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.
The part of the plant used commercially sometimes is different from the seeds or includes more than just the seeds. Production of seeds from these crops may require more specialized production methods and equipment that a farmer who produces the crops for their primary use does not have.

Four main types of seeds are grown in areas where production is concentrated. The production of seeds of vegetables and flowers tends to concentrate in rather limited geographical areas. Seeds of grasses and field crops are produced more widely. Climatic factors, such as atmospheric humidity and seasonal distribution of rainfall, are critical in determining location.

The area suitable for production of seeds is far greater than that required to meet the needs, but concentration within adapted districts takes place as the growers gain experience and processing and marketing facilities are established.

Specialty production of crop seeds was centered originally in the Eastern States, but it has moved west. Further westward movement is not possible. Therefore, barring unforeseen disease or pest problems, the location of production of many seed crops may be stabilizing. This is not to say that specialty seed production is adapted only to the West or that profitable production can be undertaken only in the West.

A meaningful economic analysis of specialized production in the United States must consider the kinds of farms on which seed crops are grown; the interrelationships between seed crops and other enterprises with which they are combined; the nature of production practices; and the inputs, costs, and returns from seed production.

There is no "typical" organization of seed farms. The company-owned seed farm and farms that produce only seeds and the general-crop farm on which an occasional small acreage of a seed crop is planted are the extremes in organization.

In between are such growers as those who grow Ladino clover primarily for seed but have a minimum of crops for rotation purposes. Very often a sheep enterprise is combined with Ladino clover to take advantage of the supplementary and complementary relationships that exist. Growers of seed of melons are primarily field-crop farmers who work a small acreage of melon seed into their organization.

Still another use of seed crops within the total farm organization is illustrated by the producer of "common" alfalfa, who may let a crop go to seed if he expects the price to rise high enough to make the seed more valuable than the hay crop. Nearly all seed crops (except flowers) are grown by farmers as one enterprise in a total farm organization.

When he considers a seed crop for his farm, the farmer must determine how well that crop fits into his total farm organization. Physical considerations include its machinery, labor, water, and management requirements relative to the needs of the other enterprises and the total quantities of these resources available at various times during the year.

Economic questions he must think of are the capital requirements of the crop, the expected price, and probable net returns compared with alternative enterprises. Of utmost importance in the farmer's mind are the possible yield, price, and income variations he may experience from year to year.

In terms of farm organization, seed crops are considered as cash crops. This is particularly true with specialty seed crops, which have no use except for sale as seeds. In that, specialty seed crops are unlike corn and wheat, which can be fed if the seed price is unsatisfactory. Relative profitability of other crops, limited total demand for seed crops, and possible extreme fluctuations in one or more of the components of net income with seed crops have led farmers interested in growing seeds to limit the proportion of the total resources of the farm going to the production of seed crops.
An elaborate system of contracts between specialty-crop seed producers and seed companies has emerged.

Given the abundance of resources capable of producing seed, the contract system, together with other institutional constraints, have been necessary to avoid chaos in the seed market. Much of the potential fluctuation in production and prices of seeds from year to year has thus been eliminated.

Flower seeds are produced almost entirely by the seed companies on land they own or lease. The entire supply of domestically produced seeds is grown each year on a few thousand acres. In terms of value, it is estimated that more than 85 percent of the seed is produced in two counties in the central-south coastal areas of California.

Since total requirements can be met from such a small acreage of seed, it is only logical that individual companies have gone into seed production to achieve close coordination between production and marketing.

Exacting technical requirements of the production of flower seeds also encourage company production. The need for continuous and exclusive development of new varieties through breeding and selection in order to compete with other companies for the home gardener’s interest further supports the growth of seed production by the seed companies.

Producer markets comparable to those existing for other types of agricultural production therefore do not exist. Were they to develop, individual growers, aware of occasional high prices, would be tempted to plant limited acreage to seed. The obvious result would be widely fluctuating prices from year to year, and many growers would find it impossible to realize even harvest costs in some seasons. Annual quantities required of some seeds are sufficiently small that no acreage is planted in some years if the seeds remain viable.

