and average price per bushel received by producers, by States, 1910–11 to 1930–31*

| Year beginning Aug. 1 | Louisiana | | | | Arkansas | | | | Texas | | | | California | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acreage | Average yield per acre | Production | Price Dec. 1 | Acreage | Average yield per acre | Production | Price Dec. 1 | Acreage | Average yield per acre | Production | Price Dec. 1 | Acreage | Average yield per acre | Production | Price Dec. 1 |
| | *1,000 acres* | *Bushels* | *1,000 bushels* | *Cents* | *1,000 acres* | *Bushels* | *1,000 bushels* | *Cents* | *1,000 acres* | *Bushels* | *1,000 bushels* | *Cents* | *1,000 acres* | *Bushels* | *1,000 bushels* | *Cents* |
| 1910–11 | 371 | 34.4 | 12,769 | 67 | 60 | 40.0 | 2,400 | 70 | 265 | 33.0 | 3,738 | 68 | (1) | 33.0 | 3 | 65 |
| 1911–12 | 371 | 31.5 | 11,693 | 79 | 72 | 39.0 | 2,792 | 82 | 238 | 34.3 | 8,174 | 80 | (1) | 40.0 | 6 | 75 |
| 1912–13 | 353 | 33.5 | 11,812 | 93 | 91 | 37.5 | 3,405 | 94 | 266 | 35.5 | 9,429 | 94 | 1 | 50.0 | 70 | 91 |
| 1913–14 | 406 | 29.0 | 11,760 | 84 | 105 | 36.0 | 3,769 | 90 | 303 | 32.0 | 9,696 | 86 | 6 | 48.0 | 293 | 100 |
| 1914–15 | 336 | 32.1 | 10,802 | 93 | 93 | 39.8 | 3,685 | 90 | 240 | 33.8 | 8,102 | 92 | 15 | 53.3 | 800 | 100 |
| 1915–16 | 401 | 34.2 | 13,714 | 90 | 100 | 48.4 | 4,840 | 95 | 260 | 30.5 | 7,930 | 89 | 34 | 66.7 | 2,268 | 90 |
| 1916–17 | 443 | 46.0 | 20,392 | 90 | 125 | 50.5 | 6,312 | 96 | 235 | 45.0 | 10,575 | 86 | 58 | 59.0 | 3,422 | 78 |
| 1917–18 | 500 | 31.0 | 15,500 | 190 | 152 | 41.0 | 6,232 | 190 | 238 | 30.0 | 7,140 | 200 | 83 | 68.0 | 5,644 | 175 |
| 1918–19 | 580 | 28.8 | 16,704 | 195 | 170 | 37.9 | 6,443 | 180 | 245 | 32.0 | 7,840 | 197 | 112 | 65.5 | 7,336 | 190 |
| 1919–20 | 527 | 35.2 | 18,550 | 271 | 147 | 46.0 | 6,762 | 240 | 217 | 32.0 | 6,944 | 280 | 155 | 60.0 | 9,300 | 267 |
| 1920–21 | 700 | 36.0 | 25,200 | 110 | 175 | 49.0 | 8,575 | 131 | 281 | 34.0 | 9,554 | 125 | 162 | 51.0 | 8,262 | 121 |
| 1921–22 | 480 | 36.0 | 17,280 | 86 | 125 | 53.5 | 6,688 | 92 | 166 | 36.1 | 5,993 | 101 | 135 | 54.0 | 7,290 | 115 |
| 1922–23 | 555 | 36.0 | 19,980 | 89 | 154 | 48.0 | 7,392 | 88 | 191 | 31.2 | 5,959 | 90 | 140 | 55.0 | 7,700 | 110 |
| 1923–24 | 405 | 33.5 | 13,582 | 107 | 135 | 39.5 | 5,332 | 112 | 145 | 40.0 | 5,800 | 115 | 106 | 53.5 | 5,671 | 112 |
| 1924–25 | 440 | 34.6 | 15,224 | 136 | 164 | 42.0 | 6,888 | 138 | 146 | 38.0 | 5,548 | 125 | 90 | 48.5 | 4,365 | 166 |
| 1925–26 | 430 | 33.3 | 14,319 | 153 | 175 | 43.0 | 7,525 | 150 | 162 | 38.0 | 6,156 | 149 | 103 | 46.6 | 4,800 | 170 |
| 1926–27 | 501 | 32.5 | 16,282 | 105 | 199 | 53.0 | 10,547 | 100 | 166 | 41.5 | 6,889 | 110 | 149 | 53.6 | 7,986 | 131 |
| 1927–28 | 500 | 40.0 | 20,000 | 87 | 175 | 44.0 | 7,700 | 90 | 165 | 48.6 | 8,019 | 86 | 160 | 56.0 | 8,960 | 115 |
| 1928–29 | 487 | 38.8 | 18,896 | 90 | 164 | 47.7 | 7,823 | 86 | 163 | 50.0 | 8,150 | 88 | 132 | 61.9 | 8,171 | 88 |
| 1929–30 | 472 | 39.9 | 18,833 | 98 | 156 | 51.0 | 7,956 | 92 | 144 | 51.5 | 7,416 | 97 | 95 | 65.5 | 6,222 | 105 |
| 1930–31 | 491 | 36.0 | 17,676 | 75 | 172 | 46.0 | 7,912 | 73 | 186 | 45.5 | 8,463 | 77 | 110 | 66.1 | 7,271 | 83 |

Compiled from records of the Division of Crop and Livestock Estimates.
1 Less than 500 acres.

TABLE 10.—*Rice consumption in the United States and possessions, United States exports, and total consumption of United States rice, 1918–19 to 1929–30*

| Year beginning Aug. 1 | Consumption in the United States and possessions | | | | | | | | | Foreign rice | United States rice[1] | United States exports[1][2] | Total consumption of United States rice[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Foreign and United States rice | | | | | | | | | | | | |
| | United States | | Porto Rico | | Hawaii[1] | | Alaska | | Total[1] | | | | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | | | | | |
| | 1,000 pockets[3] | Pounds | 1,000 pockets | Pounds | 1,000 pockets | Pounds | 1,000 pockets | Pounds | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets |
| 1918–19 | 5,829 | 5.7 | 1,669 | 114.8 | 433 | 181.2 | 16 | | 7,947 | 438 | 7,509 | 2,191 | 9,700 |
| 1919–20 | 3,632 | 3.4 | 1,405 | 98.6 | 438 | 175.0 | 14 | | 5,489 | 691 | 4,798 | 4,745 | 9,543 |
| 1920–21 | 5,565 | 5.2 | 1,648 | 113.7 | 521 | 199.2 | 8 | | 7,742 | 476 | 7,266 | 4,863 | 12,129 |
| 1921–22 | 4,890 | 4.6 | 1,643 | 113.3 | 472 | 173.0 | 11 | 19.8 | 7,016 | 198 | 6,818 | 4,740 | 11,558 |
| 1922–23 | 5,848 | 5.3 | 1,702 | 117.4 | 562 | 198.0 | 14 | | 8,126 | 315 | 7,811 | 3,249 | 11,060 |
| 1923–24 | 5,890 | 5.3 | 1,824 | 123.3 | 608 | 205.9 | 13 | | 8,335 | 354 | 7,981 | 1,564 | 9,545 |
| 1924–25 | 6,192 | 5.5 | 1,778 | 118.6 | 659 | 215.0 | 12 | | 8,641 | 435 | 8,206 | 744 | 8,950 |
| 1925–26 | 6,060 | 5.8 | 1,860 | 124.0 | 658 | 207.1 | 13 | | 8,591 | 909 | 7,682 | 285 | 7,967 |
| 1926–27 | 6,671 | 5.7 | 1,833 | 122.2 | 696 | 211.6 | 11 | | 9,211 | 464 | 8,747 | 2,381 | 11,128 |
| 1927–28 | 7,370 | 6.2 | 1,932 | 132.9 | 704 | 206.9 | 13 | | 10,019 | 327 | 9,692 | 2,390 | 12,082 |
| 1928–29 | 7,017 | 5.8 | 2,084 | 141.5 | 814 | 231.6 | 13 | | 9,928 | 237 | 9,691 | 3,196 | 12,887 |
| 1929–30 | 6,495 | 5.3 | 1,941 | 125.7 | 832 | 229.4 | 13 | 21.9 | 9,291 | 271 | 9,010 | 2,244 | 11,254 |

Compiled from annual reports of the Rice Millers' Association, New Orleans, except as otherwise stated.

[1] Hawaiian production not included. University of Hawaii reports Hawaiian production, in terms of cleaned rice, for Hawaii as follows: 1919, 15,000,000 pounds; 1924, 24,000,000 pounds; 1927, 17,000,000 pounds.

[2] Compiled from Monthly Summaries of Foreign and Domestic Commerce.

[3] A pocket of cleaned rice weighs 100 pounds.

**TABLE 11.—***United States exports of grain rice by countries, expressed as percentage of total exports, 1921–22 to 1929–30*

[Year beginning August 1]

| Country of destination | 1921–22 | 1922–23 | 1923–24 | 1924–25 | 1925–26 | 1926–27 | 1927–28 | 1928–29 | 1929–30 |
|---|---|---|---|---|---|---|---|---|---|
| | Per cent | Per cent | Per cent | Per cent | Per cent | Per cent | Per cent | Per cent | Per cent |
| Germany | 12.29 | 5.69 | 3.76 | 5.15 | 11.99 | 15.74 | 15.09 | 14.44 | 16.09 |
| United Kingdom | 7.12 | 11.01 | 15.81 | 14.97 | 28.98 | 14.11 | 15.23 | 12.47 | 15.17 |
| Argentina | 1.28 | 5.10 | 2.12 | 14.37 | 8.17 | 5.38 | 5.43 | 11.82 | 11.73 |
| Belgium | 5.68 | 8.97 | 8.01 | 11.27 | 9.11 | 7.97 | 5.66 | 6.94 | 4.16 |
| Canada | 3.42 | 5.50 | 12.03 | 8.80 | 8.62 | 3.17 | 6.17 | 6.38 | 7.70 |
| Netherlands | 4.65 | 5.57 | 9.10 | 2.24 | 2.29 | 8.61 | 10.23 | 6.13 | 6.45 |
| Colombia | .76 | .96 | .39 | 1.00 | 1.58 | .31 | 3.97 | 5.95 | 8.46 |
| France | 5.74 | 8.82 | 3.37 | 4.58 | .95 | 2.23 | 5.28 | 5.15 | 5.96 |
| Chili | 3.73 | 6.76 | 3.86 | 6.95 | 2.01 | 4.23 | 6.29 | 4.85 | 7.96 |
| Cuba | 8.37 | 3.82 | .88 | 1.70 | 10.55 | 2.24 | 11.69 | 4.82 | 2.78 |
| Japan | 29.23 | 20.21 | 27.55 | .67 | 2.25 | 27.18 | .72 | 4.55 | .42 |
| Others [1] | 17.73 | 17.59 | 13.12 | 28.34 | 12.50 | 8.83 | 14.24 | 15.50 | 13.12 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

Compiled from Foreign Commerce and Navigation of the United States and Monthly Summaries of Foreign Commerce of the United States.

