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B. WHEAT IN THE WORLD ECONOMY

(Abstracts of all issues of WHEAT STUDIES except
Surveys and Reviews)

What are here termed *Special Studies* are chiefly monographs, varying in length and degree of originality. They extend over a wide range of economic, geographic, historical, statistical, and technical subjects. Some deal with problems peculiar to wheat, but most of them have broader significance and treat problems wherein wheat is merely one of the more important special applications. Several are "projective analyses" of plans or policies, proposed or in their early stages, intensively considering how these would probably work if adopted or continued. Although many of the studies were timely when published, in general they constitute building-blocks toward an integrated structure of tested knowledge.

Typically, six special studies were included in each of the first twelve volumes, four each in Volumes XIII–XVIII, and two or three in each of the last two volumes. Those who use the lists in Part II (Sections D and E) can quickly find the abstract of a particular study by first noting the month and year of issue, and then turning to that point in the chronological series of abstracts.

Current Sources concerning Wheat Supplies, Movements, and Prices: A Select List, with Comments

W. B. STEWART

Jan '25 I (2), 61-75

Students of wheat supplies, movements, and prices have access to a vast amount of published material. But this is so scattered and so variable in quality that the Food Research Institute has prepared this working guide to useful sources of current information. Revised on the basis of criticisms and suggestions on the mimeographed draft, circulated in this country and abroad, it represents something approaching a consensus of competent opinions in trade, government, and academic circles.

The list is intentionally selective rather than comprehensive. The sources are presented in four groups, relating respectively to (I) the world situation, (II) the United States, (III) the other principal exporting countries, and (IV) the principal importing countries. Within each group official sources and unofficial sources are distinguished and yearly, monthly, weekly, and daily sources are mentioned in that order. Under each title appears a brief comment, and an index to the sources is appended.

The Disposability of a Wheat Surplus in the United States

A. E. TAYLOR

Mar '25 I (4), 121-43

United States wheat exports fall into three broad classes: (1) "principal exports" of representative milling wheats; (2) "incidental exports" of special classes of wheat and of cull wheats of milling types; and (3) exports of high-grade, standard, and low-grade flours that are largely specialties or essentially byproducts. Exports of the second and third classes may continue indefinitely, but have only an indirect bearing on the wheat-price problem created by a surplus of representative wheats.

Prewar trends presaged the disappearance of that surplus, perhaps by 1925 or 1930. Since 1919, when wheat acreage reached its peak after abnormal expansion induced by the war, the prewar trends have been resumed. An export surplus of representative wheats, far from being agriculturally unavoidable, will disappear unless public measures stimulate wheat growing.

Continuance of such an export surplus cannot properly be urged as a means of guarding against food shortage. It is not needed to insure that administrative stocks be adequate. Elimination of the surplus would of course reduce the volume of business in various lines, and call for readjustments and adaptations by business interests; but it is difficult to argue that the surplus should be maintained in order to minimize these readjustments.

From the standpoint of the national interest, in short, an export surplus of wheat is by no means indispensable to the United States. Advocates of a positive policy of maintaining such a surplus have a heavy burden of proof.

Average Prewar and Postwar Farm Costs of Wheat Production in the North American Spring-Wheat Belt

M. K. BENNETT

May '25 I (6), 173-207

In the prewar period 1908-14, costs excluding land charges varied widely in the seven political subdivisions studied, with no consistent relationship between per acre and per bushel costs. Differences in per bushel costs were due chiefly to differences in yields per acre; but different labor rates, cultural methods, and transportation facilities were also influential.

Calculation of land charges and their inclusion in costs, possible only for the postwar period 1921-24, diminished inter-area differences in per bushel costs. Among areas, such inclusive costs are likely to differ less and less as the periods for which costs are computed are extended. Though land prices are generally lower in Canada, land charges per acre are not considerably lower there. The greater prevalence of summer fallowing in Canada raises not only land charges but also charges for labor and materials. In both countries, but notably in Canada, costs vary greatly from year to year.

Between the two periods, the rank of areas in respect of costs changed strikingly. Costs per bushel excluding land charges rose by a minimum of 40 per cent in Saskatchewan and South Dakota and by a maximum of 136 per cent in Montana. Per acre costs rose only 23 per cent in Alberta but 57 per cent in Minnesota. The several cost factors have had unequal effect in each area, and have worked in different directions.

Canada cannot consistently and invariably produce spring wheat at a lower farm cost than the United States. To base a wheat tariff on differences in costs of production in the two countries is neither scientific nor practicable. Under the present law and accepted methods of revision, the tariff on wheat can be increased easily but decreased with difficulty.

Farm cost data are perhaps more subject to misinterpretation than any other type of agricultural statistics. Properly compiled, they sum up and reflect changes in conditions of agricultural production. They have slight value in diagnosing agricultural prosperity or in providing a sound basis for price-regulating legislation, and throw little light on fundamental economic problems.

(See also M. K. Bennett, *Farm Cost Studies in the United States: Their Development, Applications, and Limitations*, Food Research Institute, Miscellaneous Publication 4, Stanford University, California, 1928.)

European Wheat Production as Affecting Import Requirements

W. B. STEWART

Jun '25 I (7), 209-15

The purpose of this paper is to show the bearing of wheat production upon domestic consumption and imports of wheat in a selected group of European wheat-importing countries in prewar years, and to examine the estimates of Broomhall and Sir James Wilson in two postwar years to discover how well their estimates reflect that influence.

Aggregate figures on European or world production, however useful for a broad view, afford an unsatisfactory basis for appraising the prospective course of prices. Estimates for individual countries are essential.

Wheat consumption in European countries is not maintained at constant volume. Prewar data for Spain, Germany, Italy, and France reveal a strong tendency for domestic utilization to vary directly with domestic production. In recent years both Broomhall and Wilson seem to have made insufficient allowance for this tendency. It is less apparent in countries that produce much less wheat than they import, and their imports can accordingly be forecast with somewhat greater assurance.

Canada as a Producer and Exporter of Wheat

C. P. WRIGHT and J. S. DAVIS

Jul '25 I (8), 217-87

Within ten years Canada has risen to a leading position among wheat-exporting countries. Wheat is her principal grain crop, and she produces about 10 per cent of the world total. On the average, two-thirds of her output is exported, and wheat and flour make up nearly one-third of her total exports.

This study sets forth the conditions under which Canada has achieved her present eminence as a producer and exporter of wheat. It discusses physiographic conditions and agricultural practices in Western Canada, and some economic aspects of farming there. It traces the historical development of transportation, marketing organization, settlement, and wheat production. It describes the flow of Canadian wheat from farm to market—considering equipment, routes, inspection, middlemen, export, and costs of handling and shipment. Canada's wheat in world markets is treated both historically and analytically. Finally, the future of Canadian wheat production and export is considered. Bibliographical notes and statistical tables are appended.

Canada has large potentialities for increase in wheat acreage. Several factors favor expansion, even at levels of wheat prices lower than those of 1924-25, while other factors will retard it. But acreage increases, once made, are not likely to be reversed. Yields per acre are not likely to average as high as in prewar years. Crops and exports will continue to increase, with marked fluctuations from year to year. Yet Canada's average exports in the next ten years are not likely to exceed the average of 1920-24 by more than 100 million bushels.

The Disposition of American Wheat Supplies: A Critical Appraisal of Statistical Procedures

A. E. TAYLOR

Aug '25 I (9), 289-327

The statistical procedures now employed to measure the disappearance of wheat and the production and disappearance of wheat flour are technically inadequate in scope and incomplete in execution. Correct data on flour milling will prove more helpful in estimating wheat supplies than

improvement in wheat statistics will contribute to our knowledge of flour production.

Biennial and decennial censuses of manufactures are now supplemented by valuable new series of official reports, monthly on wheat milling and annually on stocks of wheat and flour in city mills. The Millers' National Federation might advantageously compile, for flour, regular statistics on operations and movements comparable to those compiled by the Department of Commerce for cotton, hides, and their products.

Comparable data cover too brief a period to yield a dependable index of seasonal variation in flour milling, but July–February output data are helpful in forecasting the output of March–June. As yet we lack a satisfactory basis for judging the trend of flour consumption. Several recommendations are advanced for amplification and improvement of official estimates and statistical procedures designed to elucidate the disappearance of wheat.

A National Wheat-Growers' Co-operative: Its Problems, Opportunities, and Limitations

A. E. TAYLOR

Jan '26 II (3), 101–62

The object of this study is to appraise (1) the extent to which the difficulties of wheat growers may be due to ineffective marketing; (2) the prospect of such ineffective marketing being made effective through co-operative association of growers, on a national basis; (3) the prospect of co-operative association being made advantageous to wheat growing prior to the stage of marketing.

Because of limited and unsatisfactory experience with co-operative marketing of wheat in the United States, and the brevity of Canada's wheat pool experience, only incidental reference is made to these undertakings. It nevertheless seems possible to indicate, on the basis of precedents and experiences in the marketing of other farm products, what a wheat co-operative association must do if success is reasonably to be expected.

Co-operative marketing of the American wheat crop of the present size, varieties, and qualities holds out no more than modest hope of commercial gains to growers. The most promising field of activities lies on the grower's side of the country elevator. Far greater increments of return may be expected from reformation of farm management, lowering of operating costs, control of varieties, improvement in wheat quality, uniform grades based on milling standards, elimination of submarginal growers, and restriction of outturn to the average level of domestic requirements. If these improvements were attained, co-operative solidarity could be achieved, under proper leadership.

The establishment of a national wheat co-operative implies a far-reaching change in policy and affairs. To make this change, most growers must have the positive motives of larger and less fluctuating returns and more stable and efficient operation, and must also feel dissatisfaction with current returns and distrust of the prospective price level.

Protein Content: A Neglected Factor in Wheat Grades

C. L. ALSBERG

Feb '26 II (4), 163-76

The official wheat standards of the United States are losing much of their value because they contain no reliable indication of protein content, which millers have to consider seriously because bakers have come to demand flour of specified protein content. This content varies greatly within a grade of wheat. Consequently, commonly the range of prices for wheats of the same grade but of different protein content greatly exceeds the difference between average prices for adjacent grades.

Premiums that millers pay for high-protein wheats are not at all fully reflected back to the wheat grower. This works to the disadvantage of producers of some of the choicest wheats—notably dry-land farmers, distant from terminal markets and milling centers, and especially subject to crop failures. If protein premiums were reflected back to producers, it would help to raise the milling quality of the wheat grown.

The practice of buying wheat on protein analysis reduces the miller's ability to insure against risk of price changes by hedging. It also gives a special advantage to large millers and dealers, who can map areas tributary to terminals according to protein content, and buy accordingly. Domestic demand for high-protein flour and wheat lowers the average milling quality of the export surplus, and puts export millers at a disadvantage in buying wheat to mill for export.

To make protein content a specification in wheat grading appears feasible, and is highly desirable in the interests of producers, millers, and the general public.

Price Spreads and Shipment Costs in the Wheat Export Trade of Canada

KATHARINE SNODGRASS

Mar '26 II (5), 177-202

It is orthodox doctrine that prices of wheat in exporting markets approximate Liverpool prices less handling and shipping costs to Liverpool. British dealers have recently asserted that it is common for overseas wheat to be bought in Liverpool for less than its c.i.f. value on the current price basis in export markets. This study presents the results of a test of the theory, with the use of price and cost data for 1921-25.

The analysis, limited to Canadian wheat shipped via Atlantic ports, indicates a broad tendency for the Winnipeg-Liverpool price spread to correspond to the sum of costs of handling and shipment between these two markets by the cheapest available route, and for price spreads to vary from season to season in rough correspondence with such costs.

These relationships, however, do not hold from day to day or from week to week. Differences between average spreads and average costs are not large, and may be accounted for by deficiencies in the data used. But wide deviations occur frequently, and substantial deviations may persist over several weeks.

In recent years, during open navigation on the St. Lawrence, average costs have slightly exceeded average spreads. During closed navigation, by contrast, costs by the only available route for direct shipment have substantially exceeded price spreads, whereas costs incurred for shipment via Buffalo and New York on Canadian wheat stored for a time in Buffalo have averaged below price spreads.

The data available for use do not represent trading experience in detail, and throw little light on the question of profitability of the Canadian export trade.

Wheat Acreage and Production in the United States since 1866: A Revision of Official Estimates

HOLBROOK WORKING

Jun '26 II (7), 237-64

Statistics and reliable estimates covering the several forms of disposition of wheat in the United States show that the wheat crops during 1866-1901 were considerably larger than were indicated by the census enumerations and by the original official estimates for intercensal years, and higher even than the standing [1926] series of revised official estimates. The discrepancies between total disposition and the original estimates of production were greatest during 1889-1896, when they averaged about 32 per cent. The errors in the standing estimates are such as to give seriously misleading indications of the trend of acreage during certain periods and of the response of production to price changes.

In deriving the new estimates of production here presented, statistics and estimates of wheat disposition are used to determine the general level and trend of the revised production estimates. The fluctuations of production around this trend are estimated on the basis of the standing official estimates of yield per acre and new estimates of annual changes in acreage. The development of the estimates of the changes in acreage includes an extended consideration of the apparent sources of error in the original data reflecting acreage changes.

The Decline in per Capita Consumption of Flour in the United States

HOLBROOK WORKING

Jul '26 II (8), 265-92

Critical appraisal tends to substantiate the validity of recent calculations of the United States Department of Agriculture indicating that wheat flour consumption per capita in the United States declined about 10 per cent from 1904 to 1919, and about 12 per cent more between 1919 and 1923. The occurrence of such changes must be explained in terms both of changes in the total amount of food consumed per capita and of substitutions of other foods for flour.

Analysis of statistics which reflect the consumption of foods comprising in the latest years about 80 per cent of the total energy value of all foods

consumed in the United States indicates that the decline in flour consumption has been part of a complex system of changes in food consumption. Consumption of corn meal fell off earlier and much more drastically than did consumption of wheat flour. These cereals were in part replaced in the diet by a large increase in the use of sugar, and perhaps in recent years by some increases in consumption of meats and dairy products.

There has nevertheless been a large decline in the energy value of total food consumption per capita in the United States. This decline has been a response to reduced energy output of the average person, consequent on various changes in living and working conditions.

The causes of the decline in total food consumption per capita and of the decrease in importance of cereals in the total have been such that no reversal of the recent trends is to be expected. Further declines in per capita food consumption in general and in flour consumption in particular are not unlikely.

A Selected Bibliography of Publications, 1920-25, Relating to the World Wheat Situation

ESTHER C. WRIGHT

Aug '26 II (9), 293-324

The postwar output of publications on the economic aspects of the world's wheat has been especially voluminous, through the extreme decline of wheat prices from the peak of 1920, the ensuing severe depression among wheat growers, the sharp price advance in 1920-25, the unusual fluctuations in demand and supply, and various proposals for legislative action in aid of farmers. This selective, annotated bibliography is presented as a working guide to this literature, supplementing the earlier one on *Current Sources*.

The titles are classified in 22 groups under five main heads: (I) General; (II) Production; (III) Marketing; (IV) Utilization; and (V) National Policies. An author-index is appended.

American Importation of Canadian Wheat

A. E. TAYLOR

Nov '26 III (1), 1-76

The United States, normally a heavy exporter of wheat and flour, regularly imports considerable quantities of wheat from Canada. In the past five crop years, such imports have averaged over 16 million bushels a year. Because of transportation factors, most of this wheat is milled in or near Buffalo. The larger part is imported duty-free for milling in bond into flour for export. Canadian milling interests oppose this practice, but economic considerations and accepted international policy favor its continuance. Unless restricted by government action, such imports will tend to increase as American wheat becomes too expensive to mill into standard flour for export.

Imports for domestic consumption, now subject to a duty of 42 cents a bushel, vary greatly from year to year. They tend to be largest when repre-

sentative milling wheats are scarce in the United States and abundant in Canada, but volume is materially influenced by the height of the duty. The movement is due primarily to exacting standards for flour in the United States, and to the low average milling quality of American wheat as compared with Canadian. Manufacturing considerations inherent in milling programs and relative prices for competing Canadian and domestic wheats jointly determine when and in what amounts such imports shall occur. Detailed examination of wheat prices in Minneapolis and Winnipeg reveals approximately when Canadian wheat is at import parity with comparable American wheat in Buffalo or Minneapolis.

The McNary-Haugen Plan as Applied to Wheat: Operating Problems and Economic Consequences

A. E. TAYLOR and J. S. DAVIS

Feb '27 III (4), 177-234

A new departure in our national agricultural policy is embodied in farm relief measures latest represented by two bills now before Congress. The central features of the plan, as applied to wheat, are the operations of a federal board, seeking to maintain domestic prices at enhanced levels behind the tariff wall, to segregate the surplus over domestic requirements and sell it for what it will bring, and to distribute operating costs and losses among the growers by means of an equalization fee on each bushel sold. How could this plan be expected to work if the board should undertake, with the aid of necessary tariff changes, to maintain domestic wheat prices 50 cents a bushel over the Winnipeg price?

The board would face complicated administrative problems, in part analogous to those experienced under war controls, but more difficult to solve in time of peace. Several possibilities of breakdown cannot be ignored. Nevertheless, under certain conditions the plan might be found administratively workable, and consumers would probably bear the added costs of living without materially reducing consumption of wheat products. But the evidence indicates that the predicated enhancement of wheat prices would stimulate the expansion of wheat acreage; that the resulting increase in our wheat surplus would depress world prices; that, within a few years, the net price to growers would be no higher with the plan than without it; and that a new and painful readjustment of acreage would then be required. The greater the early administrative success, the greater would be the prospect of ultimate failure to advance the growers' interests.