A small amount of flower seeds is produced by individual growers. Before planting, the grower signs a contract with a company to assure a market outlet. Contracts commonly specify isolation distances, kind and varieties to be planted, and division of responsibilities in the production and harvesting.

Contracting to produce flower seeds has not been prevalent among growers, however, because of the heavy labor inputs, the constant attention required for seed crops of flowers, and the small acreages. A few varieties of seeds have been grown under contract mainly in California. Among them are zinnias, pansies, sweetpeas, petunias, and larkspurs, but even for them the amount contracted by any one grower seldom exceeds 10 acres.

Major expense items are cultivation and thinning, control of diseases and pests, roguing, fertilization, and harvesting. Expenses of irrigation may also be sizable in some places.

Land preparation includes preparation of seedbed, usually a preirrigation, and sometimes prefertilization. Costs of preparing the seedbed, including working up beds, approximate 6 dollars an acre. Preirrigation costs of labor and water may be 5 dollars to 7 dollars an acre, depending on water conditions and amount applied. When fertilizer is applied before planting, the cost including application varies between 25 dollars and 50 dollars an acre, depending on the material and quantity.

Even when grown under contract, the seed company supplies the seeds and often does the planting. These costs are relatively minor for the common flower seeds; the total seed cost seldom exceeds 5 to 7 dollars an acre.

Additional fertilizer usually is applied as sidedressing or in the irrigation water during the period of early growth. Fertilizer materials usually contain relatively higher amounts of phosphorus and sometimes potash than those used in general crop production. Excessive growth of foliage that would result from heavy nitrogen application is to be avoided in seed production.
When used, the applied cost of fertilizer approximates 5 to 15 dollars an acre.

Weeds must be controlled in the production of flower seeds, particularly during the early period of flower growth, when mechanical cultivation can be practiced. Hand cultivation often is necessary later and is extremely costly. If thinning is required, hand cultivation is accomplished at the same time. Costs of weeding vary according to the practices employed. Mechanical cultivations may number between 4 and 12, depending on the weed growth, type of flowers, and other factors. Each cultivation at today’s prices costs approximately 2 dollars an acre. Total cultivation costs per acre can vary between 8 and 24 dollars. Hand hoeing and thinning may vary from 40 dollars to more than 250 dollars an acre, depending on weed conditions and the particular crop.

Irrigation is necessary throughout the western growing areas, but the total requirements depend on the season of growth, soil conditions, and the particular crop. Timing of irrigation is critical to the production of high yields of quality seed. Irrigation must be stopped as the seeds begin to mature. Individual crop requirements are best determined through experimentation on each site. Water costs may be 15 to 20 dollars an acre; irrigation labor may add 15 to 30 dollars. Total irrigation costs, excluding preirrigation, typically are 30 to 50 dollars.

Control of pests and diseases is essential in the production of high yields of good flower seeds; otherwise, growers have no chance to recover the large cash outlays required to grow them.

A continuous program of dusting and spraying is required. Early treatments are often hand applied. Machines, including airplanes on company seed farms, are used at later stages of maturity. DDT and the organic phosphates are used commonly against insects. Several applications of sulfur and other materials may be needed to control various plant diseases.

The pest and disease control program on flower seeds typically costs between 10 and 60 dollars. Local conditions occasionally make necessary more frequent applications and higher costs. Fieldmen of the agricultural chemical companies often observe continuously and closely the insect populations and evidence of disease. Their recommendations on control measures usually are followed. Producers of flower seeds have become aware of the possibility of drift of toxic materials, which may leave residues.

If hand pollination is required to produce seeds, the companies grow the seeds in order to assume the exacting care and the high labor costs. Frequently this type of operation will necessitate production in greenhouses.

