

studies on clover and alfalfa, and improved laboratory techniques.

The association has also worked with the Association of Official Seed Analysts and the Society of Commercial Seed Technologists in their various publications.

Arbitration, group medical insurance, insurance for specialized errors and omissions, and annual trade shows are among the other services provided members of the American Seed Trade Association.

The specific commodity promotional groups and associations also serve segments of the seed industry.

The All-America Selections, sponsored by members of the American Seed Trade Association's Garden Seed Division, promotes the introduction of new vegetable and flower varieties through an award system consisting of nationwide trial grounds for new varieties. Eminent judges select the outstanding trial-ground entries. At their discretion and subject to final vote of the Board of Directors of the All-America Selections Council, exceptional new vegetable and flower varieties are awarded All-America distinction. To finance the program, winners of the awards return fixed percentages of the sales price of winning varieties.

The National Garden Bureau sponsors an information and public relations program developed by the association's Garden Seed Division to encourage gardening. The Better Lawn & Turf Institute is an association to foster more effective grass seeding practices. The Certified Alfalfa Seed Council and the Merion Bluegrass Association are similarly constituted promotional programs. The Field Seed Institute is an association that studies economic trends in the seed business.

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## Statistics and Trends

THOMAS J. KUZELKA AND W. H. YOUNGMAN

STATISTICS are yardsticks for measuring the present in terms of the past and for making plans for action.

Farmers have felt a need for statistics of production and prices since the middle of the 19th century, when agriculture began to emerge from the level of self-sustenance. Many believed that they were at a disadvantage in bargaining because they knew less about crop production than did the people to whom they sold.

Agricultural statistics made their greatest growth in wartime. Some data were available as early as 1839, but the gathering of statistics was first made part of the work of the Department of Agriculture in the war period of 1862 and was greatly expanded in each subsequent period of conflict.

The Federal Census of Agriculture for 1849 gathered statistics on field seeds. The data for that year and for each succeeding decennial census up to 1909 were limited mostly to group totals for clovers and grasses. The census for the latter date provided separate totals for timothy seed, in addition to the group totals. The Census of 1919 was expanded further to include figures for seed of red clover. Statistics on imports and exports likewise were submerged in group totals for most kinds before 1910.

Although other fragmentary statistical information was collected by some States and the Department of Agriculture at earlier dates, the official estimates of acreage, yield, production, farm price, and value of production did not begin until 1919. Such produc-

tion totals as were available for the years before 1919 included some partly cleaned and thresher-run seeds and therefore are not comparable with the succeeding series, which is on a clean-seed basis.

Some figures on the production of seeds were collected before 1938 by the Hay, Feed and Seed Division of the former Bureau of Agricultural Economics. They were integrated into the official series after 1938, when all functions of collecting statistics on seeds were transferred to the Agricultural Estimates Division, which is now a part of the Agricultural Marketing Service of the Department.

The urgent need for statistical information during the Second World War brought a rapid expansion of the work. Estimates of production were available in 1919 for only four kinds of field seeds, including alfalfa, red and alsike clover combined, and timothy.

Sweetclover and lespedeza were added in 1924, as production of each kind became increasingly important. Other kinds were added later. The estimating program included 47 kinds of field seeds, and 46 kinds and more than 250 types and varieties of vegetable seeds by 1950. The number of seed crops and the States where seeds are grown changed periodically as production increased or declined and as the urgency of need for statistics developed or waned.

The number of crops of field seeds for which estimates were made was reduced from 47 to 28 in 1952, because by that year supplies of many kinds were far above domestic needs and price supports for hay and pasture seeds were discontinued.

The list of the 28 kinds that remained in the estimating program since 1952 includes alfalfa, red clover, alsike clover, sweetclover, white (Dutch) clover, Ladino clover, crimson clover, lespedeza, timothy, redtop, orchardgrass, Kentucky bluegrass, Merion Kentucky bluegrass, sudangrass, smooth brome-grass, crested wheatgrass, chewing fescue, red fescue, tall (Alta and Ken-

tucky 31) fescue, bentgrass, Austrian winter peas, lupine, hairy vetch, common vetch, purple vetch, common ryegrass, perennial ryegrass, and mustard.

The list of vegetable seeds includes practically all the leading kinds and types used for the fresh market and processing.

FORECASTS and estimates of seed production are made by the Crop Reporting Board of the Agricultural Estimates Division. It also compiles and publishes data on prices, value of production, carryover, disposition, supply, and disappearance of seeds.