[1] The number of countries included in "Others" averaged 52 during the period 1921–22 to 1929–30.

**TABLE 12.—***United States exports of table grades of rice through San Francisco, by months, 1919–20 to 1930–31* [1]

| Month | 1919–20 | | 1920–21 | | 1921–22 | | 1922–23 | |
|---|---|---|---|---|---|---|---|---|
| | To Japan | Total | To Japan | Total | To Japan | Total | To Japan | Total |
| | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds |
| October | 0 | 1,160 | (2) | (2) | 16,746 | 17,836 | 5 | 489 |
| November | 0 | 2,155 | (2) | (2) | 14,736 | 15,667 | 305 | 970 |
| December | 0 | 18,289 | (2) | (2) | 17,578 | 18,989 | 30 | 873 |
| January | (2) | (2) | 0 | 10,196 | 4,108 | 5,253 | 1 | 1,234 |
| February | (2) | (2) | 0 | 235 | 7,078 | 8,158 | 0 | 514 |
| March | (2) | (2) | 0 | 1,094 | 15,651 | 16,713 | 34 | 905 |
| April | (2) | (2) | 0 | 999 | 7,690 | 9,004 | 355 | 1,206 |
| May | (2) | (2) | 0 | 1,266 | 6,215 | 7,240 | 2,225 | 3,763 |
| June | (2) | (2) | 543 | 5,560 | 15,700 | 17,585 | 8,652 | 9,638 |
| July | (2) | (2) | 738 | 10,732 | 22,520 | 23,906 | 22,149 | 23,038 |
| August | (2) | (2) | 2,094 | 7,648 | 14,852 | 15,390 | 2,804 | 3,904 |
| September | (2) | (2) | 3,601 | 10,346 | 4,525 | 4,778 | 17,237 | 18,380 |
| Total | | 21,604 | 6,976 | 48,076 | 147,599 | 160,601 | 53,797 | 64,914 |

| Month | 1923–24 | | 1924–25 | | 1925–26 | | 1926–27 | |
|---|---|---|---|---|---|---|---|---|
| | To Japan | Total | To Japan | Total | To Japan | Total | To Japan | Total |
| | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds | 1,000 pounds |
| October | 1,661 | 2,145 | 58 | 580 | 0 | 2 | 802 | 909 |
| November | 325 | 868 | 336 | 1,751 | 55 | 183 | 1,583 | 2,163 |
| December | 4,669 | 5,375 | 1,161 | 1,180 | 94 | 318 | 880 | 1,657 |
| January | 4,751 | 5,722 | 0 | 80 | 0 | 16 | 10 | 204 |
| February | 1,200 | 1,927 | 0 | 200 | 0 | 72 | 12,063 | 12,669 |
| March | 3,622 | 4,383 | 2,389 | 2,489 | 87 | 170 | 13,199 | 14,173 |
| April | 310 | 1,379 | 0 | 37 | 0 | 174 | 23,070 | 23,390 |
| May | 700 | 1,417 | 0 | 36 | 0 | 320 | 9,790 | 10,346 |
| June | 0 | 1,039 | 0 | 13 | 0 | 228 | 4,099 | 4,620 |
| July | 63 | 534 | 0 | 1 | 209 | 321 | 100 | 354 |
| August | 0 | 333 | 150 | 195 | 230 | 264 | 60 | 239 |
| September | 0 | 342 | 50 | 53 | 428 | 447 | 0 | 365 |
| Total | 17,321 | 25,464 | 4,144 | 6,615 | 1,103 | 2,515 | 65,657 | 71,029 |

[1] Includes rice meal and broken rice prior to Jan. 1, 1922.
[2] Not available.

TABLE 12.—*United States exports of table grades of rice through San Francisco, by months, 1919–20 to 1930–31*—Continued

| Month | 1927–28 | | 1928–29 | | 1929–30 | | 1930–31 | |
|---|---|---|---|---|---|---|---|---|
| | To Japan | Total | To Japan | Total | To Japan | Total | To Japan | Total |
| | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* |
| October | 0 | 603 | 2 | 1,037 | 0 | 276 | 0 | 625 |
| November | 19 | 721 | 30 | 1,771 | 182 | 484 | 3 | 1,198 |
| December | 50 | 280 | 375 | 5,187 | 100 | 419 | 0 | 20 |
| January | 70 | 279 | 63 | 8,414 | 0 | 442 | 0 | 418 |
| February | 614 | 962 | 0 | 7,968 | 127 | 789 | 0 | 493 |
| March | 100 | 1,185 | 5,908 | 13,170 | 100 | 1,374 | 0 | 2,038 |
| April | 300 | 1,136 | 5,360 | 14,912 | 0 | 878 | | |
| May | 275 | 1,299 | 530 | 12,120 | 0 | 1,194 | | |
| June | 430 | 1,322 | 187 | 5,099 | 0 | 1,491 | | |
| July | 60 | 3,198 | 0 | 5,264 | 0 | 552 | | |
| August | 0 | 405 | 0 | 3,318 | 160 | 650 | | |
| September | 2,154 | 2,768 | 420 | 1,521 | 650 | 872 | | |
| Total | 4,072 | 14,178 | 12,821 | 79,801 | 1,319 | 9,421 | | |

Compiled from Monthly Summary of Foreign Commerce of the United States.

TABLE 13.—*United States exports of grain rice through stated ports, by country of destination, 1925–26 to 1929–30*

[Year beginning August 1]

| Country to which exported | Gulf ports [1] | | | | | San Francisco | | | | | All ports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1925–26 | 1926–27 | 1927–28 | 1928–29 | 1929–30 | 1925–26 | 1926–27 | 1927–28 | 1928–29 | 1929–30 | 1925–26 | 1926–27 | 1927–28 | 1928–29 | 1929–30 |
| | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* |
| Belgium | 2,592 | 19,289 | 13,510 | 10,638 | 9,338 | | 78 | | 2,534 | | 2,617 | 19,368 | 13,520 | 22,185 | 9,338 |
| Germany | 3,070 | 36,890 | 35,212 | 42,616 | 34,802 | 242 | 496 | 686 | 3,535 | 1,254 | 3,201 | 37,386 | 36,018 | 46,150 | 36,102 |
| Netherlands | 612 | 17,501 | 24,332 | 10,302 | 14,428 | 22 | 74 | 89 | 258 | 39 | 634 | 17,574 | 24,421 | 19,588 | 14,467 |
| United Kingdom | 7,813 | 33,481 | 34,412 | 32,658 | 32,724 | 512 | 776 | 1,942 | 10,365 | 1,322 | 8,324 | 34,288 | 36,357 | 43,066 | 34,046 |
| Canada | | | | | | 265 | 3,073 | 3,932 | 6,383 | 6,184 | 1,039 | 7,706 | 14,724 | 20,389 | 17,275 |
| Honduras | 1,559 | 2,578 | 3,358 | 3,413 | 2,991 | | 4 | 170 | | | 1,559 | 2,632 | 3,358 | 3,421 | 2,993 |
| Cuba | 2,090 | 4,824 | 27,623 | 11,840 | 6,233 | | | | 3,489 | 1,360 | 3,031 | 4,973 | 27,906 | 37,780 | 6,234 |
| Argentina | 2,345 | 13,051 | 12,975 | 15,616 | 24,284 | | | | 22,163 | | 2,345 | 13,075 | 12,974 | 15,499 | 26,316 |
| Chile | 576 | 10,243 | 14,992 | 13,920 | 17,785 | | 12 | | 1,578 | 75 | 578 | 10,265 | 15,013 | 19,015 | 17,870 |
| Colombia | 261 | 578 | 9,339 | 18,816 | 18,926 | | 27 | 12 | 4 | | 261 | 578 | 8,683 | 14,549 | 18,985 |
| Japan | | | | | | 645 | 66,265 | 1,978 | 14,549 | 935 | 645 | 66,269 | 1,980 | 62,597 | 935 |
| Other countries | 2,424 | 20,659 | 37,894 | 46,220 | 36,888 | 366 | 331 | 2,800 | 13,273 | 1,568 | 4,219 | 23,950 | 43,843 | 15,398 | 39,803 |
| Total | 24,251 | 159,094 | 213,655 | 224,039 | 198,309 | 2,052 | 71,136 | 11,600 | 78,135 | 12,737 | 28,453 | 238,064 | 238,999 | 319,637 | 224,364 |

Compiled from records of the Bureau of Foreign and Domestic Commerce.

[1] Includes Galveston, Sabine, and New Orleans customs districts.

