field burning in oregon

Special Report 476
Oregon Agricultural Experiment Station
February 1977

contents

summary

Most agricultural practices such as field burning have evolved because they were successfully adapted to the solution of problems and served the welfare of a broad segment of society.

These practices must also stand up to continuous public scrutiny, however, and must be accountable economically, environmentally, legally, and ethically. Field burning has thus become a controversial issue in Oregon because people apply these measures of accountability in different ways.

The Agricultural Experiment Station at Oregon State University has been involved in field burning research for many years. Because of this experience and our responsibility to inform the people of Oregon about controversial issues, we have prepared this publication.

In some instances, we have a substantial background of good information that permits some precise statements. In other cases, we may not have all the answers and can only suggest some possible courses of action including needed research.

In any event, we have attempted to provide some rather brief information to be helpful in developing decisions ahead of us; we recognize the possible dangers in the brevity and suggest that you contact Agricultural Experiment Station personnel if additional details are desired.

Following is a summary of each of the major areas of interest:

- **The reason for field burning**

The only feasible control for most diseases of annual and perennial grasses is the thermal treatment provided by field burning or other thermal field sanitizing. Development of chemical control of certain diseases is progressing. Control of weeds, which create problems of seed quality, is dependent on field burning to destroy crop residues which interfere with the activity of soil-applied herbicides and to kill most weed seeds. For the present, it appears that a thermal treatment for annual and perennial grasses is the only effective way to maintain seed yields and control diseases, weeds, insects, and other problems which otherwise could wipe out the grass seed industry.

- **The pollution problem**

Air pollution is created by field burning, slash burning, industry, and vehicle exhaust emissions, among other things. Eugene has been particularly vulnerable to air pollution from May through October because of the prevailing north wind. The air, during its long, southward path over the Willamette Valley, passes over many sources of pollution (cities, factories, highways) before reaching Eugene and is, therefore, already burdened with an accumulation of pollutants. We suggest that the residents of Eugene should not blame only field burning for their problem but look to all the air pollution sources which cause intense and extended air degradation. Scientific investigations to determine the relative importance of vehicular, industrial, slash, and field burning sources of pollution should be invited to provide for the development of public policy to manage multiple pollution sources.

- **Cropping alternatives**

In most areas of the mid to southern Willamette Valley, soils are too dense and too saturated in the winter and spring to permit the growth of crops other than grasses. Other crops are available for production in the better-drained soil areas, but for the approximately 150,000 acres of poorly drained lands there simply are no good alternatives unless both drainage systems and irrigation systems are widely deployed. With new techniques, drainage is a definite possibility but there are no drainage outlets for much of the land and the environmental impact of drainage on the water balance and on wildlife is unknown.

- **Burning management and air pollution control**

Some systems of field burning result in less air pollution than others. Burning straw in stacks, back-fire burning, and burning large areas to create a tremendous updraft are examples of these systems. Certainly, improved burning management or the organization of districts to provide burning management will continue to reduce air pollution.

Although alternating burning with mechanical straw removal has been shown to sustain seed yields of some grasses, it is not satisfactory for weed and disease control. We have just begun to understand the atmospheric condition that permits or minimizes air pollution problems. A study at OSU recently funded by the National Science Foundation should provide a much more precise means of using meteorological information for maintaining air quality.

- **Field sanitizers**

Everyone had high expectations for the potential use of field sanitizers but there are problems with these machines that presently almost preclude their commercial development and widespread adoption. Even with partial straw removal, the life of the machines is unknown and the cost of machine operation under commercial agricultural conditions is questionable. Some of the factors involved are high engine fuel consumption in an energy- short period, metal fatigue, and low field operating speed. The likelihood of private industry risking the capital necessary to produce sanitizers also is rather low without state subsidy. The sanitizers emit pollutants nearer ground level than open burning. In addition, their use will require their operation nearly continuously during the summer. On days that would be so restrictive meteorologically that open field burning would be prohibited, there would still be conflict between required continuous use of sanitizers on one hand and the potential for increased air pollution on the other hand. Thus, the problem of air pollution could be intensified rather than reduced by the sanitizers.

- **Straw utilization**

Straw can be substituted for part of the ration for animal feed. In years when the price of alfalfa hay is very high or pasture is not available, straw can compete as a maintenance ration for cattle. In competition with other raw materials, straw is too bulky and dispersed to allow for economic pickup and delivery for uses such as paper products or as a fuel. It is, indeed, unfortunate that this natural resource cannot be used as a source of fuel for producing energy, but the market price of other sources of fuel would need to be high if straw were to be competitive.