A typical forecast employs two kinds of questionnaires. One is mailed to a representative list of growers in the areas of production. The other is mailed to a list of country shippers.

Growers are asked to report acres cut and to be cut for seed and pounds of seed harvested "this year" and "last year." Other questions relate to carryover of old crop seeds, disposition of the seeds produced in the previous year, and quantities sold each month.

Country shippers are asked to give their opinion on the percentage of change in acreage harvested and to be harvested for seeds in their buying area, approximate quantities of seeds harvested and to be harvested for the current year and the previous year, and pounds of seeds purchased from growers each month of the previous year's seed-buying season. Followup mailings are made to nonrespondents to increase the returns.

The data from the questionnaires that are returned constitute a sample, or cross section, of all growers. The acreage in the sample may represent 5 percent of the growers who produce a particular kind of seed in a State or as high as 30 percent in another State. The average size of the sample for all the States is nearer the lower percentage.

A sample of this size usually is large enough to provide reasonable accuracy of the estimates. The sample from the country shippers represents one-

third to three-fourths of all shippers handling the seeds in the producing area.

The growers' and shippers' indications of percentage of change in acreage for the current year, as compared with the preceding year, are interpreted separately for each State by use of regression charts. This method allows adjustments for any bias that may be due to selectivity in mailing lists, underreporting of large crops, overreporting of small crops, and other factors. The degree of bias is established over a period of years by known benchmark observation points such as the 5-year Federal Census of Agriculture, annual State farm census, and annual crop-check information. Yield data are interpreted by means of chart relationships in a similar manner as is done for acreage.

Because forecasts of seed production are made close to the beginning dates of harvest, the forecast frequently differs from the final estimate. Such influences as inclement weather at harvesttime, depressed prices, and lack of demand are the chief reasons for such differences. Thus, in order to obtain a more accurate appraisal of change in acreage and yield from the previous year, it is necessary to re-survey the growers that reported in the forecast and to include other growers who harvested seed. This is done by means of an acreage card, which is sent to a much larger random list of growers throughout the State. This card asks about the acreage harvested and to be harvested for all crops, including seeds.

Two indications are obtained from this source. First is the ratio to land in farms—the total reported acres of a particular seed crop expressed as a percentage of the acres of all land in farms in the entire sample. Second is the "identical" percentage of change in acreage, obtained by matching the current reports of individual growers with their previous year's reports.

As in the case of the forecast, these indications are interpreted on charts.

Additional information is also obtained on yields per acre through the use of an acreage and production inquiry, which is sent after harvest to a smaller list of respondents. The information as to yield from it and from the special forecast inquiries is supplemented by judgments as to indications of yield, obtained from the October, November, or December farm reports. The latter are mailed to a list of established crop reporters.

The composite data from all these sources as to acreage and yield form the basis for the preliminary estimate, which is published in December.

Some information also is obtained by statisticians in field offices through interviews with seedgrowers, buyers of seeds, and county agents. The statisticians often make field counts and observe the set of seed before harvest.

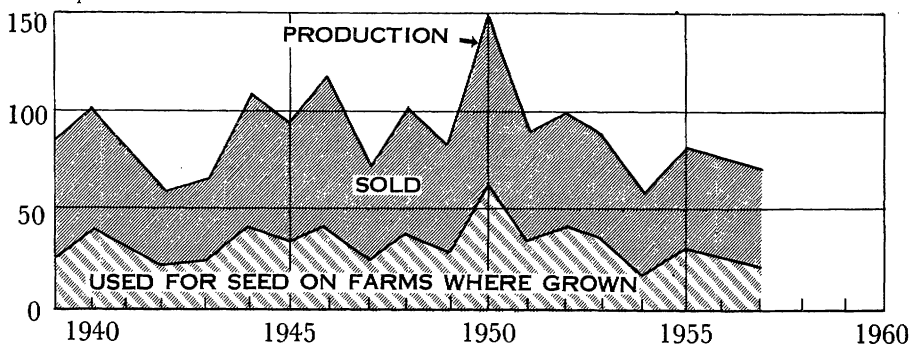
THE PRELIMINARY estimates published in December may be revised the following year if additional information indicates a need for revision. The new data may be a cleaner crop-check of all known cleaners in a State, State farm census enumerations of acreage and production, certified seed records, verified origin records, and additional indications on yield per acre. Data from the Federal Census of Agriculture become available every 5 years and set benchmarks that help to true up the level of the estimates.