The McNary-Haugen Plan as Applied to Wheat: Limitations Imposed by the Present Tariff

A. E. TAYLOR and J. S. DAVIS

Mar '27 III (5), 235-64

What could a federal board accomplish, in the way of raising the growers' price of wheat, by undertaking full operations with an equalization fee behind the present tariff of 42 cents a bushel? Price advances would be checked by competition of Canadian wheat imported over the duty. The

possibility of increasing domestic terminal prices under the present tariff is narrowly limited, for Canadian wheat already commands a price premium at American mills by reason of its inherent superiority to American spring wheats, and American wheats already enjoy some price enhancement because of the tariff.

A study of Winnipeg and Minneapolis prices during the past three crop years indicates that prices of American spring wheats at Buffalo, the natural import threshold, could not be raised, except in unusual years, by more than 10 or 12 cents a bushel. Prices of spring and winter wheats at most other markets could not be raised appreciably further without stimulating wheat imports and disrupting regional competitive relations in the milling industry. So slight an advance in prices to growers, partially offset by equalization fees, would hardly justify undertaking the experiment.

The latest bills contain substantial concessions to opponents of the central features of the plan, and include two alternatives or supplements to full operation with the equalization fee, notably loans to co-operatives and price insurance. The existence of these alternatives would impose heavier responsibilities upon the board and decrease its chances of success, without promising larger price enhancement to growers.

Comparative Levels of Wheat Prices in the United States and Canada

A. E. TAYLOR

Jun '27 III (7), 299-316

Under the existing tariff, wheat prices tend to be higher in the United States than in Canada, although Canadian wheat averages higher in intrinsic quality. The premium on American wheats varies from year to year, within a season, and with the basis of comparison. It is seldom as high as the tariff duty, except for brief periods, and then only for certain wheats; but on some wheats a premium exists even in years when the United States has a substantial export surplus.

Satisfactory comparisons of American and Canadian wheat prices or price averages are exceedingly difficult to make. The simplest comparison, between terminal prices of American and Canadian spring wheats of similar qualities, showed an average margin in favor of American wheat of about 26 cents in 1923-24 and 1925-26, or somewhat more if prices were weighted by volume of sales. The margin was much lower in 1924-25, when the American crop was large and the Canadian was short. Less reliable comparisons of No. 2 Hard Winter at Kansas City and No. 2 Red Winter at Chicago with No. 3 Manitoba Northern at Winnipeg showed lower margins than in the case of spring wheats in 1923-24, and in 1924-25, for hard wheat, a margin in favor of Winnipeg. In 1925-26, however, with a very short crop of American winter wheat, the margin was about as high as in the case of spring wheats. Per bushel values of the American crop of bread wheats east of the Rockies are usually higher than for the Canadian spring-wheat crop, but by less than the premium on American spring wheats.

India as a Producer and Exporter of Wheat

C. P. WRIGHT and J. S. DAVIS

Jul '27 III (8), 317-412

Wheat is produced in India under peculiar climatic conditions, by small-scale, simple methods. Some 10 per cent of the crop land is sown to wheat. The area is usually 30 to 31 million acres, but is heavily reduced when summer rainfall is deficient. Over a third of the wheat acreage is irrigated. Yield per acre varies chiefly with the winter rainfall; the average seldom falls below 10 bushels, and is usually 11 to 12. Good crops range from 360 to 380 million bushels, mediocre crops from 310 to 330, poor crops below 280.

Domestic requirements now absorb about 320 million bushels a year—the great bulk of the crop even in good years; in years of crop failure India becomes a net importer of wheat. Wheat is not a universal staple of the diet even in the producing provinces. Per capita consumption has tended upward for many years, but today only about a bushel per capita is retained for food, seed, and waste. The volume of exports in any year is determined chiefly by the size of the crop, but is influenced by inward carryover, export prices, and prospects for new sowings. Exports move chiefly from Karachi, the nearest port to the great surplus-producing area, the Punjab, and are usually heaviest in the post-harvest months of June–August.

India's importance as a wheat exporter was greatest in 1881-94 and in 1903-14. In the record year 1904-05, exports exceeded 80 million bushels; the average net export for the 11 prewar years was 45 million. Since the war, exports have exceeded 40 million bushels only in 1924-25, and the average net export has been only 13 million. The prospect is that consumption will keep pace with increases in production, and that India will remain a minor and erratic contributor to the world wheat trade.

Reactions in Exporting and Importing Countries to Changes in Wheat Prices

A. E. TAYLOR

Aug '27 III (9), 413-20

The public attitude toward changes in wheat prices is very different in wheat-exporting and in wheat-importing countries. The low prices prevailing in the three crop years 1921-24 contributed to the difficulties of American wheat growers and enlisted the sympathy of American manufacturers and statesmen. But in Europe low prices were advantageous as aiding the process of reconstruction in the balancing of state budgets and restraining adverse balances of merchandise trade; and the plight of European wheat growers was a minor problem. With the crop of 1924, wheat prices rose sharply and thereafter remained at a higher level. Relative prosperity replaced relative unprosperity in exporting countries, but in Europe the higher level is regarded as little less than a calamity.

The difference in attitude springs not only from the large import bill created by wheat imports necessary to Europe, but also from the different significance of bread to the populace. In the United States average income per family is relatively large, expenditure for and consumption of bread

relatively small; and bread prices do not fluctuate closely with wheat and flour prices. In Europe family income is small, bread plays an important part in the diet, and expenditure per family for bread is large; and since European bread consists more exclusively of flour than American, bread prices fluctuate closely with the prices of wheat and flour. High bread prices in Europe mean general curtailment of other family expenditures or recourse to distasteful food substitutes, but in the United States they are scarcely noticed by consumers. Wheat traders of Europe, in sympathy with European consumers, are prone to adopt a bearish attitude toward prices. American traders, in sympathy with American farmers, are prone to adopt a bullish attitude.

Statistics of American Wheat Milling and Flour Disposition since 1879

HOLBROOK WORKING

Dec '27 IV (2), 63-102

The principal results of the present study are embodied in tables and charts showing (1) for each crop year since 1879-80 the approximate flour output of the mills of the United States, the quantities of wheat ground and millfeed produced, and the domestic consumption of flour; (2) revised estimates of the monthly flour output of the mills of the United States since May 1923; and (3) estimates, in terms of deviations from a 4-year average, of the approximate total stocks of flour in all positions (including retail and household stocks) in the United States on the first of each month since May 1, 1923.

In one respect the course of flour consumption in the United States is shown to have differed significantly from that indicated by previous figures. The decline of flour consumption to a level of about nine-tenths of a barrel per capita was not a postwar phenomenon, but occurred within a few months almost immediately following entry of the United States into the war. Misapprehension as to the timing of this drastic decline in flour consumption was made possible by wide fluctuations in unrecorded flour stocks. Investigation shows that the existing statistics of flour stocks give no significant indication of the amount of change in total flour stocks or even of the time or direction of the principal changes in the total.

Disposition of American Wheat since 1896, with Special Reference to Changes in Year-End Stocks

HOLBROOK WORKING

Feb '28 IV (4), 135-80

Development of official statistical series covering stocks of wheat in interior mills and elevators (from 1919) and in city mills (from 1925) makes currently available for the United States a substantially complete statement of total carryover of wheat at the end of each crop year. The importance of changes in year-end stocks of wheat has tended to be underrated because the incomplete statistics available prior to 1919 showed changes from year to year averaging only about half as large as the actual total changes in carry-over.

The price changes induced by fluctuations in wheat production from year to year lead in the United States to only small variations in utilization of wheat for food, feed, seed, and waste. The larger part of the variation in production has been absorbed by variations in exports and by changes in carryover. The changes in year-end stocks have averaged quite as large as the variations in exports and have been especially important when export demand has been large or small in relation to production.

Available statistics of year-end stocks of wheat in the United States are here assembled and analyzed, and methods are developed for estimating annually the amount of wheat in stocks not covered by the statistics. The series of estimates arrived at by what appears to be the most trustworthy of these methods is then combined with the statistically reported stocks to obtain a new series representing approximately the total of all stocks of wheat in the United States on July 1 annually from 1896.

Rye in Its Relations to Wheat

A. E. TAYLOR

Mar '28 IV (5), 181-234

Aside from wheat, rye is the only cereal from which yeast-leavened loaf bread can be made. Rye is used for bread-making, for feed, and for distillation of alcohol; but only in Europe north of the Alps is production or consumption of large volume. Before the war, the per capita disappearance of rye was about 360 pounds in Germany and only 22 pounds in the United States. Since the war, disappearance in both countries has declined, to about 245 pounds in Germany and 17 pounds in the United States. There has been a tendency to abandon rye bread in favor of wheat, though rye is as digestible as wheat except for the bran. Europe has always produced the bulk of the world crop of rye but not of wheat, and has therefore imported much more wheat than rye.

For an equivalent number of calories, the price of wheat usually exceeds the price of rye both in the United States and in Europe. This results largely from consumers' preference for wheat; rye bread has always been the bread of poverty in Europe, and rye tends to be regarded merely as a flavoring medium for wheat in the United States. Demand for rye seems sufficiently inelastic, however, to elevate rye prices above wheat prices in years of marked shortage of rye crops. So long as consumers everywhere continue to prefer wheaten bread and suitable land is available in the world for further expansion of wheat production, and so long as American farmers prefer other grains for feeding stuffs, the prospect for profitable continuous expansion of rye production in the United States is not bright.

The Objectives of Wheat Breeding

C. L. ALSBERG

Jun '28 IV (7), 269-88

The objectives of wheat breeding are complex. They ordinarily involve the development of wheat varieties combining high yield with high protein content; but these are difficult to combine, and the breeder must often com-

promise. The farmer desires the high yields most common in soft winter wheats; but if protein content is too low or quality too poor, he may receive so low a price as to nullify the expected gain from high yield. Since wheat must be adapted to each locality in which it is grown, the breeder must add to his task the development of resistance to fungous and insect pests, to drought, to cold, to hot, dry winds, to a short growing period, and the like. Emphasis on quality in wheat breeding developed only with the advent and growth of world trade in wheat and with the introduction of roller milling in the 1870's. Changes in agricultural technique have also modified the objectives of wheat breeding. For example, lodging was unimportant when wheat was garnered with sickles; but the advent of the harvester and of the "combine" called for development of wheat that would not lodge and would not shatter its seed if allowed to stand in the field after maturity.

Only since 1900 has breeding become truly scientific. Before that date even the most adequate method, hybridization, was purely haphazard; for the laws under which the characters of the parents are transmitted to the offspring were unknown. Today the situation is complicated by the fact that many seed characters are not transmitted in the same way as the characters of the plant itself. During the last twenty years the principles of the science of genetics have been more and more applied to the complex practical problems of wheat breeding, and much progress has been made.

British Parcels Prices: A World Wheat Price Series

M. K. BENNETT

Jul '28 IV (8), 289-306

The "world price of wheat" is often discussed, usually with reference to prices in the United Kingdom; but actual price series that may reasonably be regarded as representing British or world prices are not often encountered. There are at least two important purposes which no well-known series seems fitted to serve: as a central representative series for short-time comparisons with cash wheat prices in the great wheat-producing and wheat-consuming countries of the world; and for comparisons of cash wheat prices on the world market undertaken to ascertain what particular types and grades are normally premium or discount wheats, and how relationships shift from year to year.

Weekly averages of daily quoted prices of all sales of wheat parcels in the United Kingdom appear to serve these purposes better than any other world price series now available. This series is presented here for the first time, covering the last six crop years. Comparisons with other series illustrate its adequacy. Sales of cargoes are too few to provide a continuous series. Liverpool wheat futures prices are not continuous, and cannot be employed without splicing one future to another in such a manner that the price movement is obscured. Monthly average prices of all wheat imported into the United Kingdom do not reflect short-time fluctuations satisfactorily. The prices of straight-run flour at London are at times affected by special developments in the milling industry. The prices of single grades of wheat

are usually not continuous. The parcels price seems best to fill the requirements of a world wheat price useful for short-time analyses. It is continuous, representative of the range of prices in the United Kingdom, available without undue lapse of time, and reasonably easy to obtain on a weekly or even a daily basis.

Ex-European Trade in Wheat and Flour

M. K. BENNETT

Aug '28 IV (9), 307-56

Ex-European imports of wheat and flour are becoming increasingly important. Between 1909-13 and 1921-26, the average annual volume of ex-European trade increased by some 45 million bushels, or 50 to 60 per cent, while European trade increased only about 30 million bushels, or not much more than 5 per cent. Growth of the Asiatic trade accounted for most of the increase in ex-European takings. Further growth is likely: there are few ex-European areas where domestic wheat production shows promise of obviating the need for imports; and per capita consumption of wheat is apparently increasing in most of these countries. Within a decade or so the ex-European trade may amount to as much as a fourth of the international trade, as contrasted with an eighth before the war.

European imports have always consisted chiefly of wheat, ex-European imports chiefly of flour. In the postwar period, the flour trade of ex-Europe was almost as large as that of Europe. But flour tends to become a smaller fraction of the trade in wheat and flour combined, since several important importing countries now protect their domestic milling industries. The United States remains the chief source of ex-European supplies of wheat and flour, but has become relatively less important with the more rapid expansion in the exports of Australia and Canada.

The ex-European demand appears to be rather less elastic than is commonly supposed. Year-to-year variations in the volume of trade have been large in postwar years. They appear to have been due, however, quite as much to fluctuations in the Chinese wheat crop and to a general upward trend of wheat consumption as to variations in wheat prices and concomitant substitution of other cereals for wheat.

Forecasting Wheat Yields from the Weather: Elements of an Unsolved Problem

C. L. ALSBERG

Nov '28 V (1), 1-44

Customary methods of forecasting crop yields are based on the exercise of judgment and are subject to errors inherent in judgments, especially to bias. Hence methods involving the least possible exercise of judgment are needed, if only as checks upon current methods.

Forecasting yields from the weather would satisfy this need. Proposed methods assume that a given crop plant in a given region always reacts

in the same way to a given kind of weather. Mathematical formulas have been developed to predict crops in a given year from weather and crop data of earlier years, and weather data of the year in question. Sometimes such forecasts are reasonably good, sometimes not. They would be better if data for past crops were not often inaccurate; if weather data, though reasonably exact, did not sometimes lack important weather factors; and if more were known of the laws of growth and of the influence of environmental factors on crop formation.

To remedy these deficiencies, crop-yield statistics and weather records must be improved, and much scientific research upon the laws of plant growth must be conducted. Investigations by physiologists designed especially to determine at what stages of the crop plant's growth the weather exerts the greatest influence, and why, will prove particularly important. If these various gaps in knowledge are filled—and there is no reason why they cannot be—forecasting yields from the weather should become a valuable tool for agricultural statisticians. In all probability the process must always depend in part upon statistical analysis. Experimental work promises to make its greatest contributions toward the problems of forecasting by furnishing improved bases for statistical analysis.

(See also H. L. van de Sande-Bakhuyzen, *Studies on Wheat Grown under Constant Conditions: A Monograph on Growth*, Food Research Institute, Miscellaneous Publications 8, Stanford University, California, 1937.)

The Place of Wheat in the Diet

A. E. TAYLOR

Feb '29 V (4), 147-74

Wheat now contributes about one-fourth of the calories of the American diet. It is still the outstanding single staple foodstuff. In most southern European countries wheat contributes a larger proportion of the total calories than in the United States; but in countries where rye or rice is the staple cereal, its contribution is smaller. Its nutritional importance in the United States lies primarily in the starch content, not in the content of protein, mineral elements, vitamins, or roughage.

To consume our wheat as whole-wheat bread instead of white bread would make no essential contribution to the national health, and would not be in the interest of national economy, at least if the present American diet continues to prevail. Protein, minerals, vitamins, and roughage are adequately available in other foodstuffs. Nutritional security in the diet is to be sought in the milk supply; and perhaps more than an eighth of the milk supply is secured from mill offals of wheat.

Wheat now ranks as one of the cheapest foods. Per capita consumption appears to be increasing in the world at large, but not in the United States or in Great Britain, Canada, and Australasia. Under present conditions of American prosperity, there is little reason to anticipate increased per capita consumption here.

A Weighted Series of Cash Wheat Prices at Winnipeg

M. K. BENNETT

Mar '29 V (5), 175-206

The range of cash wheat prices at Winnipeg is a wide one at any time. Broad comparisons of short-time movements of Canadian prices with the movement in other countries are considerably facilitated if a price series adequately representative of the range of prices is available for each market or country. Canadian wheat crops vary widely in their composition by grades from year to year, so that the prices of any single grade are not consistently appropriate for such comparisons; and futures prices are also unsatisfactory. This study presents a series of weekly weighted average cash wheat prices at Winnipeg which seems, with certain limitations, to be satisfactorily representative of the range of Winnipeg prices. It is based upon weekly averages of cash closing prices on the Winnipeg Grain Exchange, weighted by inspections of wheat by grades at Winnipeg.

The series is subject to several qualifications arising from the price statistics and the weights used. Of these qualifications the most important is that the volume of weekly sales at Winnipeg cannot be expected to conform precisely in its composition by grades with the composition of weekly inspections by grades. The series seems least reliable as an indicator of the true course of Winnipeg cash prices in the months of August and September, when inspections are small and when they may change radically in their composition by grades. It is less satisfactorily representative of terminal prices throughout all Canada than of terminal prices at Winnipeg, because prices and inspections of wheat sold at Vancouver are not included. The defects of weighting by Winnipeg inspections are, however, less significant in weekly weighted averages than they would be in monthly or annual weighted average prices.