- **Conclusions**

On the basis of the best information available, we conclude that the application of improved burning, cultural practices, and atmospheric forecasting can sustain a grass seed industry in the Willamette Valley. This might involve a management program that could result in burning about 200,000 acres in one year. This figure may be reduced to 100,000 acres in years when atmospheric and field conditions do not allow much burning, or may be increased to about 300,000 acres in years when atmospheric conditions and dry field conditions are conducive to burning without appreciable air pollution.

The economic value of this industry to all residents of Oregon, including the use of grass for wild fowl and for animal industries during the winter and the aesthetic and erosion-protecting values of grass fields at most times of the year, deserves additional deliberation by decision-makers and researchers. Oregon cannot give up its grass seed markets and expect at some later date to get back in the business. Our competition would not allow us to do this.

We suggest that the last several years have demonstrated to an extent that pollution can indeed be controlled and that all Oregonians in the Willamette Valley should insist on an economical and socially acceptable solution to the problem.

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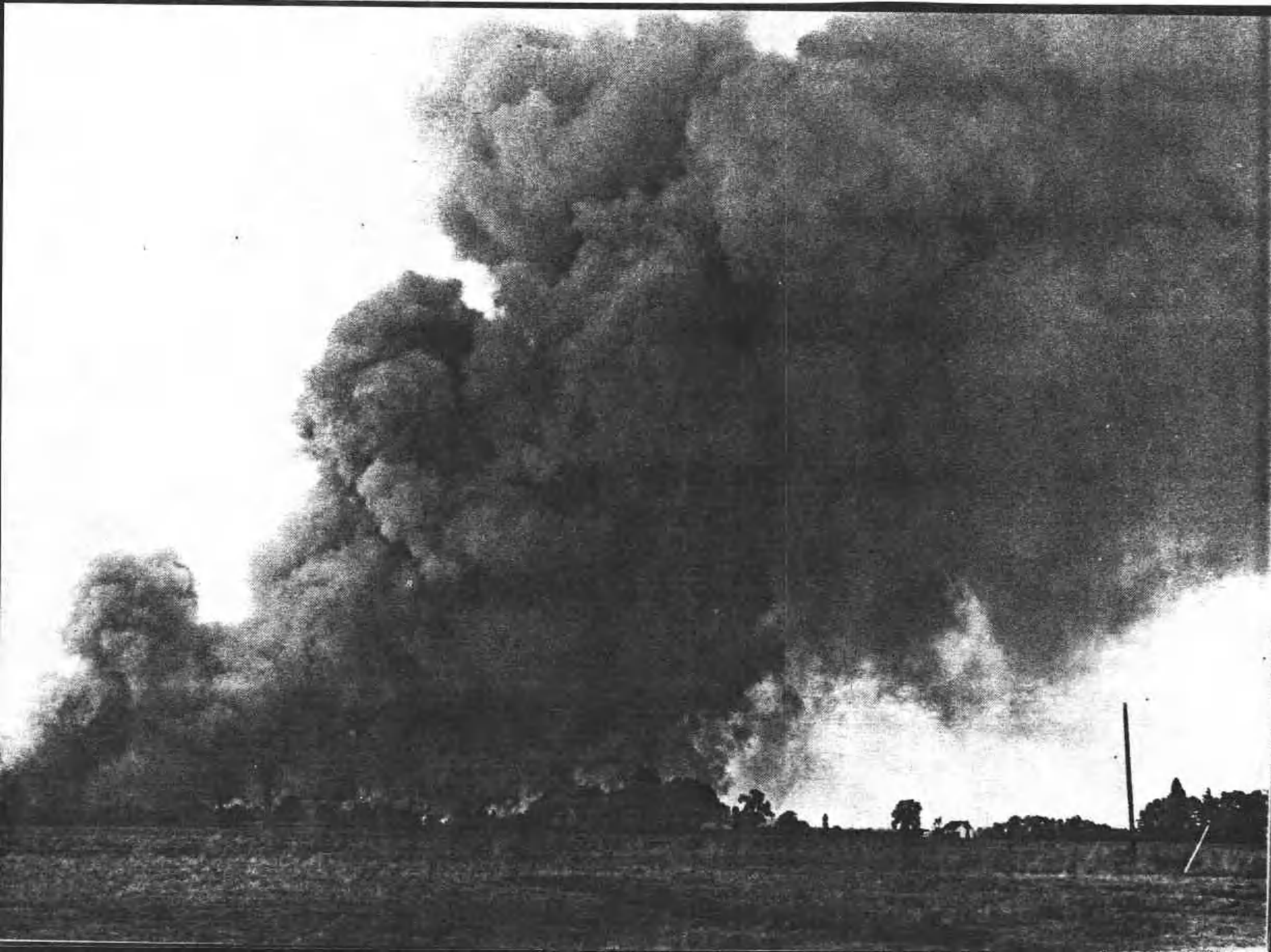


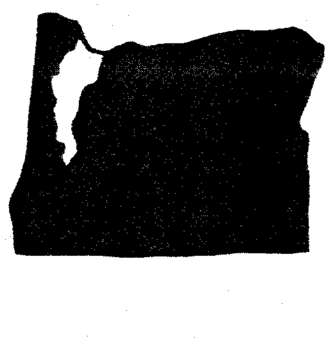
where

Oregon, with about 240,000 acres of grass seed crops grown in 1976, is the world's largest producer of forage and turf grasses. All but about 12,000 acres are located in the Willamette Valley, the "grass seed capital of the world."