STATISTICS for vegetable seeds are compiled from reports of growers and companies who produce seeds. Much supervision by trained workers and a large outlay of land and equipment are required for growing and storing vegetable seeds. Fewer than 100 companies comprise the seed-growing industry in the United States. Practically all report to the Crop Reporting Board. The sum of their data provides the basis for the totals, as little adjustment is usually necessary for nonrespondents. Statistics are compiled for 264 kinds, varieties, or types of seeds.

The reporting questionnaire for veg-

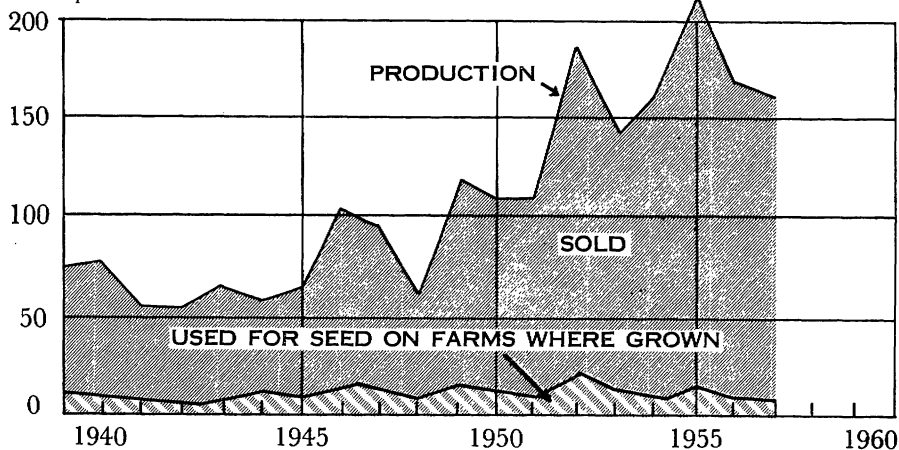
## Production and Disposition of Red Clover Seed

Million pounds



## Production and Disposition of Alfalfa Seed

Million pounds



etable seeds is one of the longest used by the Crop Reporting Board. It was prepared in cooperation with a representative group of seedsmen. The list of varieties is revised at about 5-year intervals to include new varieties. Older and obsolescent varieties are included in group totals and published as "other varieties."

Three surveys of vegetable seeds are made annually by the Crop Reporting Board.

One, as of December 1, asks for acres harvested and preliminary production of clean seed for the current crop.

The second, as of March 15 the fol-

lowing year, asks for the final acres harvested and production for the previous year and the prospective acres and production for the new crop that is to be planted.

The third survey is made as of June 30 and obtains the quantities of vegetable seeds carried over from previous crops. This survey involves a large list of dealers, many of whom are not necessarily growers of vegetable seeds. It includes wholesale and large retail companies that are known to carry over large amounts of vegetable seeds.

It does not include small retail establishments.

The information from the three surveys and data on imports under the Federal Seed Act, published by the Grain Division of the Agricultural Marketing Service, provide indications of the total supply of vegetable seeds.

Statistics for vegetable seeds were first compiled for official use in 1916 and were continued through 1923. Production increased rapidly after 1916, and by 1923 it had reached surplus proportions. Because of waning interest on the part of the seed industry, the estimates for vegetable seeds were discontinued after 1923 but were reinstated in 1940.

Changes in classifications and groupings between the two periods make comparisons of production difficult.

Such comparisons as can be made show that 1941-1945 average production was more than double the 1916-1920 average for garden beets, cabbage, carrot, kale, muskmelon, parsley, garden peas, pepper, spinach, summer squash, and turnips; and one-half larger to almost double for pole beans, parsnip, radish, sweet corn and tomatoes. The 1941-1945 average production was lower than 20 years earlier for pumpkin and salsify.

Comparison of 1916-1920 data with average production in 1951-1955—which represents the adjustment period after the war—reveals that production in the latter period was lower for cabbage, carrot, onion, parsley, parsnip, pumpkin, salsify, spinach, winter squash, and celery and higher for beans, garden beets, cucumber, kale, lettuce, muskmelon, garden peas, pepper, radish, summer squash, sweet corn, tomatoes, and turnips.