Harvesting seeds of most flowers involves hand cutting of the mature flower stalks and placing them on canvases to finish drying. Care must be taken to avoid shattering and loss of seeds. When production is by contract, the company often does the harvesting and threshing, the costs of which vary widely according to yield and crop.

The costs of harvesting and threshing pansy seeds, for example, can vary from 100 to 500 dollars an acre, depending on the yield. Harvesting and threshing zinnia seeds often require repeated passing of the flower heads through the thresher to remove all of the seeds, but usually does not exceed 100 dollars an acre.

Several charges must be considered by the producer before he can estimate his total cost and net return—land charges, rent or taxes and interest on investment, compensation insurance on labor, depreciation on equipment, and interest on the money invested in equipment, prorated according to its use. Rents on land suitable for producing flower seeds approximated 75 dollars an acre in 1961. If the land is owned, taxes plus interest on investment in the land were about 65 dollars an acre. Other overhead costs should not exceed 10 to 15 dollars an acre.
Total costs thus may vary from approximately 250 dollars to more than 1 thousand dollars an acre. Costs are even higher for some crops on small acreages that require additional hand labor for pollination. Compared to per-acre costs for other seed crops and other types of crops, the costs seem high, but, relative to expected returns, they usually are not excessive. Considering the attention they need, the production risks, variability in yield, and the small acreages on which they are grown, gross incomes well above production costs are justified.

The farmers who grow a small acreage of flower seeds under contract include it as one enterprise in their total farm operation. Usually the other enterprises are irrigated row crops, irrigated forage crops, such as alfalfa, and possibly some small grains. When the flower seeds are included as a part of the total farm organization, greater opportunity exists to control pests and diseases, reduce weed infestations, and add stability to the net income of the farms that could not be attained with seed crops alone.

Nearly all vegetable seeds are grown under contract between a grower and a seed company. The company retains ownership of the seeds. Seed companies like to deal with the well-established, experienced growers and may offer inducements to sign them.

The contracts usually specify: The seeds of a specified amount and variety to be furnished by the company, the acres to be planted and the location of the field, the isolation from similar species that must be maintained, the provisions for cleaning, germination and purity standards, the price to be paid, and the place and dates of delivery.

The contracts also may specify the cultural practices to be followed; these are usually closely supervised by the company.

The company normally does all of the roguing and furnishes the harvest or other special equipment, either as a contribution under the contract or for a nominal charge.

The seed companies usually do not finance the grower directly, but may make arrangements for the various suppliers to extend credit and cosign with the grower.

Most of the vegetable seeds are produced by general-crop farmers, who include a relatively small acreage of seed in their rotation. Few growers specialize in seed production as their major enterprise.

Much of the production of vegetable seeds in California is concentrated in the Central Valley on the relatively large farms, where the operators have the necessary flexibility to work such crops into their rotations and can bear the financial risk.

Most of the production in the Intermountain areas is on 80- to 120-acre farms, where the small acreage planted to a seed crop has a rather rigid place in the crop rotation.

Several examples illustrate some of the general types of cropping systems used. Many of the rotations listed change from year to year to adjust for weather, expected prices, diseases, insect pests, and other conditions.

Seeds of carrots, onions, and table beets produced in central California usually are grown in a rotation of tomatoes, sugar beets, alfalfa (3–4 years), and seed. Some of the other crops that may be included in the rotation are barley, milo, corn, and minor crops.

Seed of melon and cucumbers—watermelon, cantaloup, Persian, honeydew, and similar types—produced in the Sacramento Valley area of California are grown in rotations that include tomatoes, sugar beets, alfalfa, alfalfa seed, barley, milo, dry beans, safflower, sudangrass, and corn. The contracts for melon seeds typically call for planting the crop late in the season so it will not be profitable to sell any of the crop on the fresh market.