Mild and moist winters with dry summers for seed maturation and harvest make the valley an ideal place to produce high-quality seed.

Linn County, with about 110,000 acres of grass seed in 1976, is the leading grass seed producing county in the state. Linn County produces more than half the volume of Oregon grass seed and essentially all the ryegrass produced in the United States.

Significant grass seed production also occurs in Lane, Benton, Polk, Yamhill, and Marion counties. Small amounts continue to be produced in Washington, Multnomah, and Clackamas counties. Outside the Willamette Valley, limited grass seed production occurs in Union, Jefferson, and Jackson counties.



who and why

Grass seed growers in Linn, Benton, and Lane counties end to specialize in grass seed crops, especially yegrasses. Grass seed is grown on the poorly drained oil where most crops will not survive the wet winters. Farms are larger than average and use specialized machinery and equipment. Annual and perennial ryegrass production is extensive in nature with very low net returns per acre.

Although draining and supplemental summer irrigation of the poor lands is technically possible, market conditions preclude large-scale opportunities for producing intensive fruit and vegetable crops.

Seed growers in Polk, Yamhill, Marion, Clackamas, and Washington counties have smaller, more diversified arms. Soils are variable, providing opportunities for a variety of crop alternatives and rotations. The choices are definitely limited in the hilly areas where soil erosion can be a problem. In those cases, specialization in bentgrass and fine fescue grass seeds is common because of the generally higher return they offer over ryegrasses and the protection they provide against soil erosion if annual or ow crops are grown.

the markets

Cash farm receipts for grass seeds in Oregon totaled $48 million in 1976, with a cleaned and sacked value of $54 million. They have averaged near $50 million for the last three years but variation is high because of changing crop acres, yield, and market prices.

The total effect on the state's economy in 1976, using a 2.0 multiplier, is estimated at $108 million. That value-added effect, which includes input purchases of $30 to $50 million, is considerable.

Domestically, Oregon's grass seed growers produce more than 90 percent of U.S. production of annual ryegrass, perennial ryegrass, bentgrass, and fine fescues. They produce a significant but smaller percentage of U.S.-produced bluegrass, orchardgrass, and tall fescue and compete with growers in the Northern Great Plains, southern states, and Washington and Idaho regions.

Internationally, the competition in lawn and turf grasses (fine fescues and bluegrasses) comes from Denmark, West Germany, Holland, and Canada, and in pasture and cover crop grasses (tall fescue and ryegrasses) from Denmark, Canada, New Zealand, and Holland. The export market is important for U.S.-produced bentgrass, ryegrass, tall fescue, fine fescue, and other Kentucky bluegrass. Essentially, all U.S.-produced bentgrass is exported. The principal export markets for grass seed are the EEC (European Economic Community), Canada, Europe, Japan, and Mexico. Producer subsidies to growers in the EEC and non-tariff trade barriers are restricting free trade flow of grass seed from the U.S. and elsewhere into the EEC market.

The export of seed is important to Oregon. In 1976, Port of Portland reported 30 percent of all containers handled during the shipping season carried grass seed to Europe and 15 percent of all tonnages exported to Europe was grass seed.

..egislative ..ook

The practice of burning grass seed fields after harvest ..as adopted quickly by growers in the late 1940s. They ..ecognized its effectiveness in disease control, its ..nportance in weed and insect control, and the stimulus ..e heat gave to seed yield.

Burning also disposed of large quantities of straw ..hich did not decompose readily when plowed under and ..nless removed presented a problem for the next crop.

The public, at first, considered the large fires and ..moke plumes as annual curiosities. But as the number of ..cres burned increased, and particularly when fields ..here regrowth had developed were burned late in the ..eason or under adverse atmospheric conditions, ..omplaints about smoke increased.

Before 1967, post-harvest burning of gras seed straw ..as regulated by local fire districts for fire safety. In 1967, ..e State Legislature declared that field burning smoke ..as air pollution and the State Sanitary Authority—now ..e Department of Environmental Quality (DEQ)—was ..ven authority (advisory) to recommend where field ..urning was to be done.

In 1969, the Legislature granted the State Sanitary ..uthority the power to limit the amount of field burning on ..arginal burning days.

The summer of 1969 was a critical year in the history .. field burning. The Department of Environmental Quality ..opped field burning for two weeks because of ..mospheric conditions.