Seed production in the United States paralleled the domestic demand throughout most of the country's history. Up to 1940 or so, however, the national output of some field seeds was inadequate for planting needs. As more land was brought under cultivation, more seeds were produced. Relatively large imports of alfalfa, clovers, millets, orchardgrass, winter rape, ryegrass, and vetch were needed up to

1940 to balance the supplies with the increasing demand.

From the beginning of American agriculture through the first three quarters of the 19th century, many farmers were self-reliant with respect to seeds. But after that period they began gradually to depend for their seed sources on specialized producers nearby and on seed dealers, some of whom could offer a wider choice of either local or imported seeds.

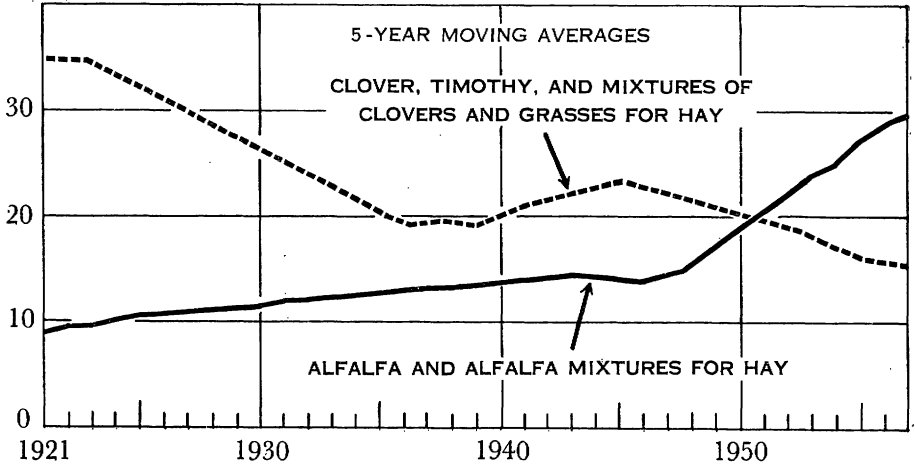
Seed corn is an example. The early settlers obtained seed corn from the Indians. Later the farmers saved some of their crops for seed, but as they learned that certain varieties were better than others, they obtained a large part of their requirements from dealers. Although dealers handled relatively large quantities of seed corn by 1890, the bulk of the seed planted by farmers was homegrown. Dealers began to handle an increasingly larger percentage after the introduction of successful hybrid varieties. Only one-tenth of 1 percent of the total American acreage in corn was planted with hybrid seed in 1933, but about 96 percent of the total was planted with hybrid seed in 1960.

While corn is an extreme example because the production of hybrid seed corn is controlled largely by commercial companies, somewhat the same trends have operated with seeds for which production is highly specialized. In 1953-1957, farmers sold more than 90 percent of their annual production for such crops as alfalfa, alsike clover, Ladino clover, whiteclover, ryegrass, chewing fescue, red fescue, bentgrass, bluegrass and redtop. But for other seeds as red clover, timothy and lespedeza, farmers continue to use much of their homegrown seeds.

ALFALFA and red clover were the principal hay legumes in the United States during the first quarter of the 20th century. Timothy was the principal grass. Alsike clover was used to a lesser extent in limited areas, mostly in mixtures with red clover and tim-

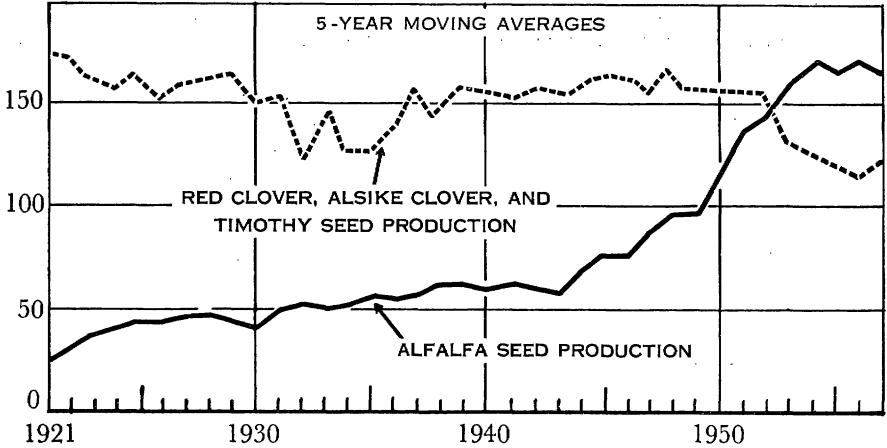
## Trend in Harvested Acreage of Leading Kinds of Hay

Million Acres



## Trend in Seed Production of Important Kinds Used for Hay

Million pounds



othy. Sweetclover, another versatile legume suitable for soil building, hay, and pasture, rose to prominence after 1920, when farmers in the Corn Belt used it extensively in rotations. Lespedeza gained popularity slowly for nearly two decades after its introduction, but by 1940 it was the leading hay crop in the Southeast.