Variations in Wheat Prices

A. E. TAYLOR

Jun '29 V (7), 241-300

The effort for stabilization of the general price level implies the occurrence of significant degrees of variation in the general price level. Agitation for stabilization of the price of a particular commodity, like wheat, similarly implies significant variations in price. The meaning and causes of wheat price variations have long been entangled in controversies over the prevailing system of marketing wheat. But to a surprising extent the variations themselves have not been classified, described, and explained. Analysis of wheat price variations is essential as a background to the consideration of stabilization of the price of wheat. The purpose of this study, a tentative incursion into the subject, is to offer a nontechnical picture of wheat price variations, principally in the United States, during the past three decades.

We have first attempted to define the various significant types of variation. Thereafter, using several series of cash wheat prices, we have sought

to illustrate the amplitude of movement in each type of variation; to indicate the immediate and distant influences to which variations may principally be traced; and to contrast variations occurring in prewar years with those occurring in postwar years. Short-time fluctuations, month-to-month changes, recurrent seasonal movements, and shifts in wheat price level from crop year to crop year are interrelated, and difficult to separate one from the other. The price of wheat at any time is not a point, but a wide range. Consequently, on the basis of available price series, a good deal of uncertainty necessarily surrounds any attempt to describe and measure wheat price fluctuations, and to point out the principal causes of variation. The present study is not offered as conclusive; but it serves to throw into relief certain characteristics of wheat price movements which seem to require attention whenever wheat price stabilization is discussed.

The Export Debenture Plan for Wheat

J. S. DAVIS

Jul '29 V (8), 301-46

The farm export debenture scheme is an ingenious proposal to supplement our protective tariff by a system of export bounties on farm products of which we produce export surpluses. The bounties would be payable in "debentures" receivable for customs duties. The proponents reason that debenture rates will be reflected back to farm prices, thereby contributing greatly to farmer prosperity and "equality for agriculture."

Our analysis of the plan, as it might be applied to wheat and flour, leads to the conclusion that the results would be highly disappointing. Even in the early stages, farm prices of wheat would be raised by less than the debenture rate. Under the stimulus of expected and realized price increases, production would expand. Consequent expansion of exports would cause declines in world prices, thereby minimizing the enhancement of domestic prices. Ensuing readjustments in acreage, here and abroad, would lead to an equilibrium in which price benefits to American wheat growers would be only moderate, even in the absence of foreign retaliation. Some reprisals are likely; and so far as these materialized, they would reduce the farm price enhancement otherwise possible. Higher prices to farmers as consumers, substantial costs to the Treasury, disturbances to agriculture, industry, and trade, and international complications would tend to offset the gains from limited increases in farm prices.

Pertinent foreign experience with analogous devices tends to bear out this reasoning. The reputation of the debenture plan might be better or worse than accurate appraisal would warrant, for its actual results would be hard to disentangle; but we are convinced that hopes of substantial benefits from its application are illusory.

(See also J. S. Davis, *The Farm Export Debenture Plan*, Food Research Institute, Miscellaneous Publication 5, Stanford University, California, 1929.)

Wheat under the Agricultural Marketing Act: Some Problems of the Federal Farm Board

A. E. TAYLOR

Aug '29 V (9), 347-425

The Agricultural Marketing Act constitutes an innovation in national policy. It embodies recognition of the desirability of maintaining reasonably comparable progress in agriculture and industry. Since the beginning of the century, and especially since the war, urban industry as a whole has undergone reorganization, through scientific management, from which rationalization of production methods has resulted. The outstanding problem facing urban industry today is to introduce into the system of distribution an efficiency comparable to that existing in the methods of manufacture. Reorganization of distribution is believed to lie within the powers of industry. Agriculture, like industry, has undergone extensive reorganization on the side of production, and as a whole agriculture is probably as efficient in production as is urban industry. The system of distribution of agricultural products remains inefficient. The new legislation is addressed to this situation. It is based on the view that agriculture is so far-flung and contains so many units that reorganization from within is peculiarly difficult and is therefore entitled to governmental assistance.

The new legislation does not deal with an emergency and is not designed as an operation of salvage. It is a forward-looking measure, designed for the permanent betterment of agriculture. In the Agricultural Marketing Act are envisaged a reorganization of co-operative marketing and a rationalization of the processes of distribution. Wheat is one of the most important crops and is prominent in our export trade. Wheat growers have suffered both general and special disabilities. On the basis of existing information, it ought to be possible to make a tentative appraisal of the reorganization of wheat production and trade under the act. We undertake such an appraisal in the ensuing study.

The Post-Harvest Depression of Wheat Prices

HOLBROOK WORKING

Nov '29 VI (1), 1-40

The tendency to post-harvest depression of wheat prices, commonly viewed as uniform from year to year, is in fact highly variable and is restricted to cash prices. We find no evidence of a general tendency toward post-harvest depression of prices of Chicago wheat futures. The tendency to post-harvest depression of cash prices is a tendency to depression of cash prices relative to prices of futures. This tendency varies widely from year to year. In some years, cash prices are slightly elevated, relative to prices of futures, during the immediate post-harvest period; in other years the depression is double the average. For some classes of wheat, at least, the post-harvest depression of cash prices relative to futures is closely related to the size of the carryover from the previous year and to the size of the crop just harvested.

Dealers can usually distinguish between years in which storage of wheat will show a profit and years in which it will show a loss. By taking the profits and avoiding most of the losses, they obtain average gross gains considerably larger than indicated by simple averages of price changes. Even so, the possible gross gains from storage of wheat during 15 prewar and seven postwar years were insufficient to cover the costs of many, if not of most dealers; the profits in the good years were offset by losses and costs of maintaining unused elevator space in the other years. Most farmers can store wheat more cheaply than dealers, but the possible profits are still small and may readily be converted into losses by an unwise storage policy.

The allegation that the post-harvest depression of wheat prices in the United States during the present century has generally been excessive, permitting exorbitant profits from storage of wheat by dealers, is entirely without foundation.

The Contractility of Wheat Acreage in the United States

A. E. TAYLOR

Feb '30 VI (4), 151-87

When producers of a commodity move for higher prices they must be prepared to restrict production. When producers undertake to effectuate a horizontal integration, they must be prepared to impose upon the associated units of the business the adjustment of supply to demand. This broadly states the position of wheat growers in the United States. They seek higher prices for wheat. They obtained from the Congress in the passage of the Capper-Volstead Act the right to effectuate horizontal integration in the shape of the growers' co-operative association, practically exempt from anti-trust laws. They obtained in the passage of the Agricultural Marketing Act the administrative and monetary assistance necessary to put theory into practice. The Federal Farm Board, undertaking to accomplish for wheat growers the objectives of the legislative enactments, urges upon wheat growers the consolidation of their individual operations into co-operative associations, and the restriction of acreage planted to wheat.

In the past, agricultural co-operative associations have not often achieved signal success in restriction of acreage or production. Nevertheless, it is only through co-operative associations that contraction of wheat acreage seems to be attainable, outside of liquidation through abandonment of farms. We have no precedents for a policy of contraction recommended by a farm board, to be executed by co-operative associations. In this undertaking, new history is being written. Large questions are involved, both direct and collateral. In the present study, we confine ourselves to an appraisal of the proposition of contraction of wheat acreage from the standpoint of the traditional and accustomed incentives of wheat growers. These incentives seem not to be such that the wheat acreage would be contracted in the absence of a movement toward farm co-operatives; and the movement itself is likely to meet opposition based upon the traditional incentives. Thus, in a direct sense, agricultural co-operation is on trial.

The Danube Basin as a Producer and Exporter of Wheat

V. P. TIMOSHENKO

Mar '30 VI (5), 189-284

The Danube basin has lost its important position on the world wheat market since the war. Before the war, 1909-10 to 1913-14, its exports averaged about 110 million bushels of wheat; five years after the war, during the period 1923-24 to 1927-28, Danubian wheat exports fell to about 36 million bushels yearly. The principal cause of the decline in exports is reduced production, the result of lower yield per acre. The acreage sown to wheat has about recovered to the prewar level. Rumania is chiefly responsible for the decline in the yield of wheat per acre. Radical agrarian reform in Rumania caused a great transfer of land from large estates to small peasant holdings; and this created certain maladjustments, at least of a temporary character. Together with the unfavorable consequences of the war, the radical agrarian reform resulted in decreased production. Other Danube countries have better recovered from the consequences of war, and their agrarian reforms interfered less with agricultural activities. The increase of local wheat consumption, as the result of the growth of population or the changes in consumers' habits, was of secondary importance in causing the decline of exports.

The outlook for further development of wheat exports depends on many factors, some of them obscure. It would be unreasonable, however, to expect a considerable or rapid increase of wheat production. As for exports of wheat, the present land distribution will tend to decrease the proportion of exports to total production, for the very high proportion of exports to production in prewar years was caused partially by the then extensive production of wheat on large estates. Peasants now produce less wheat and more corn, which they consume as food. The shift of population from the country to the city, which may be considered inevitable in some degree, will also increase home consumption of wheat and tend to reduce exports. However, there is in all the Danube countries some tendency toward recovery of wheat production, and of wheat exports as well.

Growth of Wheat Consumption in Tropical Countries

M. K. BENNETT

Jun '30 VI (7), 341-50

This study deals with total and per capita consumption of wheat as flour, 1909-28, in six groups of countries: Brazil, Other Tropical South and Central America, the West Indies, Tropical Africa, Tropical Asia, and Oceania. The aggregate population of these areas rose from 183 million at the end of 1913 to 221 million at the end of 1926.

Before the war, wheat consumption in tropical countries was increasing more rapidly than their population. During the war, with shipping controls and high prices of wheat and flour, total and per capita consumption declined in all six groups of countries. A sharp upturn in 1919 accompanied relaxation of wartime controls, and a slump accompanied the postwar depression. From 1922 to 1928, with only minor interruptions, consumption tended upward, more rapidly than in most nontropical regions.

Per capita consumption of wheat is relatively small in tropical countries, but has long been relatively heaviest among populations strongly influenced by European and American dietary habits, as in Oceania, West Indies, and Brazil. In Oceania, per capita consumption in 1923-27 averaged lower than in 1909-13. Fortuitously, the same was true of Brazil, where the 1924-28 average is well above the prewar level. In the other four groups of tropical countries, recent averages are also well above earlier levels per capita. For all six areas combined, consumption in 1928 was roughly double that in 1909.

In general, though by no means invariably, wheat consumption in these countries varies inversely with wheat prices. But the upward trend has probably been due to persistent and deep-rooted causes not clearly understood. It seems unlikely to be overcome in the immediate future unless by a strong upward movement in wheat prices or by severe and prolonged price depression in the export commodities of these countries.

Japan as a Producer and Importer of Wheat

W. Y. SWEN and C. L. ALSBERG

Jul '30 VI (8), 351-78

The trend of per capita consumption of wheat in Japan is examined in the present study, for Japan is the only major region of eastern Asia where rice is the staple cereal and where, at the same time, statistics are adequate for the determination of such a trend. Many uses of wheat unknown in the Western world complicate the analysis. Large quantities disappear unmilled: principally in sweet goods, in *miso* (cheese), and in soy sauce. Feed takes but 1.5 per cent, and seed (at 0.85 bushel per acre) only 2.2 per cent. Perhaps 30 to 40 per cent of the Japanese domestic wheat crop is not commercially milled.

In the last 50 years, the wheat area has increased 30 per cent, and the crop 170 per cent; but the prospects for further rapid expansion are not good. Nevertheless, while 50 years ago Japan was to a small extent an exporter of wheat, she has now become a heavy importer, due partly to population growth, but much more largely to expansion of milling under tariff protection. Japan today imports much wheat and exports flour to other Oriental countries, largely China; and she has become the world's fifth largest exporter of flour.

In the last 50 years, the per capita consumption of wheat in Japan proper has increased between two and three times. But it is still small; the total annual per capita disappearance in recent years has averaged only about three-quarters of a bushel. The increase in per capita disappearance was more rapid after than before the war. It is probable that utilization in baked goods has expanded more rapidly than other uses, industrial ones perhaps excepted. Growing wheat consumption is probably the expression of a general rise in the standard of living rather than of a change in taste, for the per capita consumption of rice has also been increasing, despite the fact that each unit of food value is more expensive in the form of rice than in the form of wheat.

The Changing World Wheat Situation: A Statistical Appraisal in Terms of Averages, Trends, and Fluctuations

HOLBROOK WORKING

Sep '30 VI (10), 421-57

The geographical distribution of the world's wheat production and trade is continually changing. In the present study we present first a primarily statistical and graphical description of the general situation, based on the most recent data.

In the changes from year to year in the international wheat situation, the various countries of the world play quite different parts. The changing surpluses from Canada, Argentina, Australia, and from some minor exporters are forced on the international market almost without regard to price. Half of the usually large United States surplus may either be exported or withheld, depending chiefly on the export price. Indian and Danubian exports also depend on price. Among the major importers, only Great Britain, Germany (prior to the war), the Netherlands, and perhaps Belgium appear commonly to adjust reserves so that fluctuations in the size of their own crops and part of the fluctuations in international supplies are absorbed. Italy, France, and Spain make no measurable adjustment either of domestic consumption or of year-end stocks to the international supply situation, but absorb part of the fluctuations in their domestic crops.

From the review of characteristics of year-to-year fluctuations in the various elements in the international wheat situation, it appears that certain new developments tend to promote wide fluctuations in prices from year to year. It appears also that the autumn of 1930 finds the ability and disposition to withhold or to accumulate surplus stocks, essential to the prevention of abnormal price depression when supplies are above current requirements, weakened or absent to an extraordinary degree.

The United States Wheat Flour Export Trade

A. E. TAYLOR

Nov '30 VII (1), 1-87

Before the war the wheats of the exporting countries flowed into international commerce within a relatively narrow price range. Crops varied, introducing variations into the relative positions of wheats of different types. But all these countries had representative wheats for export, and this held true with declining exports from the United States in the decade before the war. Flour exports displayed in general comparable relations. Each country engaged in the export of flour was in position to offer flour from representative wheat, with costs based on a wheat price approximating the world wheat price level. The determining factors in export flour trade were largely related to excellence in milling, type and quality of flour, and facilities in merchandising. The significant trends lay in expanding wheat production in Canada, Argentina, and Australia.

Since the war conditions in the United States have departed from those

in the other surplus-producing countries. With growth of population, the volume of representative bread wheat in the crop declines, relative to population. Flour specifications stand distinctly high. The wheats required to meet domestic flour standards tend to command premiums. We grow a relatively large amount of wheat not meeting domestic standards. Behind the tariff wall the prices of representative American wheats often stand above export parity. In Canada, Australia, and Argentina, as a rule the prices of representative wheats stand at export parity.

In consequence of these circumstances, the American miller faces a higher price for wheat than do his competitors in foreign trade. This represents a disability which has been overcome in part by milling ingenuity and merchandising efficiency. It is the purpose of this inquiry to appraise the circumstances influencing the export of flour. The topic is not one that lends itself to a set of rounded conclusions. We undertake a statement of the problem, chiefly in the endeavor to make a correct appraisal of technical considerations.

Speculation, Short Selling, and the Price of Wheat

A. E. TAYLOR

Feb '31 VII (4), 231-66

Low producers' prices for raw materials, and especially for primary agricultural products, provoke legislative efforts designed to effect changes in the practices of trade. Quite generally, current practices in transportation, distribution, and banking are regarded by producers as responsible for, or contributory to, low prices. The Hoch-Smith resolution and the Agricultural Marketing Act resulted from agitations provoked by low producers' prices. Since the passage of the Agricultural Marketing Act, farm prices for agricultural products have further declined. To this is to be ascribed the recent intensification of agitation against speculation on the grain exchanges.

Bills already introduced into the Congress make it evident that strong efforts will be exerted in the first session of the Seventy-second Congress to curtail speculation by direct legislative action and to establish far-reaching regulations by the Department of Agriculture. During recent months particular agitation has been directed against short selling and open short commitments by speculators. It is sought to preserve hedging for millers, private grain merchants, and the subsidiaries of the Federal Farm Board, while curtailing speculation on the selling side.

It is not our intention at the present time to examine in detail the relation of speculation to price level. The circumstances of the last three crop years, including the present one, offer, however, a favorable opportunity for a limited examination. This limited examination is confined to the relations of the American price of wheat to the world price of wheat during recent years, with reference to the influence of speculation. The discussion includes such references to the current practices of exporting wheat as serve to elucidate the price relations.

Official and Unofficial Statistics of International Trade in Wheat and Flour

M. K. BENNETT and ADA F. WYMAN

Mar '31 VII (5), 267-93

The statistics most widely employed to measure fluctuations in the volume of international trade in wheat and flour are unofficial statistics published in Broomhall's *Corn Trade News*, and official statistics of net exports. This study compares these series, both as to annual crop-year data and as to average monthly data.

Crop-year statistics of world net exports overseas have exceeded Broomhall's shipments by 36 million bushels a year, or approximately 5 per cent, on the average, over the nine years 1921-22 to 1929-30. There appears to be little likelihood of double counting on the part of customs officials; rather, the discrepancy seems to arise principally because Broomhall's figures have not taken account of some wheat and flour moving from North America and of some moving from Hungary and Yugoslavia. The North American situation is complicated by the crisscross movement of wheat on the Great Lakes. From Hungary and Yugoslavia much wheat is exported over land frontiers, at scattered points, a circumstance which places difficulties in the way of unofficial statistical agents. On the whole, for the annual volume of trade, it is probable that the net export series is the more accurate of the two series considered.