On August 12, DEQ, which had little experience in controlling field burning, forecast a good burning day and permitted field burning for the entire Willamette Valley. The winds changed to flow from the north and moved the smoke up the valley into Eugene resulting in a situation that led to more restrictive legislation.

In 1971, the Legislature set up a burning permit system with a fee to the grower of 50 cents an acre. Five cents of the fee was deposited in a special account, to be used in the smoke management program conducted cooperatively by the Oregon Seed Council and the DEQ. The rest of the fee was used in a research and development program. The 1971 Legislature also established January 1, 1975, as the date field burning would be prohibited.

The 1971 law established a five-member committee to direct the research and development program funded by grower acreage fees. This program has been directed primarily toward development of an acceptable mobile field sanitizer by private contract. Other committee funds have supported methods of removing and using straw which must be taken from the fields before sanitizers can operate under field conditions.

In 1973, legislation increased the growers' burning permit fee to $1 an acre (with $1 matching state funds) to be used for research and development after 10 cents an acre was set aside for smoke management. Improved smoke management substantially reduced the intrusion of smoke into metropolitan areas.

In 1975, the Legislature replaced the ban on field burning with a phase-down system which would reduce the allowed field burning from 285,000 acres burned under 1974 regulation to 235,000 acres in 1975 and down to 50,000 acres by 1978. A system of increased grower fees was adopted that would increase to $3 in 1975, $4 in 1976, $5.50 in 1977, and $8 per acre thereafter.

the benefits of burning

The primary reason for initiating field burning of grass seed fields was to control disease. However, there are other benefits:

- Inexpensive residue removal.
- Weed control.
- Stimulation of seed yield.
- Insect and rodent control.
- Reduced pesticide requirements.
- Quicker return of minerals to the soil.
- Easier crop establishment.
- Increased fertilizer efficiency.
- Reduced fire hazard.

Grass seed residue must be removed from fields. Otherwise, pests, including diseases, and reduced stand vigor will reduce yields below economic levels. Burning is the most inexpensive way to remove grass seed residue.

Burning destroys many disease organisms, helping control serious diseases including some which cannot be controlled any other way. Weed seeds, too, are destroyed on the soil surface, reducing the number of weeds in the next crop. Burning provides the only present means of grass weed control in annual ryegrass.

In perennial grass seed crops, the reduced weed populations and removal of material which can adsorb herbicide materials dramatically improve the degree of weed control.

The seed yield is increased by removing the residue and the older surviving shoots. Burning changes the soil environment, promoting vigorous new plant growth early in the fall, and increases the amount of seed heads the following spring.

The burning process also controls some insects and rodents both by direct heat and by destroying the residue which is their habitat. Cutting down on the number of pests reduces the number and amount of pesticides needed in seed production.

Ash deposited from burning residue also helps achieve a more rapid recycling of straw and stubble minerals in soil. Burning has maintained the potassium level of soils in the Willamette Valley so additional potash has not been required. Other plant nutrients also are returned to the soil more rapidly after burning than from natural decomposition which is slow in the valley's wet winters and dry summers.

Residue burning also helps establish the next crop. With burning, annual ryegrass can be planted with little or no tillage, thus saving fuel and reducing costs. Eliminating straw also gives a boost to establishing small seeded legumes on better-drained soils.

If straw decomposition is allowed to proceed, nitrogen in the soil is tied up. Burning the residue not only avoids this requirement for essential nitrogen but also reduces the amount of fertilizer which must be applied to the grass seed crop in that crop year.

Controlled field burning adds protection from large, accidental fires that could occur in the accumulated residue.

From a research viewpoint, open field burning is a broad spectrum, effective and non-residual pest control measure which has improved seed yield and quality.

burning by machine

Research over several years has shown that experimental field burning machines, called sanitizers, stimulate seed production as effectively as open burning when operated under proper conditions.

However, serious damage has resulted to the crop when recent commercial test models have been used under less than ideal crop and weather conditions.

OSU, given the task of developing and testing a mobile field sanitizer by the Legislature, began in January, 1970, with a project goal: to produce a machine with a field capacity of 2.5 acres per hour with a burning capacity of 10 tons of grass straw residue per hour. The machine was to operate within specified DEQ limits for smoke emission and at a total cost of less than $10 per acre. Data from the experimental machine were to be used for constructing practical field units on a commercial basis.

Working with its own experimental machines in 1971 and 1972, OSU produced engineering recommendations, information about the effects of heat on plants and soil, and other research results which were used by companies to build the first field sanitizers.

OSU evaluated plant and disease response to several new sanitizers in 1975 and in 1976 evaluated refined prototypes.