Alfalfa and clover-timothy hay comprised 76 percent of the country's tame

hay acreage in 1919-1923. The remaining 24 percent of the acreage was grain hay, cowpeas, and several miscellaneous kinds. Alfalfa and clover-timothy constituted 73 percent of the total of tame hay in 1954-1958. Although there was little change in the total acreage of these two leading hays—43.8 million acres and 44.7 million acres, respectively, for the two periods—the alfalfa hay acreage in-

creased more than threefold while clover-timothy hay acreage declined to less than one-half.

The trends in hay are influenced gradually by changes in the various classes of livestock and by experimental results that demonstrate advantages of one kind of hay over another for specific uses.

An example: Timothy hay is good feed for horses and mules. It follows that the demand for timothy was far greater when the number of horses and mules in the United States was at peak numbers of 26.7 million in 1918, compared with 3.1 million head in 1960. Horses and mules have almost vanished from farms and cities, and the demand for timothy hay and timothy seed is likewise on the downtrend.

The hay acreages relinquished by timothy, red clover, and other kinds have been replaced largely by alfalfa, bromegrass, fescues, wheatgrass, vetches, and other legumes and grasses.

The trends for the leading hays were reflected also in seed production. The production of alfalfa seed increased from 23 million pounds in 1919-1923 to 171 million pounds by 1954-1958. The total production of seeds of red clover, alsike clover, and timothy declined from 177 million pounds to 116 million pounds.

THE PRODUCTION of grass seeds likewise kept pace with changes brought about by improved practices in farm management and by expansion in city and urban developments. The construction of new highways with wide rights-of-way created a demand for large quantities of the turfgrass seeds. Rates per acre of seeding grass waterways and shoulders and slopes on highways are several times higher than rates used for other domestic uses.

Although the longtime trend in seed production was upward in response to normal demand, production received a great impetus following the First World War, and especially during and following the Second World War, when shortages of seeds occurred. The war-

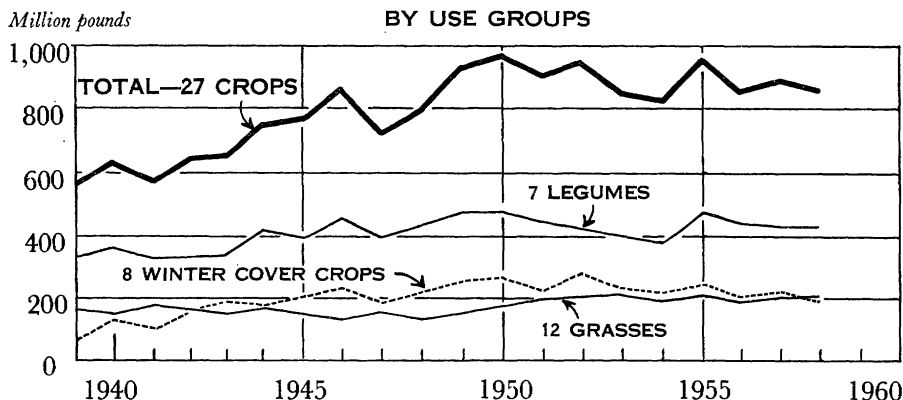
time economy required additional quantities of seeds for use abroad. Specialization was accelerated by technological advances in the development of new varieties, insecticides, herbicides, and the increased use of fertilizers for production of seeds. Expediency dictated a shift in production of seeds from the Corn Belt and the Midwestern States, where seeds were more or less a byproduct of acreage grown largely for hay and pasture, to the irrigated States of the Far West.