On the other hand, it seems clear that Broomhall's shipments provide the best available series for the study of month-to-month fluctuations. For Argentina and Australia average monthly net exports and shipments coincide fairly closely. Broomhall's data seem to represent fairly well the course of the movement from North America, whereas available official statistics are not so compiled as to provide a trustworthy picture. Probably neither series adequately measures the month-to-month outflow of wheat and flour from minor exporting countries. Too much significance should not be attached to minor month-to-month changes in the total volume of trade as shown by Broomhall's data; but larger changes presumably reflect a real alteration in the volume of trade, and the general drift over a period of months is certain to be indicated by Broomhall's shipments.

The Wheat Situation in Scandinavia

HELEN C. FARNSWORTH

Jun '31 VII (7), 347-403

During the past 25 years wheat has gradually displaced rye as the primary bread cereal in Scandinavia. Wheat production has increased while rye production has decreased; and net imports of wheat have increased while net imports of rye have declined. In Denmark and Sweden, at least, the demand for wheat and for rye appears to be quite elastic within the lower price ranges, for under appropriate price conditions large quantities of the lower grades of these cereals are utilized as feed. There is no conclusive statistical evidence of extensive year-to-year substitution of wheat for rye or of rye for wheat, but statements of competent observers suggest that such substitution is common when price relationships justify it.

About half of the wheat utilized in Scandinavia during postwar years was of domestic origin. Postwar average yields per acre of wheat were characteristically high, ranking in each of these countries among the 10 highest recorded in the world. Most of the wheat (including flour) imported into Scandinavia during the past decade originated in North America. Norway took about half of her total net imports in the form of flour; Denmark took over one-third of her imports in that form; while in Sweden net imports of flour amounted to less than one-tenth of the total.

Prices of native wheat in Denmark ruled fairly consistently below British parcels prices during postwar years. In Sweden and Norway, on the other hand, tariffs and other governmental measures kept prices of native wheat above British parcels. As in a number of other European countries, prices of native wheat in Denmark and Sweden showed a tendency to rise relative to the price of British parcels toward the end of each crop year.

Financial Results of Speculative Holding of Wheat

HOLBROOK WORKING

Jul '31 VII (8), 405-37

Not all holding of wheat is speculative, and gains or losses from purchase and resale of wheat are to a large extent nonspeculative. Gains and losses which have arisen from speculative holding of wheat may be defined as comprising those gains and losses which were transferred to speculators through hedging of wheat supplies in the futures markets, plus equal gains or losses per bushel on wheat held unhedged. Speculative gains and losses on wheat held in the visible supply may easily be calculated for a period of 41 years. Gains and losses on speculative holding of all wheat in the United States may be approximated fairly closely for a period of 18 years and may be estimated roughly for 41 years.

During the 12 years of generally declining prices, 1884-85 to 1895-96, speculative holding of wheat appears to have resulted in a net loss of 250-300 million dollars. During the next 20 years, net gains resulted in more years than did net losses; and with the large gains realized in 1914-15, net losses for the entire period 1884-85 to 1915-16 were reduced to some 120 million dollars. The largest speculative gains and losses occurred during the nine postwar years. In 1924-25 speculative holding of wheat showed a net gain of 95 million dollars, and in 1929-30, a net loss of 226 millions. For the nine years as a whole, it showed a net loss of about 190 million dollars, equivalent to a loss of eight-tenths of a cent per bushel per month on the wheat held.

Gains and losses on speculative holding of wheat on farms accrue almost wholly to the growers. Gains and losses on wheat in commercial channels are divided principally among three groups: forward buyers of flour, wheat merchants and millers who hedge irregularly or not at all, and speculators in wheat futures. Forward orders on flour seem, on the average, to have provided hedges on about half of the wheat in commercial channels. There is no indication that flour buyers have tended generally to gain more than they have lost by their forward buying. Irregular hedgers, viewed as specu-

lators, seem on the average (and doubtless with many individual exceptions) to have profited moderately from their speculations. Futures traders, taking most of the remainder of the gains and losses on speculative holding of wheat in commercial channels in the United States, appear therefore to have lost considerably more than they have gained.

The International Wheat Conferences during 1930–31

A. E. TAYLOR

Aug '31 VII (9), 439–75

Low wheat prices have provoked distress in agriculture in all countries in which wheat is a prominent crop. In consequence a widespread and intensive revival of agrarian agitation has occurred. Higher wheat prices are sought. The net-wheat-importing countries are in position to raise domestic wheat prices through tariffs and other restrictive regulations; Germany, France, and Italy furnish the outstanding illustrations. The net-wheat-exporting countries have at their disposal as instruments for the raising of wheat prices only direct subsidy or indirect bonus, and these have not been applied to any significant extent. In consequence, producers' prices of wheat in the wheat-exporting countries present an extreme contrast with producers' prices in the importing countries which have established high protection.

The wheat-surplus-producing countries have held numerous conferences to promote collective action for the purpose of raising wheat prices. Sixteen of such conferences are here reviewed. Broadly stated, the movements for concerted action in the international marketing of wheat has developed into a quota plan, which was formally presented at the recent London conference of wheat-exporting countries. The quota plan for marketing wheat would represent essentially the sale of wheat by negotiation, largely under governmental direction, which would tend to be political. At the London conference only the United States desired a continuation of international marketing of wheat upon established grain exchanges. Under the opposition of the delegation of the United States, the quota plan failed of official acceptance. The topic represents a chapter in the annals of governmental control of primary materials. It is the first time an international monopolization has been sought to control a staple foodstuff.

Cycles in Wheat Prices

HOLBROOK WORKING

Nov '31 VIII (1), 1–66

The record of weekly wheat prices over 43 years presents a panorama of price movements, one movement merging into, or superimposed upon, another; there is little evidence in the record to support the concept of seasonal price levels with appropriate interseasonal transitions.

Two broad classes of movements must be distinguished—seasonal and nonseasonal. The seasonal movements are restricted chiefly or entirely to cash wheat prices. When separated from the nonseasonal movements in

cash prices, the seasonal movements prove to constitute a *seasonal cycle*, of great variability in form and amplitude.

Prices of wheat futures, which seem to have no true seasonal cycle, show much more clearly than cash prices the nonseasonal wheat price movements. Of four main types of nonseasonal movements, three are typically of rather long duration. These three are (a) movements associated with a *long cycle* in wheat prices; (b) movements associated with the *business cycle*, but much more intimately related to wholesale prices in general than to business activity; and (c) movements associated with *size of the world wheat crop*, harvested during the season. On comparing the average magnitude of each of these three classes of movements, through the April-March wheat "price movement season," they appear of about equal importance.

A fourth class of major nonseasonal price movements—of shorter duration, but commonly responsible for sharper and larger price movements—includes the *crop-scare* and the *winter price cycles*. Each is marked in its initial phase by a price increase of 14 cents or more (on the 1913 price-level basis) within a period of five weeks or less. Such a price increase is almost always followed rather promptly by an almost equal price decline.

Economic Nationalism in Europe as Applied to Wheat

A. E. TAYLOR

Feb '32 VIII (4), 261-76

The business depression has provoked difficulties for state budgets and international accounts as well as for private enterprises. At the low price level, debtor countries find the values of their exports too small; despite low prices, creditor countries find the values of their imports too large. In order to influence their international accounts, both debtor and creditor countries endeavor to increase exports and reduce imports by direct governmental action. Quite generally the result is to promote self-containment. In Europe, in particular, the programs of self-containment are becoming state policies of ambitious extent. "Economic nationalism" is the political term applied in Europe.

The movement is fostered by distress of producer classes. In particular, agriculturists in European countries seek preferential positions. It is sought to raise more food at home and to import less. The program has been advanced for bread grains especially. Western Europe aims to raise more wheat. Central Europe seeks preference in the wheat markets of western Europe. The dominions of the British Commonwealth seek preference in the wheat markets of Great Britain. Great Britain, Holland, Belgium, and France extend preferences to their colonies for feeding stuffs. In order to effectuate quotas and preferences, intricate internal regulations and extensive interstate barter become necessary. Russia, Argentina, and the United States stand outside the charmed circle. Of the exporting countries, the United States alone must sell export wheat at competitive prices on open markets. This country possesses no bargaining tariff. If the countries of Europe develop these programs significantly, the wheat export problem of the United States will become intensified.

Russia as a Producer and Exporter of Wheat

V. P. TIMOSHENKO and M. K. BENNETT Mar-Apr '32 VIII (5-6), 277-375

Soviet Russia seems unlikely, in the next few years at least, to recover the prewar position of the Russian Empire as an exporter of wheat. Russia's domestic requirements for wheat have increased, and are increasing steadily, with the growth of population and the limited expansion of rye production. The large wheat exports of 1930-31 were made possible by exceptionally high yields per acre and rationing of domestic consumption; and large as they were, they were small in contrast with prewar exports in years of high yields. As before the war, the volume of exports will fluctuate widely from year to year. Sizable exports are to be anticipated in years of high yields, but not in years when the yields are average or low.

Broadly speaking, exports can attain the prewar level only if acreage and/or yield per acre can be increased more rapidly than the population grows. But expansion of the total crop area must take place principally on relatively poor-quality land in Asiatic Russia, and through diversion of fallow land to crops. In either direction the process must proceed under substantial difficulties, and at a moderate rate. It will also be difficult to increase average yields per acre for the territory as a whole, as the new land in the east comes under cultivation. Even if the total crop area should expand more rapidly than the population increases, this may not be true of the area in bread grain. Development of animal husbandry is needed (and is planned) in the USSR, and this involves more rapid expansion of areas in forage crops than of those in bread grains. The wheat area may expand more rapidly than the rye area, but since rye is almost wholly a food crop in Russia, the level of wheat exports is conditioned by the production of wheat and rye in relation to domestic requirements for bread grains.

(See also V. P. Timoshenko, *Agricultural Russia and the Wheat Problem*, Food Research Institute, Grain Economics Series 1, Stanford University, California, 1932.)

The World Wheat Problem

J. S. DAVIS

Jul '32 VIII (8), 409-44

Persisting surplus characterizes the current world wheat problem. For four years world wheat stocks have been excessive, by 200-300 million bushels or more. Available supplies have continuously exceeded annual consumption plus normal carryovers, even after large diversion into low-price outlets. Margins between export surpluses and import requirements have been abnormally wide. Wheat prices in many countries have fallen distressingly low.

The bumper crop of 1928 was mainly responsible for the emergence of huge surplus. Deepening economic depression since 1929 has contributed to its persistence; but extensive government policies, adopted without regard to their bearings on the world situation, have been more largely responsible. Russia's exports, the outcome of Soviet-planned policy, have been important

in the past two years. Measures of many other nations have caused contraction of consumption or restrained its expansion, stimulated production, and increased the effective burden of the surplus.

In the absence of such policies, Nature and economic forces combined to solve the wheat-surplus problem of the 1890's, and production expanded greatly in 1898-1914 without giving rise to another. Now no durable solution is in sight. Apparently Nature can merely alleviate or intensify the problem, while economic forces are so greatly modified. At best, the normal price of wheat in the present decade will probably seem low. The logical outcome of current trends, however, entails needless distress.

Many proposed solutions would prove impractical or illusory. A rational approach to solution lies through expansion of consumption and temporary contraction of production, supported by a reorientation of national policies toward consumer interests. Removal of restraints on consumption and stimuli to production, accepting low prices as inevitable for the time being, facilitating wide dispersion of stocks, and constructively promoting general economic recovery: these steps would go far toward solving the problem.

Projected Waterways in North America as Related to Export of Wheat

A. E. TAYLOR

Aug '32 VIII (9), 445-68

Three waterway improvements designed to serve North American wheat export trade are in operation, in progress, or in contemplation. The Hudson Bay route via Churchill was opened for the first shipments in the fall of 1931. Improvements of the Mississippi and its principal tributaries are in progress, designed to extend the region served by barge shipments to the Gulf. The project for the St. Lawrence seaway has reached the stage of formal treaty between the United States and Canada. Advocates of these improvements, to be made toll-free at public expense, have long held out hopes of substantial gain to wheat farmers of the United States and Canada.

We hold optimistic forecasts of the early or deferred results to wheat growers to be unwarranted. The Hudson Bay route seems likely to have significance mainly for Saskatchewan. The Mississippi route will mainly divert export shipments of Kansas and Nebraska wheat from present rail or rail-and-lake routes. Two active export areas—Texas-Oklahoma and the Pacific Northwest—are not involved. The St. Lawrence seaway would probably not reduce costs of shipments to Europe by over 5 cents a bushel during the season of open navigation, and the weighted annual saving on export wheats would be less. Whatever savings are made would be divided, in proportions varying from year to year, mainly between the growers of export wheats affected and European consumers.

We see little prospect that the net gain to American wheat growers as a whole would be significant. Canadian wheat growers would stand to gain more, unless or until expansion of acreage wiped out the price benefit. The rate of expansion of wheat growing in the Prairie Provinces of Canada might be the determining factor. There is a fair possibility that, with expansion

of acreage in Canada, farm prices of wheat in the United States might tend to be lowered by the opening of the St. Lawrence seaway. Some time in the forties the divergent views on incidence will be tested in the crucible of experience.

Price Spreads and Restraint of United States Wheat Exports

A. E. TAYLOR

Oct '32 IX (1), 1-22

Why did the United States, with an exportable surplus of record size, export so little wheat and flour in 1931-32? It was not for lack of wheat. The export surplus was unprecedentedly large, the fraction exported unprecedentedly small. The inward carryover was abnormally heavy, the outward carryover still more so. Restraint of exports and increase of stocks were not desired by the producers, the trade, or the government. The Grain Stabilization Corporation was liquidating, not accumulating. The corporation, the private trade, and the co-operatives all sought export business. Wheat growers widely recognized that continued heavy stocks constituted a major price-depressing influence. The fact is that wheat prices here, though distressingly low, were too high to permit liberal commercial exports; importing countries got their import supplies cheaper elsewhere.

This phenomenon has appeared frequently in the past, not only in years when our export surplus was small but in other years when world wheat prices were low. It has been much in evidence during the past four years, and strikingly in the present crop year. Here we undertake an inquiry into the forces that are responsible for keeping United States wheat prices above an export basis in a period when our exportable surplus is very large, and particularly in 1931-32, when the Stabilization Corporation was not "taking wheat off the market" but disposing of much of its large stocks.

Commercial exports from the United States, nevertheless, frequently move out with Chicago futures above export parity with Liverpool prices. The conditions permitting such exports are examined in some detail.

The Voluntary Domestic Allotment Plan for Wheat

J. S. DAVIS

Nov '32 IX (2), 23-62

This ingeniously elaborated proposal has been evolved to meet the demand that farmers producing export-surplus crops and livestock be assured, on the portion consumed in this country, the equivalent of "effective tariff protection."

Briefly, it calls for distributing a bonus or "tariff benefit" among producers on the basis of their past production, and deriving the necessary funds from excise taxes levied on processors. It contemplates a decentralized procedure for making allotments to individual farmers, whose claim to the determined benefit would rest upon voluntary signature and fulfilment of contracts to restrict acreage (or production) as the federal administrative agency might prescribe.

The proposal has recently come to the fore among farm relief plans with a commodity approach, and has attracted wide interest and considerable support. In the interest of those who may have occasion to consider it, we undertake here to explain and examine the plan, particularly in the form embodied in the Norbeck-Hope bills of July 1932, with primary reference to its possible application to wheat. We seek not to pass judgment on the scheme, which is still subject to numerous modifications, but rather to see how it would probably work if applied, to appraise some of the arguments pro and con, and to consider some far-reaching aspects of current opinion and social philosophy that are involved.

Estimation of End-Year World Wheat Stocks from 1922

M. K. BENNETT

Feb '33 IX (5), 167-86

Students of the world wheat situation urgently require trustworthy estimates of end-year world wheat stocks that are more comprehensive than data currently available. Familiar statements of the "world visible supply" probably cover no more than a fourth of the old-crop wheat actually existing at the end of the Northern Hemisphere crop year in the world excluding Russia, China, and southwestern Asia. Total end-year stocks as reported and directly estimated in North America, Australia, and afloat to Europe cover the situation in those important positions rather satisfactorily. Yet other important countries and positions where stocks are neither reported nor directly estimated are also significant in explaining past events or in appraising the outlook for wheat trade and prices during an oncoming crop year. This was demonstrated in 1929-30, when early-season misjudgments of probable trade and prices rested heavily on faulty appraisal of the old-crop stocks available in Argentina, the Danube basin, and importing Europe.

Within the limits imposed by the range of available statistics, this study is designed to fill the gap in available data on end-year stocks. It presents estimates of total stocks of old-crop wheat grain in the world (excluding Russia, China, and southwestern Asia) as of about August 1, from 1922. Indirect estimates are given to supplement reported stocks and direct estimates, and the methods of indirect estimation are described. The results are subject to limitations with respect to scope, degree of accuracy, and date. Nevertheless, the estimates contribute not only to explanation of past events in the world wheat situation and to appraisal of the outlook, but also to such specific important problems as measurement of the existing world wheat surplus.

Price Relations between July and September Wheat Futures at Chicago since 1885

HOLBROOK WORKING

Mar '33 IX (6), 187-238

The price spread between July and September wheat is determined primarily by current domestic supplies of all wheat in the United States, conveniently measurable in terms of July 1 carryover. Early in the season the spread may show little relation to the statistical supply position, but by June

the relation normally becomes very close. Given an accurate appraisal of the domestic supply position, the price spread in June may usually be predicted with great accuracy.