Seeds of garden beans in south-central Idaho are grown on farms of usually about 120 acres. A rotation may include alfalfa (3 years), beans
THE ECONOMICS OF SEED PRODUCTION

(2–3 years), sugar beets or potatoes, and grain. Sometimes the sugar beets or potatoes are omitted from the rotation, and a grain crop, such as wheat, may be inserted between the alfalfa and the beans.

Most of our seed of sweet corn is produced in Idaho on family farms of 80 to 100 acres. A common rotation is alfalfa, corn seed (1–2 years), sugar beets, and grain. The contracts contain more specifications with respect to production practices than do those for most vegetable crops.

The wide range of seed crops and conditions of climate, soil, water, contracts, and size of farm preclude a comprehensive presentation of costs. For example, carrot seeds are produced by growing the carrots and harvesting and replanting them to produce seed. Some farmers perform all these operations and have costs over 2 years to produce one crop of seeds.

In some instances, the company furnishes the stecklings—small roots used for subsequent planting for seed production—at no direct cost to the farmer but pays a lower price for the seed. Costs are seldom available when a small amount of seed is needed and can be grown by one or a few growers.

Most of the carrot seed is produced in California and Idaho. Acres produced by any one grower are relatively small and often are not a part of an established rotation but occupy fields free of weeds, insects, diseases, isolated from other carrot fields, and conveniently located. Six or more irrigations a year are required. Pesticides must be applied several times during the year. Yields vary from 700 to 1,700 pounds of clean seed per acre.

The stecklings are usually furnished by the seed company in California. The production of stecklings by the seed grower is commoner in Idaho; thus seed production is a 2-year deal—one year to produce the stecklings and another year to grow the seed. During the winter storage period, losses of stecklings as great as 50 percent may occur.

The variable costs of producing stecklings in 1959 were about as follows (in dollars per acre): Land preparation, 8; fertilizing, 15; seeding, 10; chemical weed control, 40; disease control, 30; cultivating, 3; irrigation labor, 6; water, 18; harvesting, 130; hauling, 50; crates and storage, 110. The total was 420 dollars.

The fixed overhead costs were: Taxes, 6; office, 6; depreciation on equipment and irrigation system, 12; interest on equipment and irrigation system, 6; and land interest on 600 dollars at 6 percent, 36. The total of overhead costs was 66 dollars, and the total cost per acre was 486 dollars.

One acre of stecklings will plant 6 to 10 acres for seed production at a rate of about a ton of stecklings to the acre. Stecklings cost 50 to 80 dollars an acre of seed produced. Winter losses may increase this to 100 to 160 dollars.

Production of onion seed is similar to production of carrot seed in that the bulbs are produced one year and transplanted for seed production the following year. If onion seed is produced in the same area as carrot seed, many of the costs will be the same. Planting the onion bulbs is more expensive than planting carrot stecklings because the bulbs must be placed upright by hand. Onions also require a little more irrigation. Harvesting is more complicated, since the seed heads must be cut by hand and dried on canvas before threshing.

The onion bulbs are planted in the fall. After they root, they are covered with soil and left dormant in the field through the winter.

Bulbs usually are furnished by the seed company in California, but in other production areas may be produced by the seed grower. The production of bulbs is similar to the production of carrot stecklings, except that the bulbs are harvested and then replanted rather than stored.

The cost of producing the bulbs in 1960 was: Land preparation, 8; fertilizing, 15; seeding, 10; cultivating, 6; irrigation labor, 6; water, 18; weeding,
### ESTIMATED COSTS OF PRODUCING SELECTED FIELD CROP SEED IN CALIFORNIA, 1959