The two wars stimulated the production in the United States of the field and garden seeds that had formerly been imported. The Nation's supplies for almost all kinds reached surplus positions by 1950. The shift of production to the irrigated areas aided the self-sufficiency movement, as it enabled growers to produce yields several times larger than yields from nonirrigated acreage. Price supports and loan programs offered growers by the Government for many kinds of seeds during the decade beginning with 1943 to encourage production demonstrated that the Nation's production potential of both field seeds and vegetable seeds is far in excess of domestic needs.

THE TOTAL amount of 27 kinds of field seeds used for domestic purposes reached peak levels in 1949 and 1950. Since that time, use declined somewhat in line with the shrinking land area devoted to production of food and fiber crops. Disappearance totaled 875.6 million pounds in 1953-1957, 4 percent less than the average of 913.5 million pounds for the preceding 5 years but 41 percent more than the 1939-1943 average of 623.1 million pounds. Most of the reduction during the 1950's occurred in the kinds of seeds used mainly for hay, crop rotation, and winter cover.

The use of clovers for hay and crop rotations has been declining almost steadily since 1950. Red clover and sweetclover are used extensively for those purposes in the North Central

## Domestic Disappearance of Field Seeds



*Legumes—Alfalfa, red clover, alsike clover, sweetclover, whiteclover, Ladino clover, and lespedeza; Winter Cover Crops—Austrian winter peas, crimson clover, lupine, hairy vetch, common vetch, purple vetch, common ryegrass, and perennial ryegrass; Grasses—Timothy, redtop, orchardgrass, Kentucky bluegrass, Merion Kentucky bluegrass, sudangrass, smooth brome grass, crested wheatgrass, chewings fescue, red fescue, tall fescue, and bentgrass.*

and North Atlantic States. The use of clovers is largely dependent on changes in acreages of the leading grain and hay crops. Increased acreages of such crops as corn, oats, and soybeans generally are accompanied by decreases in acreages of clovers and alfalfa.

Conversely, acreage reductions in the main cereal and grain crops usually are absorbed by increased seedings of legume hays. This pattern has operated up to 1956. Thereafter, much cropland was included in the Acreage Reserve and Conservation Reserve programs. Regulations in these programs prescribe guidance in the use of various kinds of seeds for specific purposes, such as soil erosion and soil cover.

The declining use of the leading clovers is offset in a large part by an uptrend in alfalfa. The increase in production and use of alfalfa since 1944 has been phenomenal. Farmers used nearly one-third more alfalfa seed in 1952-1957 than during the 5-year period 15 years earlier. Much of the credit for the expansion is given to general improvements in varieties for specific purposes, but some credit must be given also to the Agricultural

Conservation cost-sharing programs of the Department of Agriculture, which provided financial assistance for purchase of lime, fertilizer, and seeds, and thus helped to establish stands in some areas where alfalfa had not been grown successfully.

THE USE of winter cover crops in the South has been displaced to a large extent by oats, rye, and other lower priced seed crops, which provide winter grazing for the South's expanding livestock population.

The need for legumes as a source of nitrogen is being met by more extensive use of commercial fertilizer. Lack of Government price supports for seed production is another factor that helped accelerate the trend away from the use of the usual legume winter cover crops as soil builders.

The use of several grasses was on the increase during the 1950's—orchardgrass, chewings and red fescue, bentgrass, Merion Kentucky bluegrass, sudangrass, and ryegrass. The increase in this group was offset partly by the declining use of several older grasses, chiefly timothy, redtop, smooth brome grass, and crested wheatgrass. Little



or no change was indicated for tall fescue and Kentucky bluegrass.

By 1950 the United States attained export status in seeds, but we import many kinds from almost every corner of the earth. It is likely that this relationship will continue, because certain kinds can be obtained in the desired amounts at less cost from other countries.

For instance, we have depended on Denmark for our supply of seeds of Danish bluegrass (*Poa trivialis*) and orchardgrass; on Australia for much of our seed of dallisgrass; on Canada for several kinds, including red fescue, sweetclover, brome grass, alsike clover, Canadian wildrye and Canada bluegrass; and on France and Italy for some of our seeds of crimson clover and birdsfoot trefoil, when they have exportable surpluses. Japan is a regular supplier of flower and vegetable seeds, as are Denmark, the Netherlands, and France.

Japan is our best market in the Far East for seeds of grasses and legumes. Thailand buys a large part of her vegetable seeds from the United States. Our merchants supply a goodly proportion of the vegetable and flower seeds needed in South American countries, as well as seeds of some kinds of grasses and clovers.