Substantial disparity between the actual spread in June and that to be expected from the supply statistics has occurred in eight years since 1896. In each of these years there was a peculiar market situation—usually a corner or “squeeze” in the futures market. Existence of such a disparity gives prima facie evidence of abnormal speculative market conditions.

Changes in the spread tend to occur in response to influences specifically related to the spread, and not in response to general price influences. The spread-related influences necessarily affect the price of at least one of the two futures. Under certain circumstances they affect the price of July wheat and not the price of September; under other circumstances they affect September and not July; under still other circumstances they affect the price of both futures, but July more than September.

The July–September price spread is subject to conspicuous and reliably predictable seasonal changes. Most of these are related to even stronger seasonal tendencies in price of the July future, which have hitherto been only imperfectly understood because their character is dependent in part on factors related to the July–September spread in a way not previously recognized.

World Wheat Crops, 1885–1932: New Series, with Areas and Yields, by Countries

M. K. BENNETT

Apr '33 IX (7), 239–74

This study presents detailed statistics of wheat production, acreage, and yield per acre in 40 countries annually from 1919 to 1932, and in 39 countries from 1885 to 1918. From these data, summations are made which show “world” wheat production, acreage, and yield per acre within a land area unchanged from year to year. Tabulations hitherto available cover only “world” production, not acreage and yield per acre as well; they do not apply to identical land areas in prewar and postwar years; they do not cover as many years as does the tabulation here presented; and they do not provide students with detailed data for individual countries.

In preparing 48-year series on “world” wheat production consistent with respect to territorial boundaries, it has been necessary in some instances to adjust available official statistics or to fill in gaps by direct estimates. The processes of adjustment and estimation are described in some detail.

All-inclusive figures on world wheat production cannot be compiled, even for recent years. There are no reliable data for areas (China and others) which may produce 1,000 million bushels a year. The omissions are of small consequence for most purposes. Our larger “world” series excludes some other areas for which data are available only for a brief period; in recent years these may have produced 200 million bushels.

Our two "world" series show trends of wheat production substantially less steeply upward than the trends shown by less homogeneous series; and even our series probably overstate the increase. The data given show that between 1885-89 and 1927-31, in the "world" excluding the USSR, the increase in wheat production was due 78 per cent to increase of acreage, and 22 per cent to increase of yield.

Britain's New Wheat Policy in Perspective

ADA F. WYMAN and J. S. DAVIS

Jul '33 IX (9), 305-50

Drastic declines in world wheat prices, financial crises following prolonged economic recession, and the dominance of Conservatives in the new National Government led in 1932 to significant departures in British wheat policy. Since the repeal of the Corn Laws in 1846, cheap food for the nation had been a cardinal doctrine; the slogan had been, "No tax on bread"; and protective duties and subsidies for domestic wheat growers had been avoided. Now low duties on wheat and flour from non-Empire countries have been imposed; and under the Wheat Act a levy is collected on flour for British consumption, in order to insure British wheat growers a standard return for the millable wheat that they sell. In effect, though not in form, flour is taxed and wheat growers are subsidized.

As they stand, the new measures are both ingenious and moderate. They are directed primarily toward farm relief, not self-sufficiency even within the British Empire. At current levels of wheat prices, substantial aid to British wheat growers is given at small cost to consumers. Wheat growing had greatly declined; it is being stimulated, but with certain checks upon the extent of the stimulus. For the most part, milling operations and the international grain trade are not seriously affected. The influence of the present measures on the world wheat situation will not be large, though in the direction of retarding solution of the world problem of surplus wheat.

The new wheat policy is, however, the "spearhead" of a reoriented policy toward British agriculture, in which animal husbandry strongly predominates. The new program calls for far-reaching experiments in commodity control and agricultural planning, the outcome of which cannot safely be predicted.

British Preference for Empire Wheat

A. E. TAYLOR

Oct '33 X (1), 1-33

Since November 17, 1932, a duty of 2s. per quarter has been levied against British imports of wheat from non-Empire countries, while Empire wheat has been imported duty-free. Empire preference on flour began earlier, in March 1932. Both duties are low, as protective duties go.

Experience during the first season under Empire preference warrants the conclusion that preferential duties of such amount will by no means reserve the British markets for Empire wheats. The proportion of ex-Empire wheat entering into the annual supply of the United Kingdom will

not be radically lowered. Except with the occurrence of extraordinary gluts of wheat in Australia and Canada, or of exceptional shortage in Argentina, Argentine wheat will tend to hold its position in the United Kingdom. When exportable wheats are freely available to the Soviet government, Russian wheat will enter duty-paid in substantial quantities. The incidental exports into the United Kingdom, such as white wheat from Baltic Germany and soft red wheat and flour from France, will hardly find the duty formidable. Probably the duty will keep out or greatly restrain imports of American wheat and flour other than that from the Pacific Northwest, supporting the relatively higher position of the Chicago future.

Canada has indeed been given a preference over the United States in respect of hard wheat and Australia has been given a preference over the United States in respect of soft wheat; but they have not been given effective preference over Argentina and Russia. If such preference is really to be claimed by the Dominions and granted by the United Kingdom, a much higher rate of duty will need to be established.

Price Leadership and Interaction among Major Wheat Futures Markets

R. D. CALKINS and HOLBROOK WORKING

Nov '33 X (2), 35-70

The real character of price leadership and price interaction among major wheat markets of the world is a phase of price behavior which heretofore has received scarcely any systematic investigation. In the absence of definite information on such matters, it has been necessary to rely largely upon personal impressions and opinions. Here are presented the results of a detailed investigation of price leadership and interaction among Chicago, Winnipeg, and Liverpool for the seven years 1924-31. These results call for revision of many opinions which are widely held.

From an analysis of initial changes and responses, it is found that Chicago and Winnipeg "originate" approximately two-thirds of all price movements, and Liverpool only about one-third. Thus Chicago and Winnipeg are definitely the more active in directing the general course of prices. They tend to be more active and influential price leaders in summer than in winter months. Liverpool tends to be a somewhat more active and influential leader in winter than in summer months. In general, Liverpool is a less volatile and less sensitive market than Chicago or Winnipeg. Its price movements usually correspond more closely with those of Winnipeg than with those of Chicago.

In the data examined there could be found no evidence of a fundamental bearish tendency in Liverpool or of a fundamental bullish tendency in Chicago and Winnipeg, such as are occasionally supposed to exist. Also, it appears that when prices in North American markets are above export parity their movements remain closely related to price movements in other markets. The maintenance of prices at such heights seems to have no significant effect upon the price interaction between markets or on the correspondence of Liverpool and North American price changes over brief intervals.

Price Relations between May and New-Crop Wheat Futures at Chicago since 1885

HOLBROOK WORKING

Feb '34 X (5), 183-228

Previous investigations of price relations between July and September wheat futures at Chicago are here continued in a study of relations between the May and July futures, supplemented by extensions of the previous study and a broad consideration of price relations among the May, July, and September futures. The conclusions are of special practical interest to hedgers in the Chicago market and to speculators concerned with inter-option price spreads. The influences bearing on price spreads between old- and new-crop futures, however, are frequently the dominating factors in determining price movements of the May future. Conclusions regarding them are therefore of considerable interest to all concerned with wheat price movements from either a practical or an academic standpoint.

Interpretations of the domestic wheat supply position are the chief influences affecting price spreads between old-crop and new-crop futures, and often the chief influences in the price movements of May wheat itself. Corners and squeezes, and perhaps other peculiarly speculative developments, have affected or largely set aside these interpretations more often and to a greater degree than has previously been demonstrated. The traditional ideas of the character of corners and squeezes are inadequate and on occasion misleading.

The common impression that wheat prices tend to suffer a decline in March, followed by a recovery in April, is in large part justified, but contains an important error. The common downward trend in March seems to reflect a real general tendency; but the April rise has rarely occurred except after failure of the March decline and has usually followed such failure. Several other seasonal tendencies in price and in the May-July spread provide useful bases for forecasting changes in price and in the May-July spread.

Environment, Heredity, and Wheat Quality

C. L. ALSBERG and ELIZABETH P. GRIFFING

Mar '34 X (6), 229-49

Climate is more important in determining wheat quality than soil or wheat variety. The texture of soil is more important than its chemical composition, because upon it depends the soil's capacity to hold moisture. Variety in itself does not determine wheat quality, for high-protein seed, under adverse conditions, may yield grain of low protein content.

The ratio of protein to starch in the wheat kernel is largely determined by moisture conditions, especially at the time of blossoming and in the post-floral period. The wheat highest in protein content tends to be produced where summers are hot and dry, and moisture has not been too far above the minimum during the earlier stages of growth and rather scant but not too scant in the postfloral period. Longer and cooler summers, with greater abundance of moisture, tend to prolong the postfloral period; and prolongation of the postfloral period tends to reduce protein content.

Although wheat variety in itself does not determine wheat quality, some varieties within a given climate have higher protein content than others. Hence wheat quality in humid climates is susceptible of vast improvement. Stimulus toward such improvement has been lacking because improvement in quality is usually accompanied by some reduction in yield. But a new stimulus has recently appeared in governmental policies directed toward self-sufficiency of importing countries with regard to bread grains. Reduction of imports of high-protein wheat can be facilitated through development of higher-quality domestic wheats. If present isolationist policies continue, strenuous efforts to breed varieties higher in protein than those now grown are to be expected, and are likely to meet with an appreciable measure of success.

Decline and Recovery of Wheat Prices in the Nineties

HELEN C. FARNSWORTH

Jun-Jul '34 X (8-9), 289-352

Prior to 1930, the lowest wheat prices recorded in Great Britain since wheat became an important commodity in international trade were in the crop year 1894-95. These historic low prices were preceded by a general price decline from the early 1870's. More immediately, they represented the culmination of a sharp decline which began in the fall of 1891. The downward price movement of 1891-95 was primarily associated with emergence and persistence of a world wheat surplus. This was due almost wholly to Nature. It was not aggravated by governmental measures such as have figured heavily in the persistence of the wheat surplus of 1929-34. Mainly for this reason, the price decline of 1891-95 was general throughout Europe, and wheat consumption there expanded instead of contracting. China, which has been an important market for surplus wheat in recent years, did not markedly increase her imports as prices declined in 1891-95.

Recovery of wheat prices in the nineties rested mainly upon reduction of world year-end wheat stocks to about a normal level by August 1897, with prospects of a short world crop in that year. Decrease of stocks was then effected chiefly through the influence of Nature in cutting production and through "normal" increase of world consumption. The surplus wheat carryovers of August 1933 and 1934 appear roughly twice as large, in relation to ordinary world wheat consumption, as the maximum surplus carryover of the nineties. Now, as then, reduction of carryover to something like "normal" size appears the essential condition to full recovery of world wheat prices relative to commodity prices in general. It is conceivable, but does not now seem likely, that such an adjustment may occur by August 1935.

Pacific Northwest Wheat Problems and the Export Subsidy

J. S. DAVIS

Aug '34 X (10), 353-426

The Pacific Northwest is a distinct wheat-surplus region, which has long been important in the world market. The wheat is grown mostly in a lim-

ited area east of the Cascades, in Washington, Oregon, and northern Idaho, under conditions that vary greatly in different districts. Six types are produced, with white wheats predominating. Many varieties, both winter and spring, are sown, largely on fallowed land. Yields run high, but some three-fourths of the crop is unsuited to produce good bread flours, and the mills bring in hard Montana wheats for strengthening.

Ordinarily two-thirds of the crop or more must be shipped out of the region, in spite of heavy feed use of wheat within it. Part of the surplus moves to California by water, as wheat and flour. In exceptional years, a good deal goes east by rail. Normally, exports afford by far the largest outlet. Only in the past two years have shipments east by water risen to large proportions. Wheat prices in the region move in broad harmony with major movements in the country as a whole, but there is no constant "normal" relationship between prices there and in eastern markets or Liverpool.

Wheat interests of the Pacific Northwest have been hard hit during the latest depression, as export outlets have shrunk and prices have fallen drastically. Three times in the past four years, federal aid in moving the regional surplus has been accorded. The most striking of these is the export subsidy in effect since mid-October 1933. Each has given temporary relief, but has afforded no large or lasting solution of the surplus problem. We present in this issue a discussion of this regional wheat situation as it has developed and exists with its varied problems, and an analysis of the emergency export operations to June 30, 1934.

Decline in Wheat-Flour Export during the Depression

A. E. TAYLOR

Oct '34 XI (2), 39-73

In a time of prolonged and intensive decline in production and trade, it is natural that those engaged in enterprises should undertake to measure their trade losses and contrast them with those of others. A business depression is associated with recession in the outturn, distribution, and consumption of goods and services. It is natural to undertake to measure the recessions in both domestic and foreign trade, with the full realization that these cannot be expected to be parallel. The recession of trade in a particular commodity is, of course, affected by local and general influences, by commodity and monetary reactions. The study of recession of trade in a particular commodity at such a time, therefore, is naturally placed against the background of the general depression.

The export flour trade of the world has undergone pronounced decline during the past five years, as revealed in imports of the deficiency countries and exports of the surplus countries. The decline in international commerce in flour has been much more pronounced than the decline in movement of wheat. In particular, the export flour trade of the United States has suffered heavily, indeed disproportionately. In this study we endeavor, without going into the local details, to explore the extent and causes of the general decline in export trade in wheat flour, and the particular reces-

sions suffered in the outbound movement of wheat flour from the United States. The unfavorable factors influencing this decline in outbound trade are described in some detail, together with reference to the few influences which in the future may favor recovery. Insistence is placed on the point that a relatively high wheat price in the United States is a direct deterrent to export of American flour.

Prices of Cash Wheat and Futures at Chicago since 1883

HOLBROOK WORKING

Nov '34 XI (3), 75-124

The present study makes available for the first time in convenient form a record of Chicago wheat prices by weeks for more than 50 years. The record includes a new and particularly useful series of cash wheat prices in addition to prices of the four principal futures, and a tabulation of weekly discounts or premiums of cash wheat. The tables are conveniently arranged and are supplemented by charts showing the full price record, and by parallel charts showing directly the cash premiums and discounts and price spreads between the different futures.

The weekly price data are particularly useful for the study of price movements of intermediate length, such as those associated with crop scares. They avoid the defects of monthly prices on the one hand, which fail to give sufficient detail, and of daily prices on the other hand, which are unnecessarily detailed and laborious to work with.

The cash price series is unique in the further important respect that it represents throughout the price of the particular spot wheat on which the futures price is based. Familiar compilations of prices of "contract" wheat attain this result only imperfectly. It provides, moreover, a price series that is highly representative of movements of United States cash wheat prices in general.

The text of the study includes a full description of the price series and an analysis of the influences bearing on cash premiums and discounts and on interoption price spreads.

Starch and Flour Quality

C. L. ALSBERG

Feb '35 XI (6), 229-54

The part starch plays in determining the quality of flour is often overlooked because it is less conspicuous than that of gluten. In this study, existing information bearing on the influence of starch on baking value has been collected, some of the gaps in our knowledge are pointed out, and some of the problems awaiting solution are presented.

With fuller knowledge, it may appear that variations in the properties of the starches of different flours influence baking quality materially. Already it is clear that starch absorbs about as much water as all other flour

constituents combined. Variation in the absorption of flours might therefore depend to some extent upon the water capacity of their starches. The susceptibility of starch to diastase is one of the factors affecting the diastatic power of flour and in consequence panary fermentation. This susceptibility to attack depends not only upon the size of the starch granules and upon their intrinsic ability to resist conversion into sugar by diastase, but also upon their location—whether surrounded by a protecting envelope of gluten or freed from it. It is because fine grinding separates large numbers of granules from the gluten envelope that fine grinding increases the apparent diastatic power of flour. But it also injures starch granules so that they swell in cool water, thereby increasing the absorption of the flour; and at the same time some starch goes into solution. In consequence, diastatic power is increased because injured granules and dissolved starch are readily attacked by the enzyme. Finally, changes that the modified starch of bread undergoes in time seem to be the major factor in causing bread to grow stale.

Per Capita Wheat Consumption in Western Europe:

I. Measurement, from 1885–86

M. K. BENNETT

Mar '35 XI (7), 255–305

This study represents an effort to estimate the quantities of wheat devoted respectively to food consumption, feed consumption, and seed use in 13 western European countries, in terms of annual averages applicable to successive five-year periods beginning with 1885–86. Reduced to a per capita basis, expressed as averages applicable to the decade just preceding the war and the decade ending in 1933–34, and refined to apply to flour utilization, the estimates of food consumption are designed for use in projected studies of differences in national diets and of changes in national dietary habits.

The evidence here adduced shows clearly that food consumption of wheat is a much different concept from total consumption of wheat or from total utilization of wheat. Nonfood uses are very important in some countries, but not in others; and nonfood uses have greatly expanded since before the war in some countries but not in others. Recently, feed use of wheat has been so heavy that, if governments chose to divert wheat from feed to food uses and if domestic wheat crops per capita should equal those of 1929–33, wheat net imports into western Europe in 1934–38 might be reduced by roughly 100 million bushels annually without reduction in per capita food consumption of wheat. This development is possible, not probable.

The estimates of food consumption of wheat suggest, but do not demonstrate, that the long-time tendency may not be (as is commonly supposed) for wheat completely to displace rye in national diets, but for a balance to be struck between wheat consumption and rye consumption. Possibly the long-term outlook involves less increase in per capita wheat-flour consumption in rye-consuming countries than has often been thought probable.