TABLE 14.—*Rice production, net inshipments, and consumption in Japan, 1900–1931*

| Calendar year | Production [1] | Net inshipments [2] | Consumption | | Calendar year | Production [1] | Net inshipments [3] | Consumption | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Per capita | | | | Total | Per capita |
| | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *Pounds* | | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *Pounds* |
| 1900 | 12,471 | 233 | 12,704 | 290 | 1916 | 17,569 | 483 | 18,186 | 339 |
| 1901 | 13,027 | 290 | 13,317 | 300 | 1917 | 18,363 | 450 | 19,252 | 354 |
| 1902 | 14,738 | 245 | 14,983 | 333 | 1918 | 17,143 | 1,904 | 19,711 | 359 |
| 1903 | 11,602 | 1,646 | 13,248 | 291 | 1919 | 17,184 | 2,883 | 19,503 | 353 |
| 1904 | 14,600 | 1,728 | 16,328 | 354 | 1920 | 19,107 | 893 | 19,577 | 351 |
| 1905 | 16,157 | 1,690 | 17,847 | 383 | 1921 | 19,857 | 1,406 | 20,429 | 363 |
| 1906 | 11,992 | 1,028 | 13,020 | 276 | 1922 | 17,335 | 2,147 | 19,751 | 346 |
| 1907 | 14,546 | 935 | 15,481 | 325 | 1923 | 19,067 | 1,732 | 20,962 | 342 |
| 1908 | 15,410 | 910 | 16,320 | 338 | 1924 | 17,418 | 2,754 | 20,668 | 352 |
| 1909 | 16,315 | 675 | 16,990 | 348 | 1925 | 17,960 | 3,198 | 21,067 | 355 |
| 1910 | 16,474 | 366 | 16,840 | 340 | 1926 | 18,756 | 2,828 | 21,437 | 356 |
| 1911 | 14,650 | 783 | 15,433 | 306 | 1927 | 17,465 | 3,577 | 21,105 | 346 |
| 1912 | 16,246 | 820 | 17,066 | 336 | 1928 | 19,510 | (³) | (³) | (³) |
| 1913 | 15,778 | 1,345 | 17,123 | 332 | 1929 | 18,945 | (³) | (³) | (³) |
| 1914 | 15,789 | 1,233 | 16,126 | 306 | 1930 | 18,709 | (³) | (³) | (³) |
| 1915 | 17,909 | 723 | 18,510 | 349 | 1931 | 20,516 | (³) | (³) | (³) |

Compiled as follows: 1900–1927, Census of Rice Production, Department of Agriculture and Commerce Japan; 1928–1929, Statistical Abstract of the Ministry of Agriculture and Forestry, Japan; 1930–1931, Japanese Financial and Economic Monthly, November 1930. (Carry-over included 1914–1927; not available prior to 1914.)

[1] Harvested November and December of previous year.
[2] Inshipments include imports and inshipments from colonial possessions.
[3] Not available.

TABLE 15.—*Production in terms of cleaned rice in specified Asiatic countries, 1900–1901 to 1930–31*

| Year beginning Nov. 1 | Japan | Chosen | Taiwan | Total Japanese Empire [1] | India | French Indo-China | Siam | Total India, French, Indo-China, and Siam |
|---|---|---|---|---|---|---|---|---|
| | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* |
| 1900–1901 | 13,027 | [2] 3,200 | 1,351 | 17,578 | 46,313 | [3] 5,000 | [3] 2,500 | 53,813 |
| 1901–2 | 14,738 | [2] 3,200 | 963 | 18,901 | 43,041 | [3] 5,000 | [3] 2,500 | 50,541 |
| 1902–3 | 11,602 | [2] 3,200 | 886 | 15,688 | 52,582 | [3] 5,000 | 2,650 | 60,232 |
| 1903–4 | 14,600 | [2] 3,200 | 1,155 | 18,955 | 49,199 | [3] 5,000 | 3,099 | 57,298 |
| 1904–5 | 16,157 | [2] 3,200 | 1,307 | 20,664 | 50,228 | [3] 5,000 | 3,137 | 58,365 |
| 1905–6 | 11,992 | [2] 3,200 | 1,368 | 16,560 | 48,512 | [3] 5,000 | 3,368 | 56,880 |
| 1906–7 | 14,546 | [2] 3,200 | 1,247 | 18,993 | 47,907 | [3] 5,000 | 2,973 | 55,880 |
| 1907–8 | 15,410 | [2] 3,200 | 1,418 | 20,028 | 42,598 | [3] 5,000 | 3,449 | 51,047 |
| 1908–9 | 16,315 | [2] 3,200 | 1,463 | 20,978 | 43,877 | [3] 5,000 | 3,385 | 52,262 |

Compiled as follows:
Japan: 1900–1908, Thirty-fifth Statistical Report of the Department of Agriculture and Commerce. Japan, 1918, p. 8; 1909, The Agricultural and Commerical Statistics for 1919, Japan; 1910, The Agricultural and Commercial Statistics for 1920; 1911–12, The Agricultural and Commercial Statistics for 1921; 1913–14, The Statistics of Agriculture, Industries, and Commerce, 1922, Japan; 1915–1924, The Statistical Abstract of the Ministry of Agriculture and Forestry, 1927, Japan; 1925–1928, The Statistical Abstract of the Ministry of Agriculture and Forestry, 1929, Japan; 1929 and 1930, Japanese Financial and Economic Monthly, November, 1930.
Chosen: 1909, Thirty-fifth Statistical Report of the Department of Agriculture and Commerce, Japan (1918); 1910, The Agriculture and Commerical Statistics for 1920 (Japan); 1911–1916, The Agriculture and Commerical Statistics for 1921 (Japan); 1917–1920, area, The Agriculture and Commercial Statistics for 1921. (Japan) production, A report from Consul General R. S. Miller, Seoul, Chosen, dated Nov. 10, 1924; 1921–1929, Reports from Consul General R. S. Miller, Seoul, Chosen, dated Oct. 7, 1926; Oct. 11, 1927; Oct. 3, 1928; Feb. 11, 1929; Feb. 21, 1929; Oct. 12, 1929; and Feb. 11, 1931.
Taiwan: 1900–1908, The Statistical Report of the Department of Agriculture and Commerce, Japan, No. 26–34; 1909–1927, Résumé Statistique de L'Empire du Japon, 1921–1930; 1928–29, International Yearbook of Agricultural Statistics; 1930, International Review of Agriculture, Pt. III, Monthly Crop Report, January, 1931.
Siam: Statistical Yearbook of the Kingdom of Siam, 1924 to 1928–29; Siam Record, July, 1930.
French Indo-China: International Yearbook of Agricultural Statistics.
India: 1900–1926, Area and Yield; 1927–1930, Indian Trade Journal, Feb. 28, 1929; Feb. 27, 1930; Feb. 26, 1931.

[1] Including production of Chosen prior to the time it became a part of the Japanese Empire.
[2] Estimated from official returns of exports of Chosen and from per capita consumption of rice in Japan 1894–1903, including food, seed and waste, but not including rice used for saké (270 pounds per annum).
[3] Estimated from exports.

TABLE 15.—*Production in terms of cleaned rice in specified Asiatic countries 1900-1901 to 1930-31*—Continued

| Year beginning Nov. 1 | Japan | Chosen | Taiwan | Total Japanese Empire[1] | India | French Indo-China | Siam | Total India, French, Indo-China, and Siam |
|---|---|---|---|---|---|---|---|---|
| | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds |
| 1909-10 | 6,474 | 2,343 | 1,455 | 20,272 | 63,869 | [2] 5,000 | 3,734 | 72,603 |
| 1910-11 | 14,650 | 3,269 | 1,316 | 19,235 | 64,552 | [2] 5,000 | 3,486 | 73,018 |
| 1911-12 | 16,246 | 3,634 | 1,410 | 21,290 | 63,943 | [2] 5,000 | 4,533 | 73,476 |
| 1912-13 | 15,778 | 3,413 | 1,271 | 20,462 | 63,802 | 6,614 | 4,561 | 74,977 |
| 1913-14 | 15,789 | 3,804 | 1,610 | 21,203 | 64,555 | 8,051 | 4,994 | 77,600 |
| 1914-15 | 17,909 | 4,439 | 1,448 | 23,796 | 61,109 | 9,521 | 4,708 | 75,338 |
| 1915-16 | 17,569 | 4,036 | 1,504 | 23,109 | 73,315 | 7,921 | 4,786 | 86,022 |
| 1916-17 | 18,363 | 4,377 | 1,401 | 24,201 | 78,521 | 6,733 | 5,011 | 90,265 |
| 1917-18 | 17,143 | 4,261 | 1,519 | 22,923 | 80,559 | 6,313 | 5,133 | 92,005 |
| 1918-19 | 17,184 | 4,765 | 1,455 | 23,404 | 54,486 | 6,302 | 4,642 | 65,410 |
| 1919-20 | 19,107 | 3,974 | 1,547 | 24,628 | 71,734 | 6,532 | 3,114 | 81,380 |
| 1920-21 | 19,857 | 4,639 | 1,521 | 26,017 | 61,949 | 6,284 | 5,868 | 74,101 |
| 1921-22 | 17,335 | 4,500 | 1,563 | 23,398 | 74,240 | 7,931 | 5,806 | 87,977 |
| 1922-23 | 19,067 | 4,717 | 1,711 | 25,495 | 75,495 | 7,629 | 5,954 | 89,078 |
| 1923-24 | 17,418 | 4,767 | 1,529 | 23,714 | 63,164 | 7,206 | 6,034 | 76,404 |
| 1924-25 | 17,960 | 4,153 | 1,900 | 24,022 | 69,601 | 7,801 | 6,779 | 84,181 |
| 1925-26 | 18,756 | 4,641 | 2,024 | 25,421 | 68,851 | 7,951 | 5,752 | 82,554 |
| 1926-27 | 17,465 | 4,807 | 1,952 | 24,224 | 66,483 | 8,255 | 7,169 | 81,907 |
| 1927-28 | 19,510 | 5,435 | 2,167 | 27,112 | 63,244 | 8,833 | 6,261 | 78,338 |
| 1928-29 | 18,945 | 4,245 | 2,135 | 25,325 | 71,989 | 7,826 | 5,325 | 85,140 |
| 1929-30 | 18,709 | 4,304 | 2,036 | 25,049 | 69,733 | 8,045 | 5,315 | 83,093 |
| 1930-31 | 20,516 | 6,026 | 2,371 | 28,913 | 70,771 | (4) | (4) | (4) |

[1] Including production of Chosen prior to the time it became a part of the Japanese Empire.
[2] Estimated from exports.
[4] Not available.