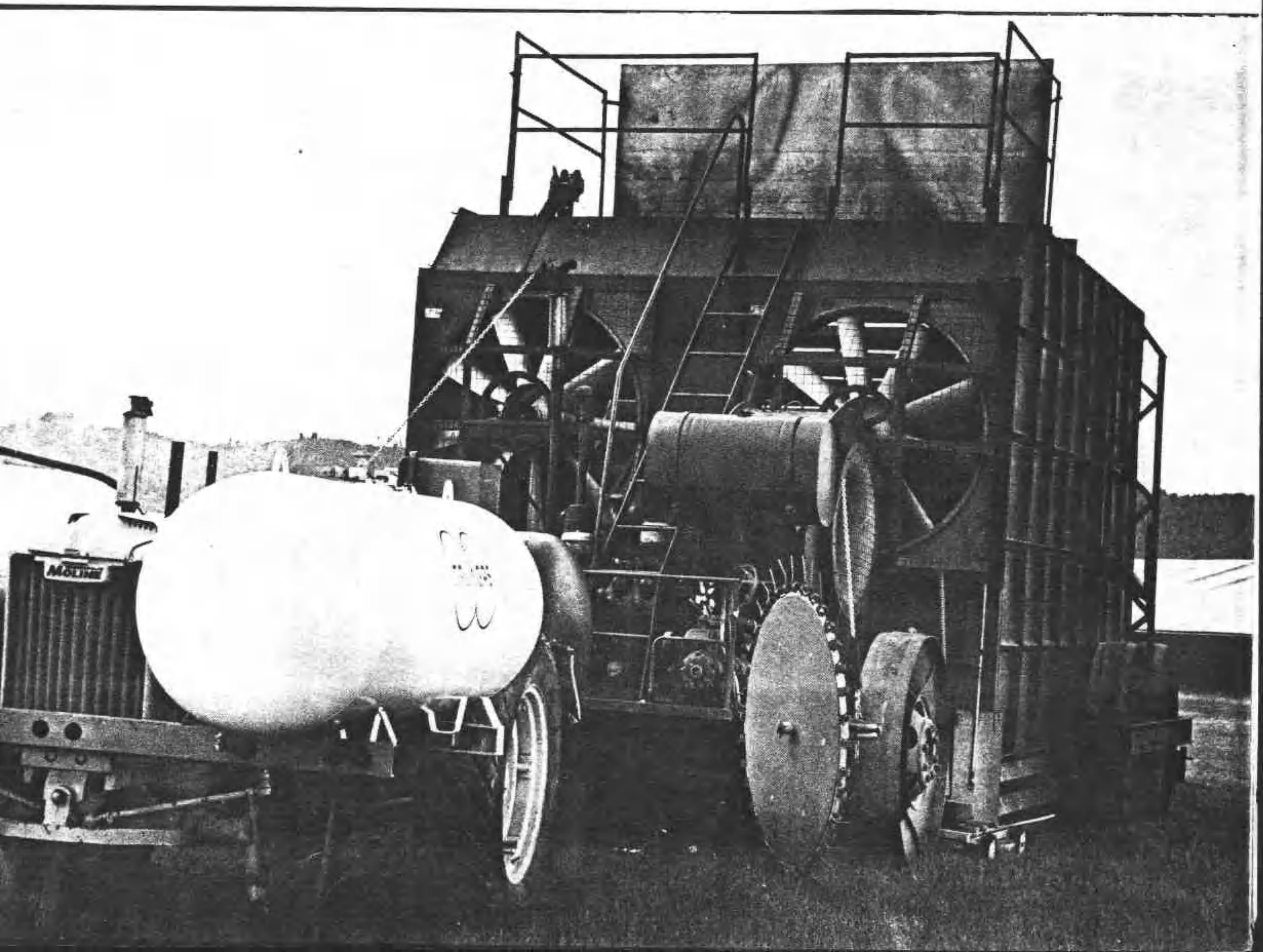
Partial straw removal from the fields before machine sanitation is essential to achieve economical operating speeds and temperatures. Some straw and stubble for fuel must be left in the field and it must be uniformly distributed.

Each machine has its own fuel burning characteristics. Additional study will be required to describe the proper operating conditions when a machine design has been selected for wider field use.

The 1976 evaluation report summation: the several models field tested in 1976 varied in their effectiveness in sanitation and in their operating characteristics. In general, the sanitation results were acceptable when the machine was well designed and was properly operated.

Further study will be required before these machine designs can be considered ready to be recommended for commercial operation. Problems which have not been overcome include factors such as metal fatigue, emissions, operator safety, and field operating speed. Recent tests have not completely established the crop tolerance to these designs when operating at the upper temperature range.

Total machine sanitizing costs, including machine overhead, maintenance, repair and operation, have not yet been demonstrated to be within the operating profit margin of most of the grass seed crops grown in Oregon.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smoke management

Scientific evidence indicates that the burning of fields can be arranged by acreage and date, in conjunction with appropriate atmospheric conditions, so overburdening of the air can be avoided if all persons are objective and reasonable.