<table>
<thead>
<tr>
<th>Variable Cultural Cost:</th>
<th>Alfalfa</th>
<th>Ladino clover</th>
<th>Sudangrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land preparation</td>
<td>$5.00</td>
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<tr>
<td>Plant</td>
<td>$3.00</td>
<td>$1.20</td>
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<tr>
<td>Clip and rake</td>
<td>$1.00</td>
<td>$0.50</td>
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<tr>
<td>Fertilize</td>
<td>$25.00</td>
<td>$20.00</td>
<td>$9.00</td>
</tr>
<tr>
<td>Irrigate</td>
<td>20.00</td>
<td>4.50</td>
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</tr>
<tr>
<td>Weed control</td>
<td>17.00</td>
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<td></td>
</tr>
<tr>
<td>Pest control</td>
<td>16.50</td>
<td>4.00</td>
<td></td>
</tr>
<tr>
<td>Bees</td>
<td>3.00</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>Mow and rake</td>
<td>7.00</td>
<td>3.00</td>
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</tr>
<tr>
<td>Defoliate</td>
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<td>15.00</td>
<td>12.00</td>
</tr>
<tr>
<td>Combine</td>
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<td>8.00</td>
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<tr>
<td>Rethresh</td>
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<td>15.00</td>
<td>16.00</td>
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<td>Haul</td>
<td>175.00</td>
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<tr>
<td>Cleaning, etc.</td>
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<td>15.25</td>
<td>10.00</td>
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<td>Fixed Overhead:</td>
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<tr>
<td>Taxes</td>
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<tr>
<td>Miscellaneous</td>
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<tr>
<td>Depreciation and interest on equipment</td>
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<td>Depreciation and interest on stand</td>
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<tr>
<td>Interest on land</td>
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<td>36.00</td>
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</tbody>
</table>

Total cost: 184.00 135.00 120.00
Credit for hay: 6.00 15.00

Net cost: 178.00 120.00

Yield (pounds): 500 300 2,000
Cost per pound: 0.36 0.40 0.06

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### ESTIMATED COSTS OF PRODUCING SELECTED GRASS SEED, 1959

<table>
<thead>
<tr>
<th></th>
<th>Common rye</th>
<th>Perennial rye</th>
<th>Chewings fescue</th>
<th>Alta fescue</th>
<th>Highland bent</th>
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<tbody>
<tr>
<td>Labor</td>
<td>$7.50</td>
<td>$4.00</td>
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<td>Tractor</td>
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<tr>
<td>Other equipment</td>
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<tr>
<td>Fertilizer</td>
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<tr>
<td>Seed</td>
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<td></td>
</tr>
<tr>
<td>Sacks</td>
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<td>2.00</td>
<td>2.00</td>
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<tr>
<td>Spray</td>
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<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Seed cleaning and testing</td>
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<td>2.00</td>
<td>15.00</td>
<td>10.00</td>
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</tr>
<tr>
<td>Taxes¹</td>
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<td>5.00</td>
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<tr>
<td>Stand depreciation</td>
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<tr>
<td>Interest on land²</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Total cost: 51.00 47.00 64.50 60.00 53.25
Credit: 3.00 2.00 5.00 8.00 3.25

Net cost: 48.00 45.00 56.00 40.00 50.00

Yield (pounds): 600 400 300 300 200
Cost per pound: 0.08 0.11 0.19 0.13 0.25

¹ Taxes vary with tax rate and assessed valuation. The figure included represents a midpoint for land on which grass seed is grown.
² Interest on land varies widely with type of land on which seed is grown. Interest charges vary from an estimated 4 to 35 dollars per acre.
³ Straw, pasturage, or hay.
75; pest control, 30; harvesting, 32. The total variable production cost was 200 dollars.

The fixed overhead costs were: Taxes, 6; office, etc., 6; depreciation on equipment and irrigation system, 12; interest on equipment and irrigation system, 6; land interest on 500 dollars at 6 percent, 30. The total overhead was 60 dollars. The total cost per acre was 260 dollars.

An acre of bulbs will plant 2 to 3 acres for the second year seed crop: Sufficient bulbs to produce an acre of seed will cost 80 to 130 dollars.

For vine crops—cucumbers, watermelons, cantaloup, squash, pumpkins—production methods and equipment are similar. Major areas of production are California, Oregon, and Colorado.