TABLE 16.—*Annual supply of rice for Japan, 1913-14 to 1930-31*

| Year beginning Oct. 1 | Carry-over | Production | Imports from— | | Total supply |
|---|---|---|---|---|---|
| | | | Colonies | Foreign countries | |
| | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds | 1,000,000 pounds |
| 1913-14 | 942 | 15,789 | 565 | 785 | 18,081 |
| 1914-15 | 1,822 | 17,909 | 817 | 157 | 20,705 |
| 1915-16 | 1,948 | 17,569 | 660 | 94 | 20,271 |
| 1916-17 | 1,822 | 18,363 | 628 | 157 | 20,970 |
| 1917-18 | 1,414 | 17,143 | 911 | 1,162 | 20,630 |
| 1918-19 | 754 | 17,184 | 1,288 | 1,696 | 20,922 |
| 1919-20 | 1,319 | 19,107 | 723 | 220 | 21,369 |
| 1920-21 | 1,728 | 19,857 | 1,225 | 251 | 23,061 |
| 1921-22 | 2,576 | 17,335 | 1,225 | 1,194 | 22,330 |
| 1922-23 | 2,293 | 19,067 | 1,445 | 503 | 23,308 |
| 1923-24 | 2,138 | 17,418 | 1,979 | 1,037 | 22,570 |
| 1924-25 | 1,634 | 17,960 | 2,199 | 1,602 | 23,395 |
| 1925-26 | 1,728 | 18,756 | 2,325 | 660 | 23,469 |
| 1926-27 | 1,885 | 17,465 | 2,670 | 1,288 | 23,308 |
| 1927-28 | 1,791 | 19,510 | 3,047 | 848 | 25,196 |
| 1928-29 | 2,435 | 18,945 | | | |
| 1929-30 | 2,173 | 18,709 | | | |
| 1930-31 | | 20,516 | | | |

Compiled as follows: 1913-14 to 1927-28, Reports of the Bureau of Agriculture, Department of Agriculture and Forestry, Imperial Government of Japan; carry-over, 1928-29 to 1929-30, James A. Anderson & Co., Rice Market Report, Dec. 6, 1929; production, 1928-29, The Statistical Abstract of the Ministry of Agriculture and Forestry, 1920, Japan; 1929-30, Japanese Financial and Economic Monthly, November, 1930.

TABLE 17.—*Rice stocks in Japan, May 1, July 1, and November 1, 1913–1930*

| Year | May 1 | | | July 1 | | | Nov. 1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Japanese | Foreign | Total [1] | Japanese | Foreign | Total [1] | Japanese | Foreign | Total [1] |
| | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* |
| 1913___ | 7,022,498 | 293,542 | 7,353,652 | 4,599,033 | 418,325 | 5,053,942 | 939,813 | (²) | (²) |
| 1914___ | 7,935,935 | 359,965 | 8,327,529 | 5,037,860 | 328,497 | 6,067,469 | 1,836,544 | (²) | (²) |
| 1915___ | 9,223,100 | 69,712 | 9,398,747 | 6,904,928 | 49,545 | 7,031,405 | 1,958,769 | (²) | (²) |
| 1916___ | 9,516,025 | 25,876 | 9,676,110 | 8,820,445 | 16,913 | 8,920,875 | 1,719,250 | 56,018 | 1,825,282 |
| 1917___ | 9,483,362 | 23,062 | 9,631,176 | 6,384,031 | 42,759 | 6,482,008 | 1,279,889 | 50,682 | 1,405,668 |
| 1918___ | 7,860,286 | 144,004 | 8,101,950 | 5,050,896 | 163,560 | 5,275,696 | 672,706 | 101,910 | 742,010 |
| 1919___ | 7,655,360 | 493,000 | 8,278,177 | 5,051,921 | 475,645 | 5,605,406 | 867,791 | 365,019 | 1,307,147 |
| 1920___ | 9,016,829 | 238,541 | 9,367,599 | 6,244,268 | 231,188 | 6,539,010 | 1,438,903 | 224,579 | 1,730,016 |
| 1921___ | 10,348,498 | 247,605 | 10,743,391 | 7,250,080 | 244,839 | 7,625,630 | 2,211,742 | 203,714 | 2,563,914 |
| 1922___ | 9,353,342 | 618,468 | 10,294,712 | 6,586,263 | 468,765 | 7,229,868 | 1,830,050 | 381,279 | 2,294,991 |
| 1923___ | 9,863,294 | 157,993 | 10,260,687 | 6,890,942 | 160,950 | 7,289,998 | 1,718,566 | 313,025 | 2,133,069 |
| 1924___ | 8,625,855 | 191,516 | 9,203,512 | 5,778,027 | 348,790 | 6,406,313 | 1,107,963 | 450,595 | 1,638,824 |
| 1925___ | 8,547,337 | 471,005 | 9,252,572 | 5,673,127 | 572,251 | 6,423,140 | 1,132,582 | 507,837 | 1,727,965 |
| 1926___ | 9,115,817 | 400,582 | 7,746,218 | 6,144,173 | 401,620 | 6,744,922 | 1,412,893 | 386,776 | 1,874,808 |
| 1927___ | 8,610,887 | 451,513 | 9,401,253 | 5,797,603 | 475,727 | 6,618,449 | 1,346,704 | 340,053 | 1,799,480 |
| 1928___ | 10,101,647 | 193,195 | 10,551,958 | 7,059,253 | 163,016 | 7,398,525 | 2,242,941 | 91,483 | 2,459,138 |
| 1929___ | 10,056,230 | 68,410 | 10,442,264 | 7,135,889 | 67,804 | 7,431,930 | (²) | (²) | [³]3,203,865 |
| 1930___ | ---- | ---- | ---- | 6,664,623 | 44,467 | 6,861,775 | ---- | ---- | ---- |

Compiled from Rice Statistics, Department of Agriculture and Forestry, Imperial Government of Japan, 1913–1916 from issue of November, 1924; 1917–1926 from issue of November, 1928; 1927, 1928, 1930 from same source by press release from report to Commerce Department by Paul P. Steintorf, Trade Commissioner.

[1] Includes Taiwan and Chosen rice.
[2] No report.
[3] Estimate.

TABLE 18.—*Index numbers of prices and wages in Japan (Tokyo) and exchange rate of the yen, 1900–1930*

| Calendar year | Index numbers of whole-sale prices, all commodities [1][2] | Index numbers of whole-sale prices, all commodities [2] | Index numbers of wages [2] | Exchange rate per dollar | Calendar year | Index numbers of whole-sale prices, all commodities [1][2] | Index numbers of whole-sale prices, all commodities [2] | Index numbers of wages [2] | Exchange rate per dollar |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Yen* | | | | | *Yen* |
| 1900_____ | 97 | 100 | 100 | ------- | 1916_____ | 182 | 155 | 137 | 1.999 |
| 1901_____ | 97 | 96 | 98 | 2.006 | 1917_____ | 238 | 194 | 168 | 1.978 |
| 1902_____ | 101 | 97 | 98 | 2.006 | 1918_____ | 289 | 254 | 215 | 1.947 |
| 1903_____ | 107 | 103 | 96 | 2.006 | 1919_____ | 364 | 312 | 302 | 1.973 |
| 1904_____ | 114 | 108 | 98 | 2.006 | 1920_____ | 266 | 343 | 423 | 2.010 |
| 1905_____ | 119 | 116 | 101 | 2.006 | 1921_____ | 266 | 265 | 421 | 2.079 |
| 1906_____ | 127 | 120 | 108 | 2.006 | 1922_____ | 256 | 259 | 446 | 2.086 |
| 1907_____ | 125 | 129 | 120 | 2.006 | 1923_____ | 272 | 263 | ------- | 2.051 |
| 1908_____ | 119 | 124 | 129 | 2.006 | 1924_____ | 272 | 273 | ------- | 2.555 |
| 1909_____ | 120 | 118 | 126 | 2.006 | 1925_____ | 245 | 267 | ------- | 2.451 |
| 1910_____ | 124 | 120 | 127 | 2.006 | 1926_____ | 226 | 237 | ------- | 2.134 |
| 1911_____ | 130 | 125 | 129 | 2.006 | 1927_____ | 225 | 225 | ------- | 2.109 |
| 1912_____ | 132 | 132 | 132 | 2.006 | 1928_____ | 224 | 228 | ------- | 2.155 |
| 1913_____ | 129 | 132 | 135 | 2.006 | 1929_____ | 223 | 220 | ------- | 2.169 |
| 1914_____ | 125 | 126 | 134 | 2.006 | 1930_____ | 189 | 181 | ------- | 2.025 |
| 1915_____ | 147 | 128 | 130 | 2.047 | | | | | |

Compiled as follows: 1900 to 1927, Report of the Bank of Japan as published in Census of Rice Statistics, Department of Agriculture and Commerce, Japan; 1928–1930, Federal Reserve Bulletins, 1929 and 1931.

[1] For crop year beginning Nov. 1 of previous year.
[2] October, 1900=100.

TABLE 19.—*Price differential, Tokyo and San Francisco, Japanese import duty, and California exports to Japan of brown rice, by months, 1921–1926*

| Year and month | Price differential per pound | Japanese import duty per pound | California exports to Japan | Year and month | Price differential per pound | Japanese import duty per pound | California exports to Japan |
|---|---|---|---|---|---|---|---|
| **1921** | *Cents* | *Cents* | *1,000 pounds* | **1924** | *Cents* | *Cents* | *1,000 pounds* |
| January | 0.52 | 0.38 | ---------- | January | .38 | (¹) | 4,751 |
| February | ¹—.20 | .38 | ---------- | February | .48 | (¹) | 1,200 |
| March | ¹—.40 | .38 | ---------- | March | .46 | (¹) | 3,622 |
| April | ¹—.05 | .38 | ---------- | April | .57 | (¹) | 310 |
| May | .15 | .38 | ---------- | May | .55 | (¹) | 700 |
| June | .47 | .38 | 543 | June | .55 | (¹) | ---------- |
| July | .52 | .38 | 738 | July | .52 | (¹) | 63 |
| August | .93 | .38 | 2,094 | August | .60 | .32 | ---------- |
| September | 1.43 | .38 | 3,601 | September | .57 | .32 | ---------- |
| October | 1.81 | .38 | 18,746 | October | .56 | .32 | 58 |
| November | 1.77 | .38 | 14,736 | November | (¹) | .32 | 336 |
| December | 1.50 | (¹) | 17,578 | December | ---------- | .32 | ---------- |
| **1922** | | | | **1925** | | | |
| January | 1.29 | (¹) | 4,108 | January | (¹) | (¹) | 70 |
| February | 1.22 | (¹) | 7,078 | February | ---------- | (¹) | 614 |
| March | 1.12 | (¹) | 15,051 | March | ---------- | (¹) | 100 |
| April | 1.13 | (¹) | 7,690 | April | ---------- | (¹) | 300 |
| May | 1.01 | (¹) | 6,215 | May | ---------- | (¹) | 275 |
| June | 1.35 | (¹) | 15,700 | June | ---------- | (¹) | 430 |
| July | 1.21 | (¹) | 22,520 | July | ---------- | (¹) | 60 |
| August | 1.06 | (¹) | 14,852 | August | ---------- | (¹) | 0 |
| September | .71 | (¹) | 4,525 | September | ---------- | (¹) | 2,164 |
| October | .61 | (¹) | 5 | October | ---------- | (¹) | 2 |
| November | .50 | .39 | 305 | November | ---------- | .31 | 30 |
| December | .21 | .38 | 30 | December | ---------- | .31 | 375 |
| **1923** | | | | **1926** | | | |
| January | .36 | .38 | 1 | January | ---------- | .31 | ---------- |
| February | .85 | .38 | ---------- | February | ---------- | .31 | ---------- |
| March | .82 | .38 | 33 | March | ---------- | (¹) | ---------- |
| April | 1.02 | .38 | 355 | April | ---------- | (¹) | ---------- |
| May | 1.17 | .38 | 5,225 | May | ---------- | (¹) | ---------- |
| June | 1.41 | .38 | 8,652 | June | ---------- | (¹) | ---------- |
| July | 1.27 | .38 | 22,149 | July | ---------- | (¹) | ---------- |
| August | 1.28 | .38 | 2,804 | August | ---------- | .33 | ---------- |
| September | ---------- | (¹) | 1,837 | September | ---------- | .33 | ---------- |
| October | ---------- | (¹) | 8,584 | October | ---------- | (¹) | ---------- |
| November | 1.05 | (¹) | 324 | November | ---------- | (¹) | ---------- |
| December | 1.03 | (¹) | 4,690 | December | ---------- | (¹) | ---------- |