Spreads between Wheat Prices in England

A. E. TAYLOR

Apr '35 XI (8), 307-25

The United Kingdom is the largest wheat import market of the world. It is also the largest sample market of the world. The price of imported wheat is a wide range, depending on type, variety, grade, and quality. Consumers' (millers') choices are various and find expression in price differentials. These vary from season to season. Each world crop is a new trade experiment. Averages hold little meaning.

In this study are presented data on wheat price spreads over the decade 1925-34. The amounts of the spread in monetary units, the ranking of the several wheats, and the percentages of the high wheat prices represented in the spreads, are tabulated and the positions classified by countries of origin. Canadian wheat usually ruled at top price, while Argentine wheat stood most often on the bottom rung. Australian wheat occupied the median position, while western European wheats were surprisingly conspicuous as low-priced imports. The hardest wheats were usually the highest-priced; but the lowest-priced were not the soft wheats but atypical and nondescript wheats of either type.

It is pointed out that a number of different factors are involved, including the major influence of cost of raw material. These combine to offer to British mills a wide scope of mixing, which finds reflection in a low price of flour and bread.

Finally, brief and rather casual comment is made on the compared meanings of British price, Dominion price, and world price of wheat. From our study of these price spreads, it becomes clear that such terms are not natural expressions of price differences but will need to be defined. Fixed prices, within the range, are not in the interest of millers or consumers in Great Britain.

International Wheat Policy and Planning

A. E. TAYLOR

Jun '35 XI (10), 359-404

The desire for a "planned" international control of wheat arose from the disorganization of agriculture and trade following the World War. In this study, the war control of wheat is first reviewed. Brief mention is then made of the several conferences in which direct and indirect attention was devoted to the subject. The conference of 1933-35, recently prolonged until August 1936, is reviewed in more detail. What is designed in this study is a review of the philosophy, the theory, of international "planning" of production and distribution of wheat.

The development of "surplus" of wheat is reviewed and the major responsibility of the wheat-importing countries emphasized. Planning from the export side is contrasted with planning from the import side. The international movement of wheat is briefly surveyed. Then follows a verification of the important trade concept that wheat is not a unity; wheats are really a group of cereals. Importers' quotas and acreages are contrasted with ex-

porters' quotas and acreages; the difficulties of acreage restriction and of quota adjustment are emphasized. The control of price is subjected to a critical analysis. Attention is then directed to several collateral methods of reducing "surpluses"—raising the consumption level and raising the feed fraction.

The technical difficulties of organization and control of any international wheat plan are set forth. In the summary and concluding observations, the vast difficulties and the limited facilities of control are contrasted, leading to the conclusion, contrary to superficial assumption, that wheat is not inherently adapted to a planned international control. Aspirations are unlimited but conflicting; power and discipline, also conflicting, are limited.

World Wheat Prices, Canadian-Argentine Spreads, and the Ottawa Agreement

A. E. TAYLOR

Oct '35 XII (2), 35-56

In the Empire preference agreement between the United Kingdom and Canada, it was provided that Canada should offer wheat "on first sale in the United Kingdom at prices not exceeding the world prices and in quantities sufficient to supply the requirements of the United Kingdom consumers." In this stipulation was no definition of "world price" of wheat, no yardstick of requirements. During recent years protest has been raised in Great Britain that the price of wheat in Canada was being artificially held above the "world price." During the first three of the last five years, the price of Argentine wheat did not stand continuously or significantly below the price of Canadian wheat; but during the last two years the price of Canadian wheat has stood continuously and significantly above the price of Argentine wheat. Since the price of wheat in Winnipeg during these two years has been directly or indirectly pegged, it is open to question whether wheat sold in the United Kingdom on the basis of the Winnipeg price could be regarded as supplied at the "world price."

For several years it has been the policy of the Conservative government of Canada under Premier Bennett to support the price of wheat. In an election held on October 14, the Liberal party, under the leadership of Mackenzie King, obtained control of the new Parliament with an outstanding majority. It is to be inferred that the policy in respect of encouragement of agriculture will not differ from that of the Conservative party. But quite certainly the people of the United Kingdom will be surprised if the Liberal party maintains in Winnipeg an artificial wheat price which enforces in England a price of Canadian wheat significantly higher than the current prices of other available imported wheats.

Japanese Self-Sufficiency in Wheat

C. L. ALSBERG

Nov '35 XII (3), 57-100

Between 1932 and 1935, Japan increased wheat production 60 per cent and became self-sufficient. High wheat prices relative to barley and systematic governmental encouragement caused acreage to expand, mostly at

the expense of barley. The reimposition of the gold embargo and a modest tariff increase supported domestic wheat prices. Yields, though greatly increased, contributed rather less than acreage expansion. The government conducted educational programs to improve methods and introduce superior varieties. Growing of superior seed wheat and small-scale milling were subsidized. Research to develop superior varieties was intensified. Growers were not subsidized. It is uncertain whether improvement of yield was solely due to governmental efforts or also to favorable weather.

In the immediate future, Japan will probably remain self-sufficient, or nearly so. The trend of per capita wheat disappearance in recent years has been stationary or slightly downward. Immediate considerable increase in per capita consumption is unlikely. Unless there is, and unless forecasts of population growth are wrong, Japan will probably require about 63 million bushels of wheat annually, and perhaps only 53 million bushels, when population becomes stationary soon after 1950. This volume of wheat she is capable of producing.

As long as Japan remains self-sufficient, she is likely to import for domestic use only modest amounts of strong wheat. She will continue to import a large volume to mill for export. She has lost most of her market in China, but increased exports to Manchukuo, Kwantung Leased Territory, and her other dependencies have more than compensated for this loss. The greater part of her exports now go to points within the Empire.

The Stale-Bread Problem

C. L. ALSBERG

Feb '36 XII (6), 221-47

The staling of bread is a serious burden to bakers. This study is devoted to the critical examination of existing information on the aging of bread. The crust is drier than the crumb and abstracts moisture from inside the loaf. In consequence, it becomes soft and tough. When bread is freshened by warming, the process is reversed, and the crust becomes crisp again. The crust effectively insulates the crumb which becomes stale before losing much moisture. The soluble-starch content of the crumb diminishes and the starch granules become opaque and harder. When bread is freshened, the change in the starch granules is reversed.

So far, all investigators are agreed. Some believe the change in the starch is a chemical one and make staling depend solely upon the change in the starch. They assume at the same time a transfer of moisture from the starch to the gluten. They regard both processes as reversed when the loaf is freshened by warming. However, there is no conclusive evidence of such a transfer of moisture. It is possible to explain many of the phenomena by merely assuming that, like other jellies, the starch hardens as it sets and softens as it is warmed up again without chemical change. Moreover, it has not been proved that change in the starch is the sole cause of staleness, for there is reason to believe that particularly well-made bread may seem fresh even though the starch has changed appreciably. The study further presents the methods that have been recommended to produce bread that keeps well and the conditions of storage that tend to keep it fresh.

Canadian Wheat Stabilization Operations, 1929-35

W. SANFORD EVANS

Mar '36 XII (7), 249-72

In a period dating from the beginning of the crop year 1929-30 in the United States, and continuing in Canada until the close of the crop year 1934-35, centralized wheat co-operatives, with the support of government money and credit, operated in the wheat markets of their respective countries on a scale never before possible to any regular market agencies. These co-operatives did not work together and phases of their activities did not strictly correspond in time, but their market policies were similar, and a combined influence on world wheat markets might be expected. A study of this period should yield important lessons in the principles of marketing.

It is not yet practicable to bring all relevant facts under review and some movements initiated in this period are still uncompleted. In an introductory way, the developments in connection with the operations of the co-operative in the United States are herein sketched; the developments in Canada are more fully presented, the main elements of the Canadian situation between August 1931 and July 1935 being assembled in graphic form.

Questions are raised as to direct effects produced, and more general questions as to the extent to which wheat prices can be influenced by special market operations of this type. In so far as answers seem clearly indicated by the facts under examination, such answers are tentatively suggested. Definitive conclusions on the broad issues involved are not attempted.

New Data on United States Flour Production since 1899, by States and by Sizes of Mills

HOLBROOK WORKING

Apr '36 XII (8), 273-312

Consumption of flour in the United States was about nine-tenths of a barrel per capita during each year 1921-29, but it dropped sharply during the depression, and declined further when the processing tax was imposed. By 1934 the average consumption per capita had declined about 14 per cent, to slightly over three-quarters of a barrel. Consumption per capita during 1935 was about the same as in 1934 or perhaps slightly higher, at about .774 barrel per capita.

Biennial census statistics of flour production have been somewhat defective in recent years, but the only important omissions of production data, except in 1933, have been for mills producing under 5,000 barrels annually. The defects, apart from omissions, have been largely remedied through a retabulation of data by the Bureau of the Census, which is here presented. The production of mills omitted from the several censuses we have estimated on a newly developed basis which appears trustworthy.

In 1899, one-eighth of the total flour production was provided by 9,835 mills producing less than 5,000 barrels each. Steady extinction of these very small mills reduced their production to one-sixteenth of the total in 1919, and to one-thirtieth in 1929; but subsequent revival of custom milling

checked this decline. Large mills, producing 100,000 barrels or more annually, provided 40.2 per cent of the total flour output in 1899 and 80.0 per cent in 1929. Their proportion declined slightly during the depression and was still only 79.9 per cent in 1935.

In the face of competition of the large mills, those of small and intermediate size have declined in numbers and production even more rapidly than have the very small mills. In some sections of the country, however, the smaller mills have been maintaining their position well.

World Wheat Utilization since 1885—86

M. K. BENNETT

Jun '36 XII (10), 339-404

This study represents a pioneer attempt to survey developments in the utilization of wheat, as distinguished from production or supplies of wheat, in a specially defined "world" during the past 50 years. The course of "world" wheat utilization reflects broadly measurable changes in population and in per capita utilization. It reflects also developments, sometimes concurrent and sometimes diverse, in wheat utilization in different parts of the "world"; these regional developments receive emphasis. Over the whole sweep of years, estimates of food-and-feed use are presented for the "world" and for five large "regions." For each of 15 postwar years it is possible to estimate roughly, for most of the 40 countries included, total and per capita amounts of wheat used annually for food, feed, and seed.

The resulting series of per capita food use of wheat in different countries present important problems of interpretation. In the closing portion of the study, postwar trends and fluctuations of per capita food use of wheat, country by country, are considered with reference to conditioning circumstances. Among the latter are national standards of living, national preferences for wheat as against other cereals on the one hand and non-cereal foods on the other, and the phase of development with reference to a "normal" course of per capita wheat consumption in which the several countries appear to stand at present. Attention is also given to the relative importance of trend influences, cyclical influences, and accidental influences on the recent course of per capita use of wheat for food throughout the world.

At many points limitations of data and methods of estimation are responsible for uncertainties. There emerges, however, the broad conclusion that the prospects for expansion of world food consumption of wheat are more limited than they have been considered heretofore.

The Timing of Wheat Marketing in Western Canada

HOLBROOK WORKING

Oct '36 XIII (2), 33-64

The marketing of wheat from western Canada is profoundly influenced at all stages by the timing of deliveries by farmers. Country deliveries tend to follow a definite pattern, a conspicuous feature of which is the rapid rate at which the first 56-74 per cent of deliveries have been made during each

of the past 15 seasons. The percentage delivered thus rapidly depends on price judgments, which influence the length of the period of rapid marketing more than the rate of delivery within it. During August-January the amounts marketed weekly tend to be directly proportional to the total to be delivered during the season. The percentages delivered weekly depend chiefly on the weather and the stage of completion of deliveries. Widespread introduction of the combine advanced the start of rapid marketing by about 15 days and the "25 per cent point" by nearly three weeks.

After the end of January, the rate of delivery in million bushels per week depends chiefly on the quantity which has been held back for deferred marketing, which has varied from 29 to 95 million bushels (12 to 27 per cent of the seasonal total). The tendency has been to market a definite proportion of this remainder each month. The proportional distribution of deferred deliveries among months has varied somewhat from year to year under the influence of contemporary price tendencies. Since 1928-29 there has been a marked trend toward longer postponement of such deliveries as have been delayed until after January.

On the basis of these and other tendencies, the course of marketings during 1936-37 may be predicted with considerable confidence. The "25 per cent point" in deliveries was reached four days earlier than predicted; the "50 per cent point," one day earlier. It remains to be seen how well predictions for deliveries later in the season will be fulfilled.

Wheat Problems and Policies in Germany

NAUM JASNÝ

Nov '36 XIII (3), 65-140

The great depression now appears to be passing, the world over. But the days that are here are far different from the days of past prosperity. Recovery is largely a domestic affair in each country. International trade in general has regained only a small part of its loss. World trade in wheat continues strikingly below its pre-depression level.

This continuing low level of trade in wheat strongly reflects the struggle for national self-sufficiency in Germany and Italy, countries which a few years ago competed for second rank among the world's largest net importers of wheat. When such countries, with the aid of modern techniques, set themselves to reduce their dependence on foreign supplies of important foodstuffs, they can be expected to show substantial achievements. Among the products in which independence is being sought, wheat is one that can be produced at relatively small sacrifice even in countries where natural conditions are unfavorable for it, and even cheaply in comparison with fibers and their substitutes, fats, motor fuel, and rubber.

In the present study an attempt is made to illuminate various wheat problems of Germany, within the background of her resources, recent history, and national policy; and specifically to appraise the possibility that Germany may resume her former position as a heavy net importer of wheat. This bears upon the prospects for revival of world trade in wheat. World economic recovery may help to undermine policies of self-sufficiency, but

the outlook for substantial enlargement of German wheat imports is by no means promising. Increased net imports may well occur over the next decade, but probably in a degree representing only fractional restoration of the pre-depression level of imports.

World Wheat Acreage, Yields, and Climates

M. K. BENNETT and
HELEN C. FARNSWORTH

Mar '37 XIII (6), 265-308

In this study three world wheat maps are presented. The first shows, by dots, the geographical distribution of world wheat acreage; it also shows, by color of dots, the average postwar levels of wheat yields per acre in 257 wheat-growing areas into which it has been found feasible to divide the world wheat acreage. The second map shows the principal climates of the world within which wheat is grown; and the third shows the parts of the world wherein annual rainfall averages less than 20 inches, 20-40 inches, and above 40 inches. The second and third maps, on semitransparent paper, may be used in analysis of the relation of wheat acreage and yield per acre to climate and to annual rainfall.

Discussion deals broadly first with world wheat acreage in relation to total land area, arable land, and acreage devoted to other crops; with its distribution by countries and political affiliations of countries; and with its distribution by levels of average yield, by rainfall zones, by latitude, and between and within climates. Yields per acre are then considered in relation to the various types of climate. Finally, the discussion deals with average postwar interrelationships between yield per acre, annual average precipitation, annual average temperature, preharvest precipitation, and preharvest temperature. Attention is here centered, first, on the meteorological values generally associated with the lower levels of wheat yield, and, second, on the meteorological values that may be termed "optimum" for yields of wheat.

An appendix table contains the basic data on acreage and yield in 257 areas, together with their climates, month of beginning of harvest, and pertinent meteorological data. Appendix notes describe the basic data and the construction of the maps.

Soviet Agricultural Reorganization and the Bread-Grain Situation

V. P. TIMOSHENKO

Apr '37 XIII (7), 309-76

This study illuminates the course of agricultural developments in the USSR since 1930 and 1931, when Soviet grain exports reached spectacular heights after a bumper crop.

Socialistic reorganization of agriculture resulted much less in increase and improvement of grain production than in greatly increased power of the government over crop disposition. Collective farms, dominated by the state but involving certain elements of co-operation, have been more suc-

cessful than state farms in stabilizing their position and improving their practices. The state grain farms were conspicuously unsuccessful in enlarging wheat production in semiarid regions; consequently, governmental efforts have recently been directed toward expansion of wheat in more humid regions, and toward enhancement of yield per acre. But in humid regions the scope for expansion of wheat is rather narrow and has proceeded mainly at the expense of rye. The total bread-grain area has not yet regained the levels of 1930 and 1931. Yields per acre, though better in 1933-35 than in the poor years 1931-32, failed to exceed the yields on peasant farms before collectivization.

Greater control over crops has enabled the Soviet government to collect more grain than was possible before 1930. This facilitated large exports in 1930-31, but left producers with insufficient reserves. During the following years the government, while continuing to collect large quantities of bread grain, exported only moderate quantities and accumulated grain sufficient for abolition of bread rationing in 1935. To the extent that the government held grain stocks, its power to export remained; but reduced need for foreign exchange, and policies aimed first at covering the rapidly increasing domestic needs, kept grain exports within moderate limits. The poor crops of 1936 necessarily affected the grain reserves earlier accumulated; and the present position does not suggest the likelihood of large wheat exports from the USSR in the next few years.

Price Effects of Canadian Wheat Marketing

HOLBROOK WORKING

Oct '37 XIV (2), 37-68

Despite extremely rapid marketing after harvest, prices of wheat in western Canada have tended to be depressed less after harvest than prices of British domestic wheat, which is marketed much more evenly through the season. When hard wheats have been relatively scarce, Canadian wheats have commanded premiums over soft wheats in the British market—higher premiums in recent years than formerly—but the amount of premium depends on the relative supplies of different types of wheat available to importers. There seems to have been no tendency for Canadian wheat to be relatively underpriced in the British market during the first half of the crop year, when Canadian farm marketings are heaviest.