Land preparation for a crop of melon seed is similar to that for other seed crops, except that a preirrigation is usually necessary because of the late planting date. No special cultural practices are necessary other than the ordinary weed and pest control, fertilization, and irrigation. Harvesting is done with a special thresher, which may be furnished by the seed company or owned by the grower. The melons or cucumbers are picked by hand and tossed into the thresher as it moves across the field. After threshing, the seed must be washed and dried; the cost therefore is higher than that of most of the vegetable seed crops.

The production of sweet corn seed works well in a rotation of alfalfa, sweet corn, sugarbeets, and grain on the Idaho farms where most of it is grown. Corn seed ranks next to sugarbeets in profitability as a cash crop on these farms. It is a good crop in the rotation. A picker is the only special equipment required.

The contracts offered by the seed companies for corn are more specific than are the contracts for most seed crops. The seed company retains ownership of the seed. Acreages, prices, and general cultural practices are specified. The seed to make the specific hybrid is also stipulated. The company supervises detasseling. Contracts set harvest dates and manner of harvest, require a germination of 90 percent, and specify no frost or other damage. Roguing is done by the company.

Much of our pea seed is produced in the Palouse region of eastern Washington and northern Idaho, where farms typically have 500 acres or more and are primarily wheat farms. Peas are the second most profitable crop. A common rotation is grain, peas, grain, and fallow. Legumes for hay or green manure may occasionally replace the fallow. Farming is done with large-scale equipment. Little labor is hired except at harvesttime. Recent expansion of production of pea seed in the Columbia Basin of central Washington has taken place.

Yields range from 700 to 2,000 pounds an acre.

More than 95 percent of the production of pea seed is under contract. The seed company furnishes the seed, supervises the growing of the crop, and does the necessary roguing.

Seed of field crops of one or more types is produced in nearly every agricultural area in the United States. Little difference exists in the cultural practices used for the commercial crop and the seed crop of small grains, soybeans, and dry beans. Recleaning and seed treatment are additional costs for wheat, oats, and barley seed. Soybeans require similar additional inputs for seed, but losses in recleaning tend to be somewhat higher because of mechanical damage to the seed. In producing cotton for seed, cultural practices are similar to commercial production, but additional cultivation—by machines and hand hoeing—is necessary to control weeds. Additional expenses for cleaning the ginning equipment before ginning seed lots must be borne by the grower. With dry beans, the only expenses added for seed production are when roguing is required. A higher loss in recleaning may reduce yield slightly.

In producing seeds of hybrid corn
and grain sorghum, there are both additional cost considerations and income adjustments. First, since hybridization requires cross-pollination, alternate blocks of males and females must be planted. Planting costs are thus increased. Grain sorghum fields are rogued from 6 to 9 times to remove off-type plants. Detasseling of corn by hand to insure the desired cross is an additional labor expense, but the achievement of male sterility may eliminate this operation. Because only the seed from the female plants are of the desired hybrid type, only part of the total yield of hybrid corn and hybrid sorghums produced in the seed field can be sold at seed prices.

Growers specializing in alfalfa for seed supply most of the seed. Those who let their plantings for hay go to seed if the price is high enough also account for a sizable amount. Nearly all of the alfalfa grown for seed in California and the Columbia Basin of Washington is planted in rows. The hay produced on these stands is chopped and spread or given to anyone who will harvest and remove it from the field.

In California, rotations consist of 2-3 years of alfalfa seed and 2 years of such crops as cotton, melons, and grain. The seedgrower may farm these rotation crops himself or rent the land to someone else. Or he may be a "migrant" tenant farmer producing seed on several farms as fields become available that have appropriate crop histories for meeting the requirements for certified seed.

In some other major producing States—primarily in the Great Plains and the Intermountain area—alfalfa seed is usually taken from stands planted for hay. The first cutting is almost always for hay. The second and third may be for hay or seed. Per acre costs for seed production vary from 11.50 to 15 dollars per acre, depending on the method of harvesting. The farms are multienterprise farms, many of which include livestock enterprises.