Compiled from Rice Statistics, Department of Agriculture and Commerce, Imperial Government of Japan.

[1] Tokyo price was below San Francisco.
[2] No import duty.
[3] No quotations on San Francisco Exchange until March, 1927.

TABLE 20.—*Price per pound of California, Japan, and Rangoon types of brown rice on Kobe exchange, by months, 1923–1927*

| Year and month | California | Japan | Rangoon | Year and month | California | Japan | Rangoon |
|---|---|---|---|---|---|---|---|
| **1923** | *Cents* | *Cents* | *Cents* | **1924** | *Cents* | *Cents* | *Cents* |
| January | 3.89 | 4.62 | 2.65 | March | 5.30 | 5.88 | 3.34 |
| February | 3.70 | 4.79 | 2.98 | April | 5.99 | 5.90 | 3.62 |
| March | 3.70 | 4.89 | 3.09 | May | 5.51 | 5.88 | 3.67 |
| April | 3.96 | 4.97 | 3.13 | June | 5.51 | 5.98 | 3.64 |
| May | 4.50 | 5.26 | 3.34 | July | (¹) | 6.10 | 3.58 |
| June | 4.86 | 5.57 | 3.48 | August | (¹) | 6.35 | 3.79 |
| July | 4.76 | 5.55 | 3.25 | September | (¹) | 6.56 | 3.88 |
| August | 4.76 | 5.57 | 3.21 | October | (¹) | 6.94 | 4.25 |
| September | 4.57 | 5.36 | 3.26 | November | (¹) | 6.96 | 4.24 |
| October | 4.39 | 5.16 | 2.68 | December | (¹) | 6.62 | 4.24 |
| November | 4.88 | 5.46 | 2.87 | **1925** | | | |
| December | 5.09 | 5.41 | 2.99 | January | (¹) | 6.63 | 4.26 |
| **1924** | | | | February | (¹) | 6.57 | 4.29 |
| January | 5.38 | 5.92 | 3.47 | March | (¹) | 6.58 | 4.05 |
| February | 5.44 | 5.89 | 3.53 | April | (¹) | 6.70 | 3.88 |

TABLE 20.—*Price per pound of California, Japan, and Rangoon types of brown rice on Kobe exchange, by months, 1923–1927*—Continued

| Year and month | California | Japan | Rangoon | Year and month | California | Japan | Rangoon |
|---|---|---|---|---|---|---|---|
| **1925** | *Cents* | *Cents* | *Cents* | **1926** | *Cents* | *Cents* | *Cents* |
| May | (1) | 6.73 | 3.87 | September | (1) | 6.27 | 4.05 |
| June | (1) | 6.98 | 3.94 | October | (1) | 6.22 | 4.01 |
| July | (1) | 7.12 | 3.94 | November | (1) | 5.96 | 4.00 |
| August | (1) | 7.34 | 4.05 | December | (1) | 5.84 | 3.97 |
| September | (1) | 7.21 | 3.93 | | | | |
| October | (1) | 7.04 | 3.99 | **1927** | | | |
| November | (1) | 6.21 | 4.01 | January | (1) | 5.84 | 3.72 |
| December | (1) | 5.91 | 3.94 | February | (1) | 5.77 | 3.71 |
| | | | | March | (1) | 5.84 | 3.50 |
| **1926** | | | | April | 5.24 | 5.93 | 3.14 |
| January | (1) | 6.16 | 4.21 | May | 5.29 | 6.02 | 3.28 |
| February | (1) | 6.12 | 4.15 | June | 5.28 | 5.99 | 3.31 |
| March | (2) | 6.09 | 4.17 | July | 5.23 | 6.05 | 3.28 |
| April | (1) | 6.10 | 4.15 | August | 4.81 | 5.93 | 3.32 |
| May | (1) | 6.06 | 4.09 | September | 4.40 | 6.34 | 3.38 |
| June | (1) | 6.22 | 4.12 | October | (1) | 5.92 | 3.36 |
| July | (1) | 6.40 | 4.16 | November | (1) | 5.61 | 3.26 |
| August | (1) | 6.40 | 4.11 | December | (1) | 5.06 | 3.23 |

Compiled from Rice Statistics, Department of Agriculture and Commerce, Imperial Government of Japan, 1924 and 1926, and converted at the par rate of exchange (2,006 yen=$1).

¹ No quotations.

TABLE 21.—*Rice imports into Japan by countries, 1919–1928*

| Country | 1919 | | 1920 | | 1921 | | 1922 | | 1923 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Imports | Percentage of total imports | Imports | Percentage of total imports | Imports | Percentage of total imports | Imports | Percentage of total imports | Imports | Percentage of total imports |
| | *1,000 lbs.* | *Per cent* | *1,000 lbs.* | *Per cent* | *1,000 lbs.* | *Per cent* | *1,000 lbs.* | *Per cent* | *1,000 lbs.* | *Per cent* |
| China and Manchuria | 114,769 | 7.87 | 12,305 | 8.31 | 4,563 | 0.91 | 5,978 | 0.63 | 8,214 | 1.48 |
| British India | 8,494 | .58 | 2,869 | 1.94 | 38,329 | 7.65 | 241,163 | 25.22 | 127,959 | 23.02 |
| French Indo-China | 1,010,121 | 69.26 | 117,310 | 79.27 | 231,743 | 46.24 | 195,174 | 20.41 | 108,550 | 19.53 |
| Siam | 324,651 | 22.25 | 15,334 | 10.36 | 190,497 | 38.01 | 368,772 | 38.56 | 218,360 | 39.28 |
| United States | 0 | 0 | 156 | .11 | 35,696 | 7.12 | 144,138 | 15.07 | 48,404 | 8.71 |
| Others | 495 | .04 | 19 | .01 | 369 | .07 | 1,037 | .11 | 44,428 | 7.98 |
| Total | 1,458,430 | 100.00 | 147,993 | 100.00 | 501,197 | 100.00 | 956,262 | 100.00 | 555,915 | 100.00 |

| Country | 1924 | | 1925 | | 1926 | | 1927 | | 1928 | |
|---|---|---|---|---|---|---|---|---|---|---|
| China and Manchuria | 37,711 | 3.67 | 31,480 | 1.95 | 9,317 | 1.29 | 32,642 | 2.67 | 2,910 | 0.52 |
| British India | 459,545 | 44.76 | 626,523 | 38.80 | 220,148 | 30.42 | 319,736 | 26.10 | 30,246 | 5.41 |
| French Indo-China | 204,854 | 19.95 | 683,021 | 36.10 | 267,125 | 36.91 | 382,558 | 31.23 | 187,042 | 33.44 |
| Siam | 282,152 | 27.48 | 350,155 | 21.68 | 200,757 | 27.74 | 378,685 | 30.91 | 333,202 | 59.58 |
| United States | 39,581 | 3.85 | 23,160 | 1.43 | 26,061 | 3.60 | 92,358 | 7.54 | 5,127 | .92 |
| Others | 2,776 | .28 | 599 | .04 | 238 | .04 | 18,944 | 1.55 | 732 | .13 |
| Total | 1,026,619 | 100.00 | 1,614,938 | 100.00 | 723,646 | 100.00 | 1,224,930 | 100.00 | 559,259 | 100.00 |

Compiled from Rice Statistics, Department of Agriculture and Forestry, Imperial Government of Japan 1919–1922 from issue of November, 1924; 1923–1927 from issue of November, 1928; 1928 from Annual Return of the Foreign Trade of the Empire of Japan, 1928.