Smoke management, properly done, results in acceptable air quality. An air quality standard is stated by law as a maximum concentration of pollutants allowed. Thus, to manage smoke pollution we have the expression: Air quality = pollution source strength divided by meteorological conditions.

Air quality is directly related to meteorological conditions. To keep the equality in balance, source strength (acreage to be burned) can be increased only on days when meteorological conditions increase (become better for dispersal). When dispersal conditions are poor, acreage burned must be reduced or eliminated.

There was no systematic effort to manage smoke in the early years of field burning. Fire safety, not air quality, generally dictated what burning management there was.

During the early 1960s, the U.S. Weather Bureau issued public advisories for agricultural burning. These advisories included the degree of atmospheric stability and the likelihood of good smoke dispersal. Farmers interpreted the advisories before arranging their burning programs.

In 1967, the Weather Bureau and the State Sanitary Authority (now the DEQ) began to work together on forecasting daily conditions of the asmosphere. Each day, the Sanitary Authority, as management agency, made a decision about the feasibility of burning.

In 1969, advisories were changed to list the number of acres which could be burned daily.

Smoke management is accomplished by balancing the field acreage to be burned against the meteorological conditions of a given day. The smoke problems in populated areas have decreased with more experience in forecasting, better communications, greater grower cooperation, and acreage allocation of grass fields by areas. DEQ figures show visibility at the Eugene airport was reduced to 6 miles or less by smoke on 14 occasions in 1976—only 3 from field burning and 11 from other sources. This compared with 7 cases attributed to field burning in 1971. In Salem, there were no occasions in 1976 when field burning reduced visibility below 6 miles but 14 cases were attributed to other sources.

In August and September, 1976, DEQ, with the cooperation of the Oregon Seed Council, scheduled three "big burns" to test the concept of whether a concentrated heat source created by burning large areas would give sufficient buoyancy to the smoke column to avoid low-level pollution.

Depending on a number of factors, the "big burn" can be successful but takes a great deal of field preparation, a large number of workers, and special equipment. This technique could become important in smoke management ut requires greater organization of growers and perhaps ome revamping of fields to make them easier to fire.

An active smoke management program should be eneficial to grass seed producers and other Oregon ublics because research in meteorology and in imatology of the Willamette Valley indicates that burning large acreage is feasible in July, August, and early eptember.

some partial answers

One of the primary purposes of field burning is to control plant diseases.

Experimental chemicals to control ergot and blind seed disease are continually being evaluated but most have not given control in field plots. In 1976, for the first time, one experimental chemical controlled ergot and blind seed disease after it was applied in field plots. However, it controlled the diseases only in two of three tests.

Work on the chemicals, which are not registered for use, will continue.

Cultural research on alternatives has centered on physiological effects of non-burning methods. Mechanical removal is expected to be more expensive and reduces seed yield. The extent of loss depends a great deal on soil type, soil conditions, and age of stand. Weed problems intensify when non-burning techniques are used in both perennial grasses and in annual ryegrass seed production.

Mechanical removal

Mechanical techniques studied:

- Raking the straw (leaving remaining stubble intact).
- Flail-chop removal of a major portion of the straw and stubble.
- Close clipping (a technique for removal of most organic material on the soil surface).
- Soil incorporation of the residue in annual ryegrass production.

Research results indicated that the physiological esponses to mechanical removal techniques vary in their mpact on seed yield depending on the species and ariety of crop. Chewings fescue, red fescue, and Highland bentgrass usually showed greater need for urning than did bluegrass, perennial ryegrass, and, articularly, orchardgrass. Differences in responses of arieties are expected to be measurable and this nformation is being collected.

Leaving straw in the field was found to lower seed ield substantially. Raking was little better than leaving he straw in terms of seed yield and flail-chop removal was omewhat superior.

Close clipping and removal were found to be an ffective treatment for approximating the physiological esponse of burning for maintaining seed yields but dust s a problem. Field testing of a prototype machine was artially successful on some species but demonstrated the ifficulty in designing appropriate equipment. Soil particle nd chaff entrainment is a problem with this operation.

Researchers also determined that age of stand will nfluence response to non-burning treatment. In the bsence of burning, the yield from older grass stands was educed more than from young grass stands.

Seeding annual ryegrass through straw and stubble, sing specialized drills, was not successful. Mechanical emoval of straw improved the establishment of annual ryegrass drilled through stubble. When annual ryegrass fields are not burned, weed control problems increase.

Non-selective pre-plant chemical weed control was partially successful in years when early rains occurred. Because it relied on moisture to germinate weed seeds prior to seeding, this technique was not effective when early rain did not occur. A new herbicide to selectively control annual grass weeds in annual ryegrass is being tested. This herbicide is effective only if crop residues are completely removed mechanically or are incorporated by tillage operations before application of the chemical.