Most of the seeds of Ladino clover are produced in the Sacramento Valley of California on soils that are not adapted to the production of deep-rooted crops. Much of this production is on land which was originally used for dryfarmed barley and sheep pasture. Many of the growers have retained their sheep enterprise and utilize the early spring growth of Ladino for pasture. Ladino is usually grown in rotation lasting about 8 years—4 years of Ladino and then 4 years of a combination of sudangrass, corn, barley, and other shallow-rooted crops. The land must not have grown whiteclover unless it was certified Ladino for 4 years to be eligible to produce certified seed. Most of the producers of Ladino seeds

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**ORGANIZATION, INCOME, AND EXPENSES OF A TYPICAL FARM IN THE SACRAMENTO VALLEY AREA OF CALIFORNIA PRODUCING SUDAN SEED**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Acres</th>
<th>Yield (tons)</th>
<th>Price</th>
<th>Gross income</th>
<th>Cost 1</th>
<th>Net income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Per acre</td>
<td>Per acre</td>
<td>Total</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>125</td>
<td>20</td>
<td>$22</td>
<td>$440</td>
<td>$340</td>
<td>$100</td>
</tr>
<tr>
<td>Sugarbeets</td>
<td>125</td>
<td>20</td>
<td>12</td>
<td>240</td>
<td>190</td>
<td>50</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>300</td>
<td>7</td>
<td>22</td>
<td>154</td>
<td>110</td>
<td>44</td>
</tr>
<tr>
<td>Milo</td>
<td>100</td>
<td>21/2</td>
<td>42</td>
<td>105</td>
<td>90</td>
<td>15</td>
</tr>
<tr>
<td>Barley</td>
<td>250</td>
<td>11/2</td>
<td>37</td>
<td>55.50</td>
<td>30</td>
<td>25.50</td>
</tr>
<tr>
<td>Sudan seed</td>
<td>100</td>
<td>1</td>
<td>100</td>
<td>100</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,000</td>
<td></td>
<td></td>
<td>165,575</td>
<td>85</td>
<td>1,500</td>
</tr>
<tr>
<td>Interest on land</td>
<td></td>
<td></td>
<td></td>
<td>41,325</td>
<td></td>
<td>36,000</td>
</tr>
<tr>
<td><strong>Net profit</strong></td>
<td></td>
<td></td>
<td></td>
<td>5,325</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Interest on investment in land is not included.
own their equipment except for possibly suction machines for harvesting the seed on the ground from shattering. Much of the suction harvesting is done by custom operators for a percentage of the crop.

The production of sudangrass seeds is concentrated in California, Texas, and Colorado. Sudangrass will grow successfully under many different soil conditions and in combination with many crops. In California, for example, sudangrass may be grown in combination with tomatoes, sugar beets, alfalfa, Ladino clover, corn, barley, and milo. It may be grown in combination with rice on a different type of soil.

No special cultural practices are required except that the crop may have to be mowed or swathed and dried in the windrow before threshing to avoid losses from shattering.

Production of grass seeds exhibits extremes similar to those found with other seed crops, both in terms of total acreage and in the relative importance of the crop in individual farming operations. Some have small seed fields and care for them as time can be spared from other activities. Commercial producers give the seed crop care comparable to any other crop of equal possibilities of net return.

Grass seeds in the Great Plains, the Intermountain region, and the Pacific Northwest are produced under both dryfarmed and irrigated conditions. Some are planted in solid stands, but row plantings can be cultivated and irrigated more effectively. Seeds are also taken from native stands of some grasses when the set of seed and market are favorable.

Forage, as well as seeds, is usually produced on grass stands in this region. Typically, the farms producing small grains and livestock find a grass seed enterprise to be well adapted and profitable. An additional cash income from seed and additional forage for livestock are provided. As a multiple-purpose planting, relative prices of seed, forage, and livestock determine to a large extent whether seeds are harvested from a given grass planting in any year.