TABLE 22.—*Exports of grain rice from principal producing countries, 1922–1930*

| Calendar year | Unites States | Burma to— | | Saigon, French Indo-China | Siam |
| | | India | Other countries | | |
|---|---|---|---|---|---|
| | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* | *1,000 pounds* |
| 1922 | 358, 827 | 1, 984, 849 | 4, 030, 578 | 2, 778, 621 | 2, 515, 635 |
| 1923 | 292, 852 | 1, 536, 799 | 3, 742, 912 | 2, 524, 961 | 3, 078, 574 |
| 1924 | 122, 543 | 1, 311, 502 | 4, 338, 219 | 2, 431, 026 | 3, 284, 553 |
| 1925 | 39, 907 | 2, 626, 118 | 5, 003, 854 | 3, 144, 580 | 2, 955, 050 |
| 1926 | 77, 081 | 1, 623 935 | 4, 868, 208 | 3, 036, 094 | 2, 790, 534 |
| 1927 | 239, 596 | [1] 2, 208, 042 | 4, 996, 085 | 3, 235, 830 | 3, 806, 293 |
| 1928 | 288, 702 | [1] 2, 661, 048 | 3, 968, 180 | 3, 673, 221 | 3, 404, 779 |
| 1929 | 315, 441 | [1] 1, 993, 011 | 4, 594, 430 | 2, 770, 933 | 2, 588, 033 |
| 1930 | 213, 066 | [1] 1, 727, 040 | 5, 815, 040 | 2, 333, 371 | 2, 307, 263 |

Compiled as follows: United States, Foreign Commerce and Navigation of the United States, and Monthly Summary of Foreign and Domestic Commerce; Burma, Saigon, and Siam, 1923–1926 from Annual Statistics of Rice, Department of Agriculture and Forestry, Japan; Burma, 1927–1930, Weekly Rice Report, Lockie, Pemberton & Co., Jan. 10, 1931; Saigon, 1927–1930, issues of Bulletin Bi-Mensuel de la Chambre de Commerce de Saigon; Siam, 1927, 1928, Statistical Yearbook of the Kingdom of Siam, 1926–27, 1928–29; Siam, 1929, The Record, Ministry of Commerce and Communications, Bangkok, Siam; Siam, 1930, Weekly Report, Lockie, Pemberton & Co., Feb. 14, 1931.

[1] From Rangoon.

TABLE 23.—*Rice exports from Burma, Saigon, and Siam, by countries of destination, expressed as percentages of total exports, 1921–1930*

**BURMA [1]**

| Country of destination | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | 1928 | 1929 | 1930 |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* |
| Germany | 18. 95 | 19. 08 | 22. 80 | 20. 81 | 16. 37 | [3] 20. 65 | [3] 18. 76 | [3] 22. 57 | [3] 22. 50 | [3] 17. 18 |
| England | 8. 86 | 4. 04 | 3. 12 | 4. 63 | 3. 53 | | | | | |
| Ceylon | 20. 82 | 16. 27 | 10. 75 | 10. 45 | 15. 05 | | | | | |
| Straits Settlements | 11. 15 | 9. 70 | 13. 49 | 13. 25 | 11. 34 | [3] 23. 25 | [3] 15. 73 | [3] 11. 13 | [3] 15. 04 | [3] 35. 79 |
| Egypt | 2. 81 | 5. 30 | 2. 24 | 4. 35 | 3. 11 | [3] 3. 23 | [3] 3. 69 | [3] 3. 24 | [3] 3. 61 | [3] 2. 08 |
| Java | 10. 97 | 4. 26 | 7. 54 | 2. 41 | 4. 97 | 7. 91 | 5. 77 | 4. 90 | 9. 97 | 9. 75 |
| Japan | 3. 47 | 4. 47 | 7. 21 | 12. 02 | 12. 50 | 9. 00 | 9. 94 | 2. 28 | 4. 01 | . 58 |
| Others | 23. 03 | 36. 88 | 32. 85 | 32. 08 | 33. 13 | 35. 96 | 46. 11 | 55. 90 | 44. 87 | 34. 62 |
| Total | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 |

**SAIGON (FRENCH INDO-CHINA)**

| | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | 1928 | 1929 | 1930 |
|---|---|---|---|---|---|---|---|---|---|---|
| France | 8. 54 | 11. 97 | 18. 94 | 11. 68 | 13. 39 | 13. 74 | 14. 31 | 15. 45 | 14. 96 | 19. 24 |
| Europe (other) | | 5. 10 | 2. 41 | 1. 48 | 6. 44 | 3. 26 | 8. 78 | 10. 89 | 7. 79 | 2. 54 |
| Hong Kong | 45. 14 | 48. 12 | 59. 85 | 54. 97 | 35. 34 | 50. 01 | [3] 50. 62 | [3] 32. 84 | [3] 35. 32 | [4] 47. 36 |
| Japan | 6. 09 | 3. 83 | 2. 94 | 6. 98 | 17. 53 | 12. 45 | 12. 83 | 6. 59 | 3. 76 | 3. 17 |
| Philippine Islands | . 96 | 3. 19 | 4. 28 | 11. 02 | 5. 92 | 4. 51 | . 30 | 2. 98 | 7. 18 | |
| Cuba | 1. 06 | 5. 34 | 4. 00 | 2. 75 | 1. 40 | 1. 29 | 2. 38 | 2. 87 | 1. 98 | 1. 59 |
| Java | 21. 92 | 14. 82 | 2. 96 | 6. 57 | 11. 53 | 7. 15 | 3. 66 | 9. 04 | 15. 21 | 10. 62 |
| Singapore | 7. 38 | 5. 78 | 2. 47 | 3. 57 | 3. 52 | 5. 32 | 4. 92 | 5. 05 | 7. 90 | 8. 29 |
| Others | 8. 91 | 1. 85 | 2. 09 | . 98 | 4. 71 | 2. 27 | 2. 20 | 14. 29 | 5. 92 | 7. 19 |
| Total | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 |

**SIAM**

| | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | 1928 | 1929 | 1930 |
|---|---|---|---|---|---|---|---|---|---|---|
| Hong Kong | 28. 37 | 50. 22 | 54. 09 | 45. 12 | 30. 61 | 21. 58 | 33. 17 | 32. 80 | (6) | (6) |
| Japan | 8. 71 | 2. 24 | 2. 67 | 3. 86 | 5. 48 | 8. 97 | 7. 39 | 2. 97 | 8. 09 | 10. 61 |
| Port Said | 11. 49 | 1. 22 | 1. 31 | 1. 21 | . 58 | . 34 | | 2. 31 | | |
| Singapore | 31. 75 | 30. 41 | 29. 19 | 30. 93 | 33. 77 | 41. 56 | 37. 79 | 39. 56 | [3] 73. 80 | [3] 71. 60 |
| United Kingdom | 4. 08 | 1. 59 | . 08 | 1. 12 | . 42 | . 54 | 1. 96 | 7. 38 | [3] 2. 52 | [3] 2. 92 |
| Others | 15. 60 | 14. 32 | 12. 66 | 17. 76 | 29. 14 | 27. 01 | 19. 69 | 14. 98 | 14. 69 | 14. 87 |
| Total | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 | 100. 00 |

Compiled as follows: Burma, 1921–1925; Saigon, 1921–1925; Siam, 1921–1925, from Rice Statistics, Department of Agriculture and Forestry, Japan; Burma, 1926–1930, Weekly Rice Report, Lockie, Pemberton & Co., Jan. 10, 1931; Saigon, 1927–1930, issues of Bulletin Bi-Mensuel de la Chambre de Commerce de Saigon; Siam, 1926–1928, Statistical Year Book of the Kingdom of Siam, 1928–29; Siam, 1929–30, Weekly Report; Lockie, Pemberton & Co., Feb. 14, 1931.

[1] Exports 1926–1930 were from Rangoon.
[2] Exports 1926–1930 were to Europe.
[3] Exports 1926–1930 were to Straits Settlements and China.
[4] Exports 1926–1930 were to African ports.
[5] Shanghai and other Chinese ports included.
[6] No report.

TABLE 24.—*Average wholesale price per 100 pounds of Fancy Blue Rose clean rice, at New Orleans, by months, 1920–21 to 1929–30*

| Year beginning Aug. 1 | August | September | October | November | December | January | February | March |
|---|---|---|---|---|---|---|---|---|
| | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars |
| 1920-21 | 7.25 | 6.25 | 5.38 | 4.62 | 3.44 | 3.00 | 2.50 | 2.38 |
| 1921-22 | 3.19 | 3.50 | 3.78 | 3.69 | 3.12 | 3.10 | 3.18 | 3.44 |
| 1922-23 | 4.10 | 4.25 | 3.62 | 3.82 | 4.00 | 4.08 | 3.94 | 3.91 |
| 1923-24 | 3.78 | 4.00 | 4.88 | 4.66 | 4.38 | 4.82 | 4.69 | 5.00 |
| 1924-25 | 5.88 | 5.69 | 5.12 | 5.50 | 6.10 | 6.30 | 6.50 | 6.38 |
| 1925-26 | 6.82 | 6.31 | 5.69 | 6.34 | 6.41 | 6.31 | 6.50 | 6.25 |
| 1926-27 | 4.94 | 5.62 | 4.81 | 4.44 | 4.38 | 4.50 | 4.19 | 4.34 |
| 1927-28 | 4.12 | 4.12 | 3.84 | 3.62 | 3.69 | 3.75 | 3.66 | 3.62 |
| 1928-29 | 4.12 | 4.00 | 3.91 | 3.81 | 3.94 | 4.12 | 3.88 | 3.88 |
| 1929-30 | 4.25 | 4.03 | 3.78 | 3.88 | 3.84 | 3.97 | 4.12 | 4.38 |

| Year beginning Aug. 1 | April | May | June | July | Average | | | |
| | | | | | August–July | November–July | December–April | May–July |
|---|---|---|---|---|---|---|---|---|
| | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars |
| 1920-21 | 2.25 | 2.40 | 2.56 | 3.06 | 3.76 | 2.91 | 2.71 | 2.67 |
| 1921-22 | 3.56 | 3.60 | 4.31 | 4.38 | 3.57 | 3.60 | 3.28 | 4.10 |
| 1922-23 | 4.00 | 3.56 | 3.75 | 3.94 | 3.91 | 3.89 | 3.98 | 3.75 |
| 1923-24 | 5.06 | 5.88 | 6.12 | 6.19 | 4.94 | 5.18 | 4.76 | 6.06 |
| 1924-25 | 6.34 | 6.50 | 6.81 | 6.88 | 6.17 | 6.37 | 6.32 | 6.73 |
| 1925-26 | 6.19 | 5.60 | 5.94 | 5.94 | 6.18 | 6.17 | 6.35 | 5.83 |
| 1926-27 | 4.06 | 4.12 | 4.52 | 4.22 | 4.51 | 4.31 | 4.29 | 4.29 |
| 1927-28 | 3.50 | 4.12 | 4.28 | 4.12 | 3.87 | 3.82 | 3.64 | 4.17 |
| 1928-29 | 3.88 | 3.75 | 3.81 | 3.81 | 3.91 | 3.88 | 3.94 | 3.79 |
| 1929-30 | 4.38 | 4.38 | 4.52 | 4.38 | 4.16 | 4.21 | 4.14 | 4.43 |

Compiled from annual reports of the New Orleans Board of Trade.