The price of the Winnipeg December future has declined slightly over four cents relative to Liverpool, on the average, from early August to late October. This decline seems attributable less to hedging pressure than to necessities of the export trade. The Winnipeg price in early August has tended to stand too high relative to Liverpool to permit an adequate rate of exportation.

Changes in the rate of country delivery of wheat and the associated changes in volume of hedging have been accompanied, nevertheless, by measurable changes in the Winnipeg price. The price has responded more definitely to sustained changes in the rate of farm marketing than to temporary variations; and the response, though still small, was relatively much

larger in 1933 to 1936 than in earlier years. Causal connections are difficult to establish, but consideration of associated events suggests interesting possible explanations of the changes in sensitiveness of Winnipeg prices to hedging pressure.

Trends of Yield in Major Wheat Regions since 1885: Part I. General Considerations and Rising Trends

M. K. BENNETT

Nov '37 XIV (3), 69–102

Trends of wheat yield per acre in rather large geographical regions of the world have moved diversely since 1885. In 14 regions here considered, such trends have risen in five, moved irregularly in four, and declined or remained about stable in five.

The slope and conformation of yield trend in any area are determined by numerous interacting influences. Six types of influence are distinguished: inaccuracies in basic statistics; geographical shifts of wheat acreage within the region; the initial level of yield per acre; changes in the environment of the wheat plant due to natural causes (pests, weather); man-made changes in this environment, chiefly disease controls, rotations, fertilizers, mechanical devices, and regulation of water supply; and changes in types and varieties of wheat.

This study analyzes the specific influences that seem to have determined the trends of wheat yield in the five regions of rising trend. Initial levels of yield seem to have been relatively unimportant. Some of the trend-increase in all regions resulted from “accidental” influences—either the sequence of stretches of bad and good weather for wheat, or statistical inaccuracies, or both. In three regions, increase of yield was hampered by internal shifts in acreage, but in two the shifting was favorable to yields. The major part of the trend-increase in yield in all five regions seems assignable to man-made improvement of agricultural techniques. One cannot reliably appraise the relative effects of different forms of improvement in agricultural operations; but wider use of fertilizers and the development and spread of improved wheat varieties seem to have dominated.

Trends of Yield in Major Wheat Regions since 1885: Part II. Irregular, Stable, and Declining Trends

M. K. BENNETT

Mar '38 XIV (6), 223–61

Following an earlier study of trends of wheat yield in five “regions” of generally rising trend, this study deals similarly with trends in nine other regions. Measured, as before, by weighted nine-year moving averages of annual data, the trends were irregular in four regions and about horizontal in two, while in three they declined. If one makes rough allowance for statistical inaccuracies and vagaries of the weather, it appears that, over the major and more recent part of the past half-century, the basic trend was upward in two regions, broadly horizontal in four, and downward in three.

The three regions characterized by declining trends lie in the great cen-

tral plain of North America. Here the statistical trends are downward partly because of the way in which stretches of adverse weather happen to be concentrated. But the natural environment restricts the use of known techniques for maintaining or increasing yield per acre, and acreage has rapidly expanded in low-yielding areas. The basic decline in trend of yield in these regions reflects primarily these acreage shifts and the relatively narrow scope for crop diversification and use of fertilizer.

In a "world" made up of all these 14 regions, and not including Russia and China, the basic trend of yield was upward in the first part of the past half-century and downward in the second part. Agricultural technique has improved, with only temporary or local interruption, and rapidly enough to overcome persistent drain on soil fertility in most parts of the world. The reversal of trend rests heavily upon the altered distribution of wheat acreage, with large increases mainly in essentially low-yielding territory. The downward drift of world average yield, thus evident for some three decades, may or may not persist. As in the past, much will depend upon the interaction of opposing tendencies whose relative effects cannot be confidently forecast.

Monetary Influences on Postwar Wheat Prices

V. P. TIMOSHENKO

Apr '38 XIV (7), 263-318

Interpretation of the course of postwar wheat prices in the light of specific supply-demand relationships on the world wheat market throws into relief numerous price movements in which monetary influences were important. Emphasis has commonly fallen upon the depressing effects on wheat prices of monetary and credit deflation following 1919-20 and 1929. The present analysis brings out important price-raising effects of monetary developments between 1924 and 1930. Unduly high levels of wheat prices during that period stimulated rapid expansion of wheat production and created disequilibrium between the supply and the demand for use. The ensuing price readjustment was deferred because speculative demand for wheat, stimulated by the same monetary factors, enabled surplus stocks to be carried for several years.

The long-deferred readjustment took place in 1930-31, in a collapse of wheat prices. Granting the previous course of prices, this was in the main unavoidable. It was, however, made still more drastic by certain governmental policies, and by the rapid depreciation of currencies in Argentina and Australia. The price collapse, however, preceded the general abandonment of the gold standard that began late in 1931.

The wave of currency depreciation following Great Britain's departure from gold tended to check further rapid declines of wheat prices in currency, but tended further to depress wheat prices in gold. These depressing effects were particularly marked in 1931-32 and 1933-34, when competitive depreciation of currencies was intensified.

By 1935, gold prices of wheat began to react normally to changes in the supply-demand situation, but on a level considerably below that which pre-

vailed before the depression. To bring the level of wheat prices in terms of gold up to the pre-depression level would require a sharp rise of general price levels that would involve danger of new price disequilibria.

Shipping and Freight Rates in the Overseas Grain Trade

V. D. WICKIZER

Oct '38 XV (2), 49-120

Completion of wartime contracts left merchant shipping overbuilt. Low ocean freights intensified competition, curtailed shipping profits, and created much idle tonnage. Yet more efficient ships were built faster than trade expanded, and total tonnage increased in 1921-31 despite extensive scrapping. Governments have subsidized their merchant marines, facilitated combinations of shipping interests, and recently encouraged adventures in shipping "rationalization."

World trade in grain is still the most important employment for that branch of shipping devoted to transport of bulk goods which must move at low cost. Though tramps have lost ground to liners until recently, tramp charter rates remain the best barometer of the changing supply-demand relationships expressed in the freight market. Due largely to advances in technology and organization, the trend of ocean freights has been downward for decades, especially in relation to commodity prices generally. Important interruptions of this trend occurred during the World War, and in briefer periods before and since, most recently in 1936-37.

The striking fall in shipping freights in the past century had revolutionary consequences for world agriculture and commerce. Rate variations over briefer stretches of years, and fluctuations over periods of months, continue to influence the course of trade and international price spreads in grain. Except temporarily, such influences are now overshadowed by those exerted by nationalistic policies which affect agriculture, commerce, and shipping directly and indirectly. It remains to be seen how rate controls now in force will withstand current economic pressure upon established minimum rates. Future levels of trade, shipping activity, and freight rates, however, will depend heavily on whether trade barriers are raised or lowered.

Wheat Futures Prices and Trading at Liverpool since 1886

HOLBROOK WORKING and SIDNEY HOOS

Nov '38 XV (3), 121-80

World-wide influences affecting wheat prices converge to a peculiar degree in the British market for imported wheat. Representative prices of such wheat deserve better than any others to be regarded as "world" wheat prices. The average price of all wheat imported into the United Kingdom seems the most broadly representative of the various series. Better for some purposes is the monthly average of spot prices of "good red wheat" compiled by Broomhall, or the average parcels price which we compile. For short-period comparisons, prices of Liverpool wheat futures are best of all.

Comparisons among these series show that the futures prices are in fact admirably representative of the general level of prices of British imported

wheat and are useful for long-period as well as for short-period comparisons. Accompanying tables and charts give a complete record of the prices of Liverpool wheat futures monthly and weekly from 1886, for five delivery months in each year.

That Liverpool futures so well represent the general level of imported wheat prices is a result of effective adaptation to difficult conditions. The history of the Liverpool futures contract is one of progressive improvement. A prime objective in the evolution of the contract has been adaptation to the needs for hedging wheat in channels of international trade.

From the standpoint of volume of trading or volume of open contracts, the Liverpool futures market ranks far below Chicago and Winnipeg. It is pre-eminent in balanced reflection rather than in generation of price influences. A large proportion of its business originates with hedgers, and with speculators who take a long view of the price outlook. Although peculiarly vulnerable to "corners" and "squeezes," Liverpool has succeeded remarkably in avoiding such manipulation.

Seasonal Aspects of the European Wheat Trade

M. K. BENNETT

Mar '39 XV (6), 297-335

Overseas shipments of wheat and flour to Europe in August-December, when North American wheat usually preponderates, have ranged in the past 17 crop years from 37.40 to 44.55 per cent of the crop-year shipments. A view rather widely accepted in trade circles is that the fraction of the year's total shipped in these months tends to be small when the margin between world export surpluses and world import requirements is large. Under such circumstances, it is commonly supposed that European importers tend to avoid accumulation of stocks in August-December, in expectation of cheaper wheat in the winter when the Southern Hemisphere export movement is at its peak.

The present study indicates that the reverse of this is true. Autumnal accumulation of import wheat stocks appears to be normal behavior of European importers in years of large margin of surpluses over requirements, mainly as the result of export pressure in the autumn. In general, August-December shipments to Europe may be expected to approximate 43.3 per cent of crop-year shipments in years when margins (as calculated in this study) run larger than 250 million bushels.

The current crop year, 1938-39, is one of very large margin between surpluses and requirements. If the political events of mid-March have not prompted Europeans to begin to accumulate wheat stocks, and if intensified war scare or war itself does not eventuate in the next eight months, the principles developed in the following pages suggest three conclusions regarding the outlook for European trade in wheat. August-December shipments may prove to be the largest fraction of the crop-year total recorded in 18 years. May-July shipments may run larger than usual in relation to January-April shipments. By the end of the crop year, the stage may be set for severe export pressure in the autumn of 1939-40.

Durum Wheats and Their Utilization

C. L. ALSBERG

Apr '39 XV (7), 337-64

Durum wheat, a distinct species, probably originated in northern Africa, where it still predominates. Because some strains are resistant to rust and drought, it is grown in many semi-arid regions, for example, the Mediterranean basin, southeastern Russia, western Asia, British India, the Great Plains region of western Canada and of the northern United States, and Argentina. Elsewhere it occurs but is of slighter importance. It probably constitutes about 8-9 per cent of the world's wheat crop.

Because of its yellow color and its vitreousness, durum is the premier raw material for the semolina used in alimentary pastes of the macaroni type. Though its hardness varies with climate and variety, other things being equal, it is the hardest of all cultivated wheats. In recent years quantitative methods for evaluating its quality for macaroni have been developed. These measure color, mechanical strength, and cooking quality of macaroni. As bread wheats, durums have been less esteemed, except in Russia, in part because most varieties yield denser and less porous loaves, in part because their flour is of creamy yellow color, a defect which can now be overcome by chemical bleaching.

When their price is favorable, durums now tend to be used by millers in western Europe as "weak filler wheats" to the extent of 10-20 per cent, for improved methods of tempering render them less difficult to mill. They have good "gassing" power and do best blended with wheats deficient in this respect. Except in regions where they are the principal wheat and the requirement of the natives with respect to baking quality is not great, they are never used alone for flour, even in Russia. Their price does not parallel that of common wheat because of their special use for macaroni. Sometimes they bring considerable premiums, and sometimes they are discounted.

"World" Wheat Stocks, 1890-1914 and 1922-39

HELEN C. FARNSWORTH

Oct '39 XVI (2), 39-66

Scarcely noted before the World War, but increasingly recognized over the past decade, was the importance of a comprehensive series of estimates of year-end "world" wheat stocks. Several such series have been published covering the past five to eighteen years; but no similar estimates have been available for the period prior to the World War of 1914-18. The present study attempts to fill this gap with a stocks series for the twenty-five years beginning in 1890. For comparison with this prewar series, *adjusted* postwar estimates are presented for a "wheat world" somewhat smaller than that covered by the postwar series regularly published in earlier issues of WHEAT STUDIES. Occasion has also been taken to revise the latter series, though the changes made can hardly alter major generalizations based upon the original estimates.

Comparisons between prewar and postwar years show a materially higher level of stocks in the postwar period. This is largely attributable to growth

of population and to the persistence of an unprecedented world surplus of wheat after the bumper harvest of 1928. Less important but significant factors were the increase in world trade and the development of Argentina and Australia as major exporters. Tending slightly to offset these influences were the lower postwar level of per capita wheat consumption and the several factors that combined to speed delivery of new-crop wheat from farms to consuming centers.

The stocks series here presented show two major periods of persistent wheat surplus—1893–96 and 1929–35—and five years of notably small stocks—1898, 1909, 1925, 1937, and 1938. As compared with the prewar period, the two decades since the war have been characterized by much heavier wheat surpluses and less marked wheat shortage.

Wheat and War, 1914–18 and Now

M. K. BENNETT

Nov '39 XVI (3), 67–112

During the World War, difficulties in maintaining wheat supplies in Europe culminated in acute shortage in 1917–18. Small crops in the unblockaded part of Europe created enormous import requirements, even with utilization defined in terms of wartime levels much below those customary in peacetime. Russia could not ship wheat to the deficiency area. The full burden therefore fell upon the distant overseas exporting countries.

These overseas countries secured only moderate crops in 1917, in spite of expanded acreage, and their total supplies were too small to yield exportable surpluses adequate to cover the heavy world import requirements of 1917–18. In addition, shortage of shipping prevented Southern Hemisphere surpluses from passing fully into export. Heavy drafts upon stocks in North America, economies in American consumption, and stretching of wheat supplies in Europe so ameliorated the European position that mass starvation or hunger was generally averted outside of the Central Powers. Yet there was profound disturbance of consumption habits, even privation, and wheat prices rose exceedingly high.

At the outset of the present war, European countries are in a far better position than in 1914 to hold down their essential requirements for overseas wheat. This difference is likely to persist even if the war should last for four or five years. The overseas exporting countries, with normal yields on present acreage, could probably supply maximum import requirements with ease. Recurrence of a world wheat stringency like that of 1917–18 seems improbable for at least two years and possibly three, and would probably not occur later except in the event of abnormally low yields per acre in the overseas exporting countries.

Physical Tests of Flour Quality

C. H. BAILEY

Mar '40 XVI (6), 243–300

Three major subdivisions of this general subject are discussed in this study: (1) absorption, or the proportion of water required to produce

doughs of optimum plasticity or viscosity; (2) physical tests of crude gluten; and (3) physical tests of wheat flour dough.

1. Several types of devices have been proposed for measuring dough viscosity, including extrusion viscometers, penetrometers, extensimeters, centrifuges, and recording dough mixers. Extrusion viscometers are simplest and relatively inexpensive, but provision must be made for temperature control. Among flours of widely varying composition and baking strength, different levels of dough viscosity must be provided for optimum baking behavior.

2. Physical testing of crude gluten is largely confined to European laboratories at this time. Even when mechanical gluten-washing devices are used in preparing glutes for testing, it is difficult to recover gluten that is unaltered and uniform in properties. Elastic recovery of gluten after compression and decompression is used as the index of quality in numerous instances, and special instruments have been devised for that purpose. In other instances the force required to effect extension of a strand of gluten is measured. Evidence of the usefulness of such tests is not abundant.

3. Physical tests of wheat flour dough have involved numerous mechanical devices. Most prominent have been various forms of extensimeters and recording dough mixers. While the latter are useful in preparing standard doughs, they may fail to reveal certain significant physical characteristics of the doughs under test. In general, measurements of extensibility may be more useful, although these should be combined with a measurement of the rigidity modulus to render them most significant. Apparently no single device now available is entirely adequate for all these purposes.

Bulk Handling in Australia

J. S. DAVIS

Apr '40 XVI (7), 301-64

Country and terminal grain elevators had been long discussed but never introduced in Australia before New South Wales, in 1916, provided for a state system. Commonwealth financial aid shortened delays in starting construction, but led to some unfortunate modifications in the plans affecting the Sydney terminal and the first country "silos." Opened for partial use in 1920-21, this system was slow to find favor with farmers, merchants, and millers; and for ten years other states were content to observe the operating and financial experience in the pioneer state.

In 1930-31, ocean freight differentials in favor of bulk wheat were established, and bulk shipment oversea soon became the rule. With this change, bulk handling within Australia has expanded materially. The New South Wales plant has been extended, is more widely used, and yields operating surpluses, but has been cursed by recurring congestion. Victoria is building a similar state network, a portion of which is being first used this season. In Western Australia, progressive farmers' co-operatives have developed a cheaper, more flexible, unorthodox system which has worked well.

Since early in 1936, when this received delayed official sanction, it has expanded rapidly despite poor terminal facilities and grudging co-operation from the state railways.

Bag handling and storage, however, still have a large place in Australian practice, and may long persist in some degree. This year, as in 1916, Australia faces the task of dealing with a bumper crop under conditions that severely restrict exports. Accumulated experience can be drawn upon to facilitate solution of resulting problems in ways more satisfactory than during the last war.

Wheat Subsidization and Exports: The Experience of 1938-39

V. P. TIMOSHENKO

Oct '40 XVII (2), 39-99

Government interventions on wheat markets and various schemes of wheat subsidization reappeared in the third quarter of 1938 with great rapidity after a short period of relaxation during the two preceding years. In particular, wheat exports were subsidized during 1938-39 by practically all the principal exporting countries. This experience deserves careful study, even though full information on the operations and results is not yet available. Conclusions from such study have important bearings on national policy.

American subsidization of wheat exports was perhaps the greatest departure from traditional policy, and it represents the clearest case of direct export subsidy. But other exporting countries participated in competitive subsidization. This resulted in a substantial depression of wheat prices in international markets. The depression of international wheat prices partly defeated efforts of exporting countries to raise prices for their own wheat growers, and made the costs of these efforts excessively high.

Competitive subsidization of exports threatened to continue at great losses in 1939-40. This was prevented by the onset of the European war. The war soon led to concentration of wheat buying in many of the important countries, and the problem of coping with wartime conditions made government interventions in wheat markets indispensable for all countries involved in the war.

Altogether, extensive study of the experience with competitive export subsidization in 1938-39 yields little support for this approach to the problem of coping with export surpluses of wheat.

Price Relations of Liverpool Wheat Futures, with Special Reference to the December-March Spread

SIDNEY HOOS and HOLBROOK WORKING

Nov '40 XVII (3), 101-43

The influences that may affect price relations between different wheat futures in a great importing market differ in many respects from those affect-

ing price relations in such a market as Chicago. General similarities which appear despite such differences are especially significant, for they point to characteristics of futures markets that are not dependent on special conditions in a particular market.

At Liverpool, as at Chicago, price influences which might seem significant principally for deferred futures are found in fact to have nearly or quite as much effect on the near future. Expectations of subsequent developments are reflected in prices of all futures about equally. Price differences between futures arise mainly from conditions and expectations that have greater price significance for the near future than for the deferred future.

The price spread between the December and the March futures at Liverpool appears to have depended mainly on conditions that tend to determine the level of European stocks of imported wheat at about the end of December. Among these conditions have been the pressure of export surpluses during the previous crop year, affecting European stocks in early August, and the various factors that determine what proportion of the current crop year's shipments to Europe will be made during August–November. The December–March spread as early as September implies a forecast of shipments during the autumn. As such, it has been reasonably trustworthy, but it has tended to underestimate the force of extreme conditions, with the result that unusually wide spreads have tended to widen as the season progressed. The influences affecting the December–March spread tend in August–October to bear principally on the price of the December future, but to affect the March future in the same direction. In November and December they tend to affect only the price of the December future.

Rice and Wheat in World Agriculture and Consumption

V. D. WICKIZER

Mar '41 XVII (6), 261–314

The World War of 1914–18 focused attention upon the importance of wheat in the food position of Western nations and gave impetus to study which has greatly increased understanding of the world wheat situation. Despite the war developments of 1937–41, much less is known of rice, a food crop of comparable importance in the world as a whole, and of far greater importance in the Orient. This comparative study therefore focuses on the rice world centering in Monsoon Asia.

Rice and wheat together constitute the major element in food supplies for four-fifths of the world's population. Changes in their positions and prospects, aside from their immediate strategic or military importance, have considerable long-term significance. Contrasts between rice and wheat in methods, places, and conditions of production and consumption largely explain the position and importance of each cereal in agriculture, the diet, and the national economy; the degree of elasticity in supply and demand, and the behavior of prices; the character and extent of international trade; the nature of the problems entailing government intervention; the potentialities

for and ease in expanding production; and the degree and type of population pressure on food supplies.

Per capita consumption of wheat and rice alike has tended to decline, though for quite different reasons. The decline in wheat consumption has been largely voluntary; the decline in rice consumption has not. Herein are considered the numerous trends in and problems of national nutrition, population, agricultural adjustment, trade development, and international politics which lie behind and explain changes in consumption of the two cereals, as well as competitive relationships which seem destined to assume greater importance in the future.

(See also V. D. Wickizer and M. K. Bennett, *The Rice Economy of Monsoon Asia*, Food Research Institute, Grain Economics Series 3, Stanford University, California, 1941.)

Wheat in the Post-Surplus Period 1900-09 with Recent Analogies and Contrasts

HELEN C. FARNSWORTH

Apr '41 XVII (7), 315-86

The wheat-surplus period of the 1890's was followed by a decade characterized by extremely heavy wheat output. In per capita terms, this output was larger than that responsible for the burdensome surplus stocks of the mid-nineties or that later associated with the depressing surplus of 1928-35. But the early years of this century witnessed no piling up of surplus stocks comparable with the accumulations of 1892-96 and 1929-35. Historical and statistical analysis suggests that this extraordinary outcome was largely due to three factors: (1) the sharper upward trend and higher level of per capita normal wheat disappearance in the early 1900's; (2) the more favorable timing of crop surpluses and deficits in those years; and (3) the fact that wheat disappearance was then farther above normal than in 1928-35.

In the absence of burdensome wheat stocks, the purchasing power of British import wheat, trend considered, was moderate rather than low during 1898-1909. Except in 1898-99 and 1901-02, deflated prices of such wheat reflected reasonably well the wheat commodity position of each of the crop years considered. From about 1902 to the beginning of the World War, the trend of purchasing power of British import wheat was horizontal, in sharp contrast with downward trends during the 15 to 20 years prior to 1902 and from 1922 to 1939.

Since 1938 the world's wheat output has again been heavy, and existing wheat stocks are unprecedentedly large. These might conceivably be reduced to normal by two successive years of abnormally low yields per acre, or by prompt expansion of wheat consumption following an early peace; but neither of these developments can at present be expected. Nor would such reduction in wheat acreage as now appears in prospect suffice to bring stocks to a normal level by 1943. Although future developments are not predictable, it now seems probable that the next few years will be characterized by the persistence of some degree of wheat surplus.

Wheat in National Diets

M. K. BENNETT

Oct '41 XVIII (2), 37-76

Wheat is one of the more important foodstuffs in a group designated herein as cereal-potato foods. This study presents analyses of the quantitative position of this group in the average diets of 52 nations (1933-38), the quantitative position of wheat calories among total food calories and among the cereal-potato calories of these nations, and changes in the position of wheat between 1923-28 and 1933-38. The survey is nearly world-wide, since the populations of the 52 nations constituted some 88 per cent of the world total in 1935.

Calories from cereals and potatoes constitute as little as 30 per cent of total food calories in some countries, as much as 90 per cent in others. Income status largely determines the relative importance of this group of cheap foods. The ratio of cereal-potato calories to total food calories is itself a rough index of income status, and a rougher index of quality of diet.

Wheat contributes less than 5 per cent of total food calories in several countries, mostly Oriental or tropical; and as much as 40-50 per cent in others. The interrelated factors of climate, food preference, and income status seem to explain these contrasts. They also explain differences in the importance of wheat calories among cereal-potato calories. Wheat contributes around 75 per cent of the cereal-potato calories in some nations, including the United States. Here, and in some 17 other countries, wheat dominates among the cereal-potato foods, furnishing over half of the cereal-potato calories. But in other countries, rice, rye, or corn is dominant.

Changes in national per capita disappearance of wheat flour from 1923-28 to 1933-38 were in some instances of large magnitude and are usually difficult to explain. They did not tend toward equalization of divergent levels.

Why Enrichment of Flour?

A. E. TAYLOR

Nov '41 XVIII (3), 77-108

"Enrichment" of flour is a new expression. A few years ago, specialists in nutrition discussed ways and means whereby valuable components of natural foodstuffs might be preserved from destruction during processing or in preparation for the table. Originally, the word "retention" was used to indicate avoidance of depletion, and "restoration" was used to indicate repair of unavoidable depletion. "Fortification," the oldest term, implied supplementation beyond the natural level. Recent years have taught us that loss of vitamins may occur all the way from harvesting through storage, processing, and preparation for the table, and, more or less, in all foodstuffs. Also, more or less, foodstuffs lose both water-soluble and fat-soluble vitamins.

Earlier attempts at restoration were made under the Seal of Acceptance of the Council on Foods of the American Medical Association. Under the provisions of the new Food, Drug, and Cosmetic Act, the Federal Security

Agency is empowered to authorize and promulgate specific additions of vitamins and minerals to named foodstuffs. The first moves were made with reference to wheat flour, and others have followed. Enrichment of white flour has been proceeding in 1941, in advance of legal provisions scheduled to come into effect in 1942.

This issue of *WHEAT STUDIES* is devoted to a discussion of the background of the problem of enrichment or fortification of foods with vitamins and minerals, and the reasons which have prompted our government to take a formal step in enrichment of wheat flour by permitting the addition of specified amounts of thiamin, nicotinic acid, riboflavin, and iron.

Federal Crop Insurance in Operation

J. C. CLENDENIN

Mar '42 XVIII (6), 229-90

Three years of federal all-risk wheat crop insurance have demonstrated the attractiveness of such insurance to a substantial number of farmers. The insured percentage of the acreage seeded was between 17 and 18 per cent in 1940 and 1941, and will be larger in 1942.

Crop insurance sells with equal facility to rich men, poor men, landlords, owner-operators, tenants, diversified-crop farmers, and one-crop farmers. At present it is less widely utilized in hazardous areas, where premium rates are high, than in low-risk areas. The security it provides is convenient rather than essential to most of those now insured, but general participation would add much to the economic stability of many individuals and communities. The present volume of participation is inadequate to accomplish these ends on a wide scale.

Actuarial data and certain operating procedures are not yet in good order. Despite fair crop years in 1939 and 1940 and a very good one in 1941, loss indemnities have each year greatly exceeded premium receipts. Improvements are being made, and it should be possible to eliminate underwriting losses reasonably soon. In a voluntary program, it is not likely that premium receipts can be made to cover loss indemnities and full operating expenses.

Careful review and appraisal of the experience reveal that the venture still faces problems involving both general policies and operating techniques. Justification for indefinite continuance and expansion awaits the solution of these problems.

Variability in Wheat Yields and Outputs: Part I. Cycles and Random Fluctuations

V. P. TIMOSHENKO

Apr '42 XVIII (7), 291-338

Variability in wheat yield and output is an important subject in itself, but its study is of even greater importance for a better comprehension of fluctuations in agricultural production as a whole, and fuller understanding of these is highly necessary for students of general economic fluctuations.

Are fluctuations in wheat yields and outputs systematic in some respects and consequently predictable to a certain extent, or are they wholly dominated by chance? This is the central question here considered. The answer is that many fortuitous factors, of which weather is perhaps the most important, dominate fluctuations in regional yields and outputs of wheat, at least to such an extent that, even with close statistical scrutiny, it is difficult to detect systematic tendencies.

The usual analysis of series on wheat yields and production into component parts, however, reveals "cycles" with an average duration of about $3\frac{1}{2}$ years, which recur less irregularly than cycles in business. The amplitudes of these oscillations, though varying greatly from region to region, are large enough in the major wheat-exploring regions to be of great economic importance.

Cycles of 3 or 4 years are also characteristic of fluctuations in other crops, and they are the most frequent in business cycles. However, the relatively frequent occurrence of cycles of much longer duration in business oscillations indicates their greater divergence from random fluctuations than may be said of fluctuations in wheat yields and outputs.

New International Wheat Agreements

J. S. DAVIS

Nov '42 XIX (2), 25-83

From the Washington Wheat Meeting of the five nations with the largest stake in overseas trade in wheat, new international wheat agreements emerged in mid-1942. These involved: (1) commitments by the five countries to make donations to a "relief pool" of wheat, and by the four chief exporting countries to adopt or maintain positive measures to control their wheat production; (2) the establishment of an International Wheat Council to administer these international arrangements and others that may come into effect during the war and after hostilities cease; and (3) the publication of a draft of a fairly comprehensive international agreement.

The few steps on which agreement became effective at once seem timely and reasonable. The new Council faces important opportunities to facilitate the co-ordination of national wheat policies, especially if it strives to promote the fullest utilization of this abundant resource.

The Draft Convention is designed to be brought into operation among the five countries by degrees, as further decisions are taken, and also for submission, at some future date, to "a wheat conference of the nations having a substantial interest in international trade in wheat." An extremely ambitious scheme for postwar application, it provides for large reserve stocks, production restraints, export quotas, and minimum and maximum prices of wheats moving in international trade.

For a peacetime world, this elaborate system of restrictive regimentation seems out of harmony with evolving principles of international economic relations appropriate to a world rededicated to freedom and progress. It merits the most careful study by all interests concerned, before any of its

main provisions comes into operation and before it is submitted to the proposed international conference.

Variability in Wheat Yields and Outputs: Part II. Regional Aspects of Variability

V. P. TIMOSHENKO

Mar '43 XIX (5), 151-202

A study of regional differences in the variability of wheat yields and outputs has a twofold interest. First, it leads to a causal explanation of these differences in terms of climatic and other geographic characteristics of wheat regions. Second, it supplies information that may help to explain fluctuations in other phenomena such as prices or trade. Data on variability of regional yields and outputs may be useful not only for general analysis of the world wheat market but also in connection with national and international regulation of wheat marketing.

Continentality of climate appears to be the most general climatic characteristic of the wheat regions with high relative variability of yields. Aridity of climate must be regarded as the second most general characteristic of these regions. But wheat yields vary widely in some of the humid areas, while they are relatively stable in semiarid regions with the winter regime of rainfall.

Great diversity in the fluctuation of regional yields results in a good deal of compensation of unrelated variations. Consequently, yields and total production of wheat for the large continental areas and for the world as a whole show a considerable degree of stability.

These contrasts between the great variations in the wheat outputs of some important wheat regions, particularly in several wheat-exporting countries, and the relative stability of wheat production in the principal wheat-importing countries of Europe and for the world as a whole, should be studied attentively by those who are responsible for formulating international wheat agreements and planning under them. Significant changes in the variability of wheat yields in some important wheat regions may afford some guides to rational wheat policies in the respective areas.

Wheat Outlook and Policies

J. S. DAVIS

Sept '43 XX (1), 1-36

Impressive gains by the United Nations on the Atlantic, Mediterranean, and Russian war fronts have inaugurated a period of enlarging wheat and flour shipments to Europe and Soviet Russia. Their needs, great though often exaggerated, are less by reason of good grain crops, on expanded acreage, in most of Europe except embattled Russian soil and the Iberian Peninsula.

World wheat supplies for 1943-44 are about equal to the unprecedented total of last year. Overseas exporting countries can readily spare far more than shipping yet permits to move. Flour production, stimulated by orders

for armed forces and eventual relief use, is at near-capacity levels in Canada and is expanding in Australia and the United States.

Government measures, old and new, keep forcing wheat prices abnormally higher in the United States, with far-reaching consequences. Canadian wheat prices have been sharply raised, following increased demands for export southward and overseas, and export prices in Argentina and Australia are rising.

In the four chief exporting countries combined, as much wheat may this year be used for nonfood purposes as for food and seed. In the United States, where such diversion is heaviest, wheat imports for feed use seem likely to exceed wheat and flour exports. Shortages of coal and maize are driving Argentina to burn wheat. Re-expansion of wheat acreage in these two countries has begun, and Canada and Australia will follow suit in 1944 if absorption of their surpluses proceeds far enough. Judicious restraints on use of wheat for feed, alcohol, and fuel are needed if ample reserves are to be held for prospective food relief and other purposes.

The crucial problems ahead call for vital policy decisions and far-sighted management, national and international.

Wheat Prices and Milling Costs in Classical Rome

NAUM JASNY

Mar '44 XX (4), 137-70

The primary aim of this study was to ascertain the price of wheat in classical antiquity, and specifically the price or prices that correspond to the flour prices mentioned in Pliny's *Natural History*. It is concluded that the wheat price corresponding to Pliny's flour prices was at least 8 sesterces per modius for the cheaper of the two principal types of Roman wheat, rather than 3-4 or 5 sesterces for wheat as such—the interpretation hitherto commonly accepted. In other words, the free-market price of wheat in Rome at the end of the Republic and at the beginning of the Empire is likely to have been considerably higher than classical scholars have been assuming. Attention is also given to the price of wheat in certain other parts of the ancient world and an attempt is made to appraise the probable price spread between surplus and deficit areas.

To reach conclusions on prices required the intensive consideration of wheats, flours, milling techniques and costs, and related matters in classical antiquity. A further objective of the study has been to bring order out of the chaos that has characterized the available information on these subjects. If the work contributes only a little to reliable knowledge of the price of wheat in the ancient world, so important for its bearing on purchasing power and cost of living, it goes farther toward settling questions about flour grades and milling costs in classical antiquity.

A Roman flour with only bran separated, widely used during that period, was "discovered" in the course of the study. Extraction percentages of flour in antiquity appear to have been substantially higher than some prominent scholars have believed. It was also found that the high cost of power for

grinding at that time was largely offset by the coarseness of the grinding, and that the total cost of producing flour, while higher than at present, represented only a small part of the flour price.

Interregional Correlations in Wheat Yields and Outputs

V. P. TIMOSHENKO

Jul '44 XX (6), 213-60

Correlation analysis is here applied to numerous series of wheat yields and outputs, for the major wheat regions of the world and for some of their smaller subdivisions.

Variations in world wheat production, region by region, display less regularity and uniformity than is sometimes assumed or asserted. Variations in wheat yields in remote regions of the several continents are very little related among themselves. The correlation between yields is not close even in far-distant regions of the same continents, as, for instance, in the wheat regions of North America. Fairly close correlations among regional wheat yields and outputs exist only for relatively limited areas, the weather developments within which are controlled by similar meteorological factors.

Variations in wheat outputs in the wheat-exporting countries dispersed throughout the world are particularly diverse and practically independent. Such variations happen, however, to be more or less compensatory. This results in a considerable approach to stability of world wheat production, and in the total supply of wheat on the world wheat markets, as compared with production or supplies in individual exporting countries.

Still less correlation than in wheat-yield variations should be expected among variations in yields of different crops in regions remote one from another. Consequently, world crop production should be essentially stable, if the trend of growth is disregarded. Only a slight portion of the variability of total crop production should depend on factors common to most crops in most of the regions. Hence, it is probable that small variations in the total world crop production are less responsible for disturbances of the world's business than are great variations in crops in some of the leading countries that play an important role in world trade in agricultural products.