In the predominantly irrigated regions of the West, grass plantings on farms are primarily for the production of seed. Per-acre inputs and costs are greater, but yields are generally higher as a result of more intensive cultural practices. Plantings tend to be small, however, and are invariably conducted as one of several enterprises on a farm. Farmers experienced in the production of other types of seeds under irrigated conditions often add a grass-seed enterprise. They usually have the necessary experience and equipment. When added to other seed enterprises on a farm, the production costs can be reduced by taking advantage of supplementary relationships which exist. Established contacts with the seed markets may further contribute to a profitable grass seed enterprise on these farms.

By any measure, the production of seeds in the United States is an important agricultural enterprise. Yet an analysis of the agriculture in the major seed-producing areas indicates that seed production is relatively less important than other enterprises, both within the area and on individual farms. There are usually other crops that on the average will bring higher net returns than seed crops.

The organization and financial structure of a typical farm producing sudangrass seed in the Sacramento Valley area of California illustrates this point. Sudangrass seed is considered an important crop in the area, but it typically occupies only about 10 percent of the crop acres of the farm, produces only 6 percent of the gross income, and contributes about 3.5 percent of the net income.

Sudangrass is a good rotation crop because it uses much of the same machinery as milo and barley, thus making more complete use of these capital items. It also loosens the soil, and many crops can be planted in the
stubble with a minimum of soil preparation. The rather wide variation in prices and yields makes this a good speculative crop when the income of the farm is fairly stable as a result of including such crops as tomatoes and sugar beets grown under contract and barley and alfalfa.

On a farm that produces alfalfa seed in the San Joaquin Valley area of California, the seed crop occupies 60 percent of the land area and furnishes 50 percent of the gross income. Even so, the seed crop provides less than 30 percent of the net income.

Thus, for two of the dominant forage seed crops in California, the seed enterprise represents a relatively insignificant part of the total income at average yields and prices.

One reason why a farmer elects to grow a seed crop is that he sees a chance to make high net returns on a small acreage. Some flower crops occasionally offer such possibilities. High yields sold at a favorable price can provide substantial net returns. If the acreage required is small, the total cash outlay may still be within the reach of the operator of a relatively small farm.

Another reason is that some seed crops provide an opportunity to use resources that for one reason or another cannot be used as effectively by other enterprises.

In some areas, producer contracts that stipulate a purchase price are attractive to many farmers. Such a contract may appear to add a measure of certainty to the farm income, although this added certainty may be more imaginary than real because of the many other variables that affect income. Contracts of this type may also help the farmer to obtain production credit.

Farmers often are willing to sacrifice the opportunity for very high incomes to avoid excessive variation in income, particularly if available capital is limited. This argument is often advanced to explain the farmers' reluctance to increase the proportion of land allocated to seed production. For some seed crops, particularly the few flower seed crops grown by individual farmers, this explanation may be valid. Wide year-to-year fluctuations in yield and price where not stipulated in a contract may occur.

Available evidence fails to support this argument when applied to many of the field crop seeds. Often, the variation in yield, price, and income are equal to or lower than those for other crops grown on the same farms. This is particularly true of seed crops grown under contract on irrigated farms in the West.

A part of the income of a farm operator is due to his skill in making managerial decisions and accepting responsibility for the decisions. The level of income in agricultural production thus is related to the managerial skills required and the financial responsibilities to be assumed. Since good management is essential to successful production of seeds, the management income to individual producers should be relatively high over time. Yet evidence we have suggests that this is not necessarily the case.

The answer lies in the fact that responsibility for many of the management decisions in seed production is retained by the contracting seed company and, in some cases, it assumes substantial financial responsibility ordinarily borne entirely by the producer in other production lines. Thus what appears to be a wrong allocation of returns between producer and contracting company often may be quite in keeping with the relative contributions of the two parties to the production of seeds of many specialty crops.

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