TABLE 25.—*Average wholesale price per 100 pounds of Fancy Blue Rose clean rice, at New Orleans; deflated by Bureau of Labor all-commodity price index, by months, 1920–21 to 1929–30* [1]

| Year beginning August 1 | August | September | October | November | December | January | February | March |
|---|---|---|---|---|---|---|---|---|
| | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars |
| 1920-21 | 4.49 | 4.03 | 3.73 | 3.46 | 2.85 | 2.63 | 2.38 | 2.32 |
| 1921-22 | 3.41 | 3.75 | 4.02 | 3.92 | 3.36 | 3.39 | 3.42 | 3.71 |
| 1922-23 | 4.16 | 4.28 | 3.63 | 3.80 | 3.97 | 3.98 | 3.81 | 3.74 |
| 1923-24 | 3.87 | 4.01 | 4.91 | 4.74 | 4.46 | 4.64 | 4.70 | 5.14 |
| 1924-25 | 6.06 | 5.86 | 5.21 | 5.55 | 6.01 | 6.12 | 6.25 | 6.13 |
| 1925-26 | 6.37 | 6.10 | 5.49 | 6.07 | 6.20 | 6.09 | 6.45 | 6.23 |
| 1926-27 | 4.99 | 5.64 | 4.84 | 4.51 | 4.47 | 4.66 | 4.37 | 4.59 |
| 1927-28 | 4.33 | 4.27 | 3.96 | 3.74 | 3.81 | 3.89 | 3.80 | 3.77 |
| 1928-29 | 4.17 | 4.00 | 4.00 | 3.94 | 4.07 | 4.24 | 4.01 | 3.98 |
| 1929-30 | 4.35 | 4.13 | 3.93 | 4.11 | 3.98 | 4.25 | 4.47 | 4.82 |

| Year beginning August 1 | April | May | June | July | Average [2] | | | |
| | | | | | August–July | November–July | December–April | May–July |
|---|---|---|---|---|---|---|---|---|
| | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars | Dollars |
| 1920-21 | 2.28 | 2.49 | 2.74 | 3.28 | 3.06 | 2.72 | 2.49 | 2.84 |
| 1921-22 | 3.82 | 3.75 | 4.48 | 5.41 | 3.79 | 3.80 | 3.54 | 4.21 |
| 1922-23 | 3.85 | 3.49 | 3.74 | 4.00 | 3.87 | 3.82 | 3.87 | 3.75 |
| 1923-24 | 5.20 | 5.13 | 6.45 | 6.47 | 5.06 | 5.33 | 4.83 | 6.35 |
| 1924-25 | 6.22 | 6.40 | 6.61 | 6.60 | 6.08 | 6.21 | 6.14 | 6.54 |
| 1925-26 | 6.18 | 5.57 | 5.91 | 5.97 | 6.05 | 6.07 | 6.23 | 5.82 |
| 1926-27 | 4.33 | 4.40 | 4.82 | 4.48 | 4.68 | 4.52 | 4.48 | 4.57 |
| 1927-28 | 3.59 | 4.18 | 4.39 | 4.19 | 3.99 | 3.93 | 3.77 | 4.25 |
| 1928-29 | 4.01 | 3.91 | 3.95 | 3.89 | 4.01 | 4.00 | 4.06 | 3.92 |
| 1929-30 | 4.83 | 4.92 | 5.21 | 5.21 | 4.52 | 4.64 | 4.47 | 5.11 |

Compiled from annual reports of the New Orleans Board of Trade.

[1] 1926=100.
[2] Averages do not always agree with an average of figures given because the deflated figures were carried three decimal places before averaging.

TABLE 26.—*Production, carry-over, and total supply of milled rice, southern belt and California, 1914–15 to 1930–31*

| Year beginning August 1 | Southern belt [1] | | | California | | |
|---|---|---|---|---|---|---|
| | Produc-tion | Carry-over | Total supply | Produc-tion | Carry-over | Total supply |
| | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* | *1,000,000 pounds* |
| 1914–15 | 635 | 11 | 646 | 22 | | 22 |
| 1915–16 | 741 | 34 | 775 | 63 | | 63 |
| 1916–17 | 1,040 | 36 | 1,076 | 95 | | 95 |
| 1917–18 | 806 | 18 | 824 | 157 | | 157 |
| 1918–19 | 868 | 1 | 869 | 204 | | 204 |
| 1919–20 | 908 | 17 | 925 | 258 | | 258 |
| 1920–21 | 1,217 | 53 | 1,270 | 229 | 8 | 237 |
| 1921–22 | 842 | 89 | 931 | 203 | 97 | 300 |
| 1922–23 | 936 | 55 | 991 | 214 | 35 | 249 |
| 1923–24 | 779 | 80 | 859 | 158 | 56 | 214 |
| 1924–25 | 774 | 20 | 794 | 121 | 28 | 149 |
| 1925–26 | 791 | 9 | 800 | 133 | 7 | 140 |
| 1926–27 | 958 | 77 | 1,035 | 222 | 13 | 235 |
| 1927–28 | 994 | 108 | 1,102 | 249 | 7 | 256 |
| 1928–29 | 980 | 84 | 1,064 | 227 | 87 | 314 |
| 1929–30 | 951 | 49 | 1,000 | 173 | 68 | 241 |
| 1930–31 | 947 | 49 | 996 | 202 | 32 | 234 |

Compiled as follows: Production estimates from records of the Division of Crop and Live stock Estimates and carry-over from the annual report of the Rice Millers' Association.

[1] United States except California.

TABLE 27.—*Visible stocks of rough and cleaned rice in mills in the United States on first of each month, 1914–15 to 1929–30* [1]

| Year beginning August 1 | Au-gust 1 | Sep-tem-ber 1 | Octo-ber 1 | No-vem-ber 1 | De-cem-ber 1 | Janu-ary 1 | Feb-ru-ary 1 | March 1 | April 1 | May 1 | June 1 | July 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* | *1,000 barrels* |
| 1914–15 | | 362 | 700 | 1,065 | 1,174 | 1,097 | 1,122 | 938 | 771 | 625 | 453 | 341 |
| 1915–16 | 341 | 287 | 448 | 797 | 1,506 | 1,458 | 1,555 | 1,549 | 1,252 | 837 | 583 | 475 |
| 1916–17 | 356 | 343 | 512 | 1,156 | 1,772 | 1,412 | 1,390 | 1,218 | 785 | 335 | 209 | 87 |
| 1917–18 | 160 | 171 | 459 | 1,126 | 1,708 | 1,495 | 1,521 | 980 | 870 | 562 | 151 | 87 |
| 1918–19 | 57 | 99 | 657 | 883 | 1,075 | 1,302 | 1,107 | 1,098 | 1,014 | 965 | 578 | 309 |
| 1919–20 | 166 | 168 | 552 | 884 | 1,419 | 1,479 | 1,593 | 1,721 | 1,483 | 1,037 | 900 | 676 |
| 1920–21 | 528 | 533 | 748 | 906 | 2,338 | 2,922 | 2,431 | 1,936 | 1,601 | 1,593 | 1,493 | 1,059 |
| 1921–22 | 650 | 597 | 686 | 968 | 1,129 | 1,258 | 1,505 | 1,653 | 1,540 | 1,336 | 972 | 761 |
| 1922–23 | 515 | 402 | 621 | 1,410 | 2,003 | 2,326 | 2,284 | 2,039 | 1,743 | 1,575 | 1,170 | 956 |
| 1923–24 | 744 | 548 | 355 | 954 | 1,734 | 2,011 | 2,019 | 1,880 | 1,162 | 718 | 430 | 303 |
| 1924–25 | 165 | 399 | 638 | 1,587 | 2,265 | 2,347 | 1,867 | 1,560 | 1,060 | 674 | 364 | 223 |
| 1925–26 | 95 | 398 | 632 | 752 | 1,001 | 2,046 | 2,168 | 2,052 | 1,825 | 1,556 | 1,174 | 975 |
| 1926–27 | 767 | 716 | 1,218 | 1,879 | 2,197 | 2,362 | 2,096 | 1,958 | 1,868 | 1,697 | 1,401 | 1,181 |
| 1927–28 | 987 | 1,236 | 1,581 | 2,247 | 2,410 | 2,291 | 2,106 | 2,038 | 2,138 | 1,958 | 1,455 | 1,067 |
| 1928–29 | 530 | 696 | 1,108 | 1,142 | 2,887 | 2,792 | 2,515 | 2,315 | 2,058 | 1,764 | 1,311 | 865 |
| 1929–30 | 485 | 507 | 1,099 | 1,175 | 2,551 | 2,439 | 2,317 | 2,360 | 1,899 | 1,394 | 1,000 | 730 |

Compiled from monthly report of the Rice Millers' Association.

[1] Expressed in terms of rough rice. The conversion factor, 100 pounds of cleaned rice equivalent to 1 barrel (162 pounds) of rough rice, was used to convert the cleaned portion of visible rice stocks.