Alternative ways to remove residue from harvested grass seed fields will be more expensive and less effective than open field burning. The greater the degree of residue removal, the higher the subsequent seed yield, it was found. Even the best experimental technique is less thorough than thermal sanitation and adequate field equipment has not yet been designed. Historical evidence indicates that diseases will increase under mechanical removal operations without annual thermal sanitation.

Soil incorporation of straw from annual crops

In establishing annual ryegrass it was necessary to chop the straw before it could be plowed into the soil. Incorporation of straw was still difficult particularly where heavy straw loads were encountered.

Applying fertilizer to the straw at the time of incorporation did not have visible effects on the breakdown and decomposition of straw. Biological decomposition of crop residue was slow because of high soil water level and low temperatures in the winter and summer's dry soil conditions which limit microbiological activity.

Since grass weed control in annual ryegrass depends mainly on burning, these practices will be faced with intensification of weed problems and reductions in the quality and marketability of the seed. In experimental tests, annual ryegrass seed yields were substantially reduced with non-burning seed bed preparation methods.

Alternate year burning with mechanical removal

Burning one year with mechanical straw removal the next year may provide a method for sustaining seed yields of some grasses but it is not satisfactory for weed and disease control. A reduction in seed yield is realized compared to annual burning but results are superior to continuous mechanical removal techniques.

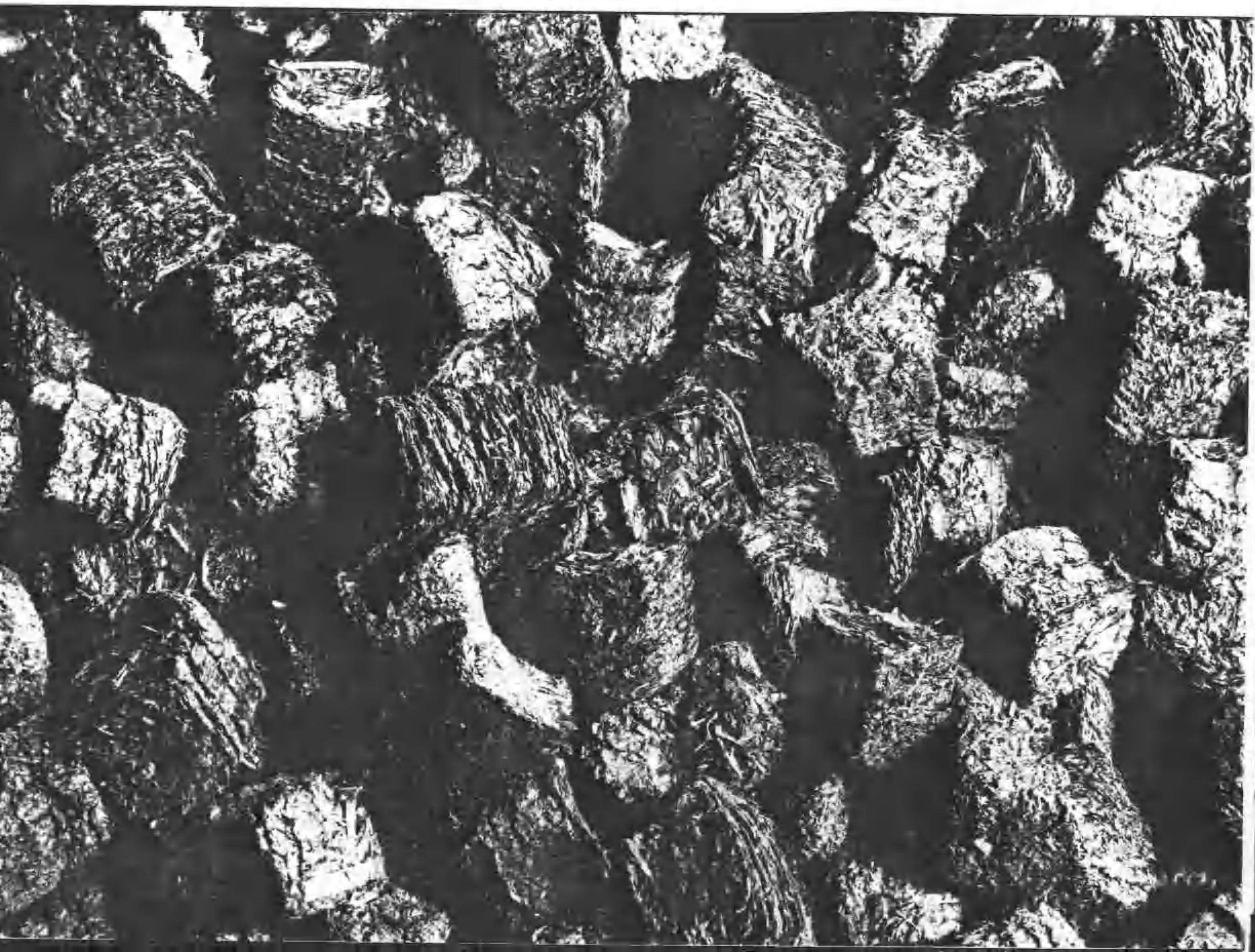
Straw utilization

Straw can be used as a raw material to make paper particleboard and other fiber board products, oil, gasoline, fuel logs, plastics, composted fertilizer, and microbial protein.

However, its bulk, transportation difficulties, uncertainty of long-term supplies, and cost of collection and shipment make straw non-competitive with other raw materials used to manufacture these products.

In livestock feed, straw's low protein and high cellulose and lignin content limit its use in winter maintenance rations or as a fiber source in a feed mix. Palatability and digestibility can be improved chemically and/or mechanically but this, too, is costly.

Supplies of wood chips, the traditional base for making pulp and paper, generally are adequate and their use requires no retooling of manufacturing plants.



grower and industry adjustments

Historically, the Willamette Valley's grass seed industry has had an economic advantage in supplying premium-quality grass seed to domestic and foreign markets for lawn and turf, cover crop, and pasture grass, primarily because of its climate.

Changing economic and social conditions in recent years may be eroding the economic advantage. In 1974 and 1975, average grass seed producers suffered losses. Improved market conditions in 1976 provided positive returns. A number of factors contribute to what appears to be a generally deteriorating condition:

1. Senate Bill 311 was enacted to reduce acreage of fields open burned, eliminating the traditional least-cost means for thermal sanitation and residue removal.
2. Inflationary pressures, since 1970, have doubled grass seed production costs per acre.
3. Growers compete in the open market which is characterized by widely fluctuating market prices over which they have no control.
4. The major international markets for public varieties in the European Economic Community and Japan face stiffer non-tariff import restrictions and internal production subsidies.

Individual grower adjustments to the changing conditions are diverse, economically painful, and slow. Contributing factors include:

- On the poorly drained Valley soils there are few alternative crops to annual and perennial ryegrass which will survive winter flooding.
- Unfortunately, major technological breakthroughs in developing economically viable alternatives to open field burning without significant reduction in grass seed yields and/or farm income have not been forthcoming.
- Active markets for grass straw have not developed. Its bulkiness imparts costly densification and transportation costs which make straw generally non-competitive with alternative raw materials.

Results of economic research suggest a number of djustments are likely to occur from Senate Bill 311 which educes acres of open burned from 234,000 acres in 1975 o 50,000 acres by 1978.

rop adjustment

Some grass seed acreage reductions in acreage of nnual and perennial ryegrasses are occurring as better-rained lands are shifted to wheat. The potential for holesale shifting to other crops is very limited, however, eaving changes in cultural practices as the only cropping hoice.

For bentgrass, confined primarily to the Silverton hills, e world markets for bentgrass and wheat appear to be e major factors influencing bentgrass acreage. Large shifts from bentgrass to other seed types are not expected since bentgrass is a serious weed problem in other seed types. The relatively high profit margins on orchardgrass suggest some increased production of it. Unfortunately, acreage increases of orchardgrass may be limited since it is a serious weed in the turf-type grasses. Whether fine fescue acreages will be reduced greatly will be influenced in part from market competition by Canadian red fescue. Considerable bluegrass acreage is shifting into eastern Oregon, Washington, and Idaho where open field burning is permitted to assure high seed quality.

A substantial decline in tall fescue acreage may occur since Oregon produces a very small volume of total U.S. production. For bluegrasses, tall fescue, fine fescue, and orchardgrass, an overriding economic concern is that production cost increases in the Willamette Valley from air emission controls may well place this area at an absolute economic disadvantage with other production regions. Whether this will precipitate large-scale shifting of grass seed to other regions is determined not only by economic conditions in the Willamette Valley but also by profitability of grass seed production relative to other enterprise choices in those regions.

Farm adjustment

Historically, farm reorganization adjustments, both in the U.S. and Oregon, have taken the form of (1) farm size expansion and adoption of unit cost-reducing technology, and (2) transfer of farmland near urban centers to non-farm uses. The extent to which grass seed farm adjustments will continue these historic trends is an important but unanswered question.

In central Willamette Valley counties where poorly drained soils are prevalent, the only farming choice is to continue ryegrass production and adopt cost-reducing/ output-stimulating machine technology as it becomes available to stay competitive or leave the industry. Farm size expansion is an integral part of this adjustment process. Conversion of grass seed land for urban use is not expected to be rapid.