Our expansion in the production of alfalfa seed in the Pacific Coast States has given us a major share of the world's market. The United States produces alfalfa seed for several countries, including France, Germany, Greece, Sweden, and Canada—that is, we are growing seed of their domestic varieties on a contract basis.

Formerly the United States was the major source of Kentucky bluegrass seed, but now we compete with Denmark and the Netherlands. Because of our oversupply of seeds of common ryegrass in the 1950's, we exported varying amounts to European markets. Perennial ryegrass seed also moved abroad in some volume, as did bentgrass.

Seeds of Ladino clover, which we

formerly imported from Italy, are produced in California and Oregon in substantial volume. There was a period when it was in oversupply in the United States and was cheaper than whiteclover seeds, and several countries imported Ladino seeds from the United States. We are now exporting fairly large quantities of seeds of Ladino clover to Europe and Japan. Chewings fescue, similarly, was imported from New Zealand, but now we are the major exporter.

We exported seeds of orchardgrass up to about 1949. Then it became apparent that orchardgrass, well managed, is a good grass for pasture and hay and fits well in grass-legume mixtures. Our domestic seed production has expanded, but we also import millions of pounds of seeds each year to supplement the domestic crop. Meadow fescue is another crop whose seeds we formerly exported, but now import to meet our limited needs. We can buy it so cheaply that our farmers do not consider it a worthwhile crop to produce.

What has been said about foreign trade in seeds of grasses and legumes applies to a considerable extent to seeds of such field crops as vetch, Austrian winter peas, and rape.

High costs of land, labor, and equipment have affected the production of some of our vegetable and flower seeds.

We could produce our supply of spinach seeds in the Pacific Northwest, but it is cheaper to buy them from Denmark and the Netherlands. Consequently, much is imported. Some of the hybrid seeds are imported from countries where labor costs are lower than in the United States. This trend may continue, and imports could be increased from countries where production is dependable.

The interest in American-grown seeds is not accidental. During the Second World War, our Allies obtained large amounts of seeds to meet their needs. This was continued for some years after the war under the United Nations National Recovery Act pro-

gram, and many thousands of tons of seeds were shipped to oversea countries to help them restore production.

THE VARIOUS U.S. AGENCIES charged with working in other countries to help improve economic conditions tested many American-bred varieties of crops in the foreign experiment stations. In addition, other Government agencies have sent seeds abroad, as have private firms. It is not strange therefore that many American varieties have demonstrated their superiority and are in demand.

This is true of our varieties of hybrid corn. Corn is widely grown, and many American varieties have been found to be greatly superior to the native kinds. Shipments of hybrid seed corn attained considerable volume, but by the mid-1950's, when some countries began to produce their own hybrids, there was a noticeable decline in exports. Except in countries where the acreage of corn is small, this decline in exports can be expected to continue, although the question of relative costs enters at this point. This is especially true since much of our hybrid seed corn exports represents the less desirable sizes that would otherwise be sent to the feed-grain markets. Much of the seed therefore is marketed at a substantial discount below seed corn prices in the United States, but still sufficiently above the cash-grain market to be attractive to some of the growers of hybrid seed. Because there is no question as to the genetic qualities and the size is of little concern where hand planting is practiced, these low-cost seeds should continue to be attractive to the importers.

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## The Economics of Seed Production

CHESTER O. MCCORKLE, JR., AND  
A. DOYLE REED

THE PRODUCTION of seeds in the United States has evolved from the simple procedure of saving part of a crop to plant the next year into a highly specialized enterprise.

Today's producer of seeds must have special equipment, follow rigid production methods, and observe scientific cleaning and testing procedures.

The early farmer was little concerned with prices or markets. Today's producer is faced with a highly sensitive price mechanism and, for some kinds of seeds, a complex marketing structure.

Seed production was formerly an art, which consisted of knowing which seeds to select from a field. Seed production today is dependent on scientific knowledge of the transmission of hereditary characteristics, an understanding of supply and demand, and a high level of managerial ability.

Much seed is still produced for use locally by the grower or for sale to other farmers in the area. There is increasing demand, however, for seeds of improved varieties and disease-resistant strains and for plants with characteristics adapted to specific uses or localities.

Seeds of a large number of crops cannot be produced satisfactorily in the areas of major production because of weather, diseases, and difficulties in isolating fields to prevent cross-pollination.

Sometimes a seed crop cannot compete economically with other crops in the area or with the production of seeds in other areas.