TABLE 28.—*Disappearance of United States rice in Southern States, by months, 1914–15 to 1929–30*

| Year beginning Aug. 1 | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets | 1,000 pockets |
| 1914–15 | 504 | 332 | 571 | 896 | 875 | 723 | 559 | 416 | 277 | 185 | 232 | 124 | 5,694 |
| 1915–16 | 255 | 599 | 848 | 859 | 872 | 709 | 663 | 748 | 555 | 336 | 120 | 128 | 6,497 |
| 1916–17 | 334 | 620 | 1,205 | 1,374 | 1,036 | 964 | 725 | 1,312 | 726 | 499 | 138 | 68 | 9,001 |
| 1917–18 | 151 | 449 | 964 | 1,010 | 708 | 683 | 1,219 | 1,078 | 596 | 521 | 111 | 199 | 7,689 |
| 1918–19 | 104 | 532 | 1,091 | 1,037 | 1,224 | 1,249 | 413 | 380 | 355 | 580 | 332 | 144 | 7,421 |
| 1919–20 | 147 | 550 | 1,007 | 899 | 1,203 | 915 | 366 | 518 | 680 | 342 | 371 | 214 | 7,252 |
| 1920–21 | 242 | 610 | 963 | 901 | 593 | 1,122 | 1,210 | 1,037 | 1,037 | 1,420 | 787 | 839 | 10,761 |
| 1921–22 | 910 | 752 | 871 | 744 | 759 | 864 | 1,020 | 1,198 | 499 | 482 | 283 | 267 | 8,649 |
| 1922–23 | 520 | 790 | 1,425 | 1,287 | 940 | 1,015 | 562 | 654 | 708 | 560 | 348 | 345 | 9,154 |
| 1923–24 | 410 | 618 | 969 | 1,236 | 820 | 1,165 | 926 | 819 | 470 | 306 | 135 | 135 | 7,949 |
| 1924–25 | 131 | 730 | 1,303 | 1,300 | 933 | 981 | 543 | 496 | 390 | 337 | 192 | 140 | 7,476 |
| 1925–26 | 315 | 619 | 842 | 835 | 751 | 911 | 609 | 498 | 471 | 474 | 361 | 279 | 6,955 |
| 1926–27 | 310 | 717 | 1,035 | 1,007 | 895 | 1,120 | 877 | 734 | 509 | 700 | 643 | 345 | 8,952 |
| 1927–28 | 423 | 850 | 1,200 | 1,163 | 1,006 | 1,118 | 961 | 905 | 836 | 910 | 531 | 285 | 10,188 |
| 1928–29 | 346 | 777 | 1,246 | 1,278 | 1,053 | 973 | 816 | 766 | 745 | 715 | 650 | 515 | 9,880 |
| 1929–30 | 507 | 841 | 1,378 | 1,134 | 1,023 | 1,073 | 1,005 | 703 | 636 | 566 | 369 | 334 | 9,707 |

Compiled from monthly report of the Rice Millers' Association. A pocket of cleaned rice equals 100 pounds.

TABLE 29.—*Average wholesale and export price per 100 pounds of rice in selected countries, and index numbers of price in India, 1851–1930*

| Calendar year | Average wholesale price in— | | | | Export price in France | Index numbers of price in India [1] |
|---|---|---|---|---|---|---|
| | Hamburg | New York | London | Tokyo | | |
| | Dollars | Dollars | Dollars | Dollars | Dollars | |
| 1851 | 2.90 | 3.78 | 1.70 | | | |
| 1852 | 2.50 | 3.78 | 2.00 | | | |
| 1853 | 3.40 | 4.59 | 2.30 | | | |
| 1854 | 3.10 | 4.86 | 2.70 | | | |
| 1855 | 3.50 | 4.88 | 2.80 | | | |
| 1856 | 2.70 | 5.94 | 2.20 | | | |
| 1857 | 2.70 | 4.72 | 2.20 | | | |
| 1858 | 2.20 | 4.05 | 1.60 | | | |
| 1859 | 2.40 | 4.05 | 1.80 | | | |
| 1860 | 2.60 | 4.59 | 2.20 | | | |
| 1861 | 2.70 | 4.19 | 2.30 | | 3.30 | 83.0 |
| 1862 | 2.50 | 8.37 | 2.30 | | 3.20 | 79.9 |
| 1863 | 2.50 | (2) | 2.40 | | 3.20 | 74.0 |
| 1864 | 2.50 | (2) | 2.10 | | 2.60 | 101.5 |
| 1865 | 2.70 | 12.96 | 2.30 | | 2.60 | 124.0 |
| 1866 | 2.50 | 12.96 | 2.60 | | 3.10 | 180.0 |
| 1867 | 2.60 | 9.58 | 2.60 | | 3.20 | 127.0 |
| 1868 | 2.50 | 9.29 | 2.40 | 0.95 | 2.80 | 98.0 |
| 1869 | 2.10 | 9.45 | 2.10 | 1.43 | 2.80 | 118.0 |
| 1870 | 2.40 | 7.83 | 2.10 | 1.46 | 3.10 | 96.6 |
| 1871 | 2.40 | 7.83 | 2.10 | .89 | 3.50 | 92.0 |
| 1872 | 2.50 | 9.45 | 2.20 | .62 | 3.70 | 86.3 |
| 1873 | 2.20 | 8.91 | 2.10 | .76 | 3.80 | 100.0 |
| 1874 | 2.50 | 9.18 | 2.20 | 1.16 | 3.10 | 137.6 |
| 1875 | 2.10 | 8.64 | 1.80 | 1.16 | 4.40 | 141.0 |
| 1876 | 2.10 | 7.69 | 2.00 | .79 | 4.60 | 106.6 |
| 1877 | 2.30 | 7.02 | 2.20 | .88 | 4.70 | 149.3 |
| 1878 | 2.40 | 7.02 | 2.20 | 1.03 | 4.70 | 165.3 |
| 1879 | 2.30 | 6.88 | 2.10 | 1.27 | 4.90 | 176.0 |
| 1880 | 2.10 | 8.10 | 2.00 | 1.72 | 4.90 | 130.3 |
| 1881 | 2.10 | 7.55 | 1.80 | 1.78 | 4.70 | 105.3 |
| 1882 | 1.90 | 7.55 | 1.60 | 1.42 | 4.60 | 100.0 |
| 1883 | 2.10 | 6.48 | 1.80 | .99 | 4.80 | 119.6 |
| 1884 | 2.00 | 6.48 | 1.70 | .82 | 4.80 | 140.0 |
| 1885 | 1.90 | 6.61 | 1.50 | 1.04 | 4.80 | 135.3 |
| 1886 | 1.80 | 5.81 | 1.40 | .89 | 3.10 | 131.3 |
| 1887 | 1.80 | 4.99 | 1.50 | .79 | 3.10 | 114.0 |
| 1888 | 1.80 | 4.99 | 1.50 | .78 | 2.60 | 122.3 |
| 1889 | 1.90 | 5.54 | 1.60 | .95 | 3.20 | 148.3 |

[1] 1873=100.
[2] No report.

TABLE 29.—*Average wholesale and export price per 100 pounds of rice in selected countries, and index numbers of price in India, 1851–1930*—Continued

| Calendar year | Average wholesale price in— | | | | Export price in France | Index numbers of price in India |
|---|---|---|---|---|---|---|
| | Hamburg | New York | London | Tokyo | | |
| | Dollars | Dollars | Dollars | Dollars | Dollars | |
| 1890 | 1.90 | 6.10 | 1.60 | 1.42 | 3.20 | 147.6 |
| 1891 | 2.00 | 6.40 | 1.70 | 1.12 | 3.20 | 148.0 |
| 1892 | 2.30 | 5.70 | 1.70 | 1.15 | | 172.3 |
| 1893 | 2.10 | 4.60 | 1.30 | 1.17 | | 171.3 |
| 1894 | 2.00 | 5.30 | 1.30 | 1.40 | | 166.0 |
| 1895 | 1.90 | 5.30 | 1.20 | 1.41 | | 140.0 |
| 1896 | 1.80 | 5.20 | 1.30 | 1.53 | | 154.0 |
| 1897 | | 5.40 | 1.50 | 1.90 | | 208.3 |
| 1898 | | 6.10 | 1.60 | 2.37 | | 164.3 |
| 1899 | | 6.10 | 1.60 | 1.59 | | 134.3 |
| 1900 | | 5.50 | 1.60 | 1.89 | | 146.6 |
| 1901 | | 5.50 | 1.40 | 1.95 | | 169.6 |
| 1902 | | 5.60 | 1.30 | 2.01 | | 166.6 |
| 1903 | | 5.70 | 1.60 | 2.29 | | 168.0 |
| 1904 | | 4.40 | 1.40 | 2.10 | | 160.8 |
| 1905 | | 4.20 | 1.50 | 2.04 | | 140.6 |
| 1906 | | 4.70 | 1.60 | 2.34 | | 202.3 |
| 1907 | | 5.30 | 1.80 | 2.62 | | 241.3 |
| 1908 | | 6.20 | 1.60 | 2.53 | | 250.0 |
| 1909 | | 6.20 | 1.50 | 2.09 | | 215.5 |
| 1910 | | 5.50 | 1.60 | 2.11 | | 155.6 |
| 1911 | | 5.00 | 1.80 | 2.75 | | 181.3 |
| 1912 | | 5.50 | 2.20 | 3.33 | | 184.0 |
| 1913 | | 5.50 | 1.80 | 3.38 | | 153.0 |
| 1914 | | (2) | 2.00 | 2.56 | | 216.6 |
| 1915 | | 4.90 | 2.80 | 2.07 | | 226.0 |
| 1916 | | 3.80 | 3.60 | 2.18 | | 221.5 |
| 1917 | | 6.30 | 5.40 | 3.15 | | 200.3 |
| 1918 | | 8.20 | 5.60 | 5.20 | | 136.0 |
| 1919 | | 9.80 | 5.10 | 7.30 | | 277.5 |
| 1920 | | 9.60 | 7.60 | 7.08 | | 340.0 |
| 1921 | | 3.30 | 3.20 | 4.89 | | |
| 1922 | | 4.40 | 2.90 | 5.58 | | |
| 1923 | | 4.10 | 3.03 | 5.16 | | |
| 1924 | | 5.50 | 3.30 | 6.12 | | |
| 1925 | | 6.50 | 3.45 | 6.61 | | |
| 1926 | | 6.20 | 3.50 | 6.00 | | |
| 1927 | | 4.10 | 3.00 | 5.62 | | |
| 1928 | | 3.80 | 3.30 | 4.83 | | |
| 1929 | | 3.80 | 3.10 | 4.24 | | |
| 1930 | | 4.00 | | 3.98 | | |

Compiled as follows: Prices in Hamburg and France to 1891, Wholesale Prices, Wages and Transportation, Senate Committee on Finance, Mar. 3, 1893, 52d Cong., 2d sess., Senate Report 1394; Hamburg, 1892–1896, Statistischer Auszug und Verschiedene Nachweise in Bezug auf Hamburg Handelszustande in Jahre, 1896; London prices, 1850–1906, Augustus Sauerbeck, Journal Royal Statistical Society; Editor of the Statist, Journal of Royal Statistical Society, 1907–1928; Tokyo prices, 1868–1927, Statistics of Rice Department of Agriculture and Commerce, Japan, 1928, Weekly Circular, London Rice Brokers' Association; India, index numbers of rice, C. M. Vakil and S. K. Muranjan, Currency and Prices in India; New York, 1851–1899, Wholesale Prices, Wages and Transportation, Pt. I, 1888; 1890–1923, U. S. Bur. of Labor Statis, Bull. 440; and yearly bulletins.

[1] No report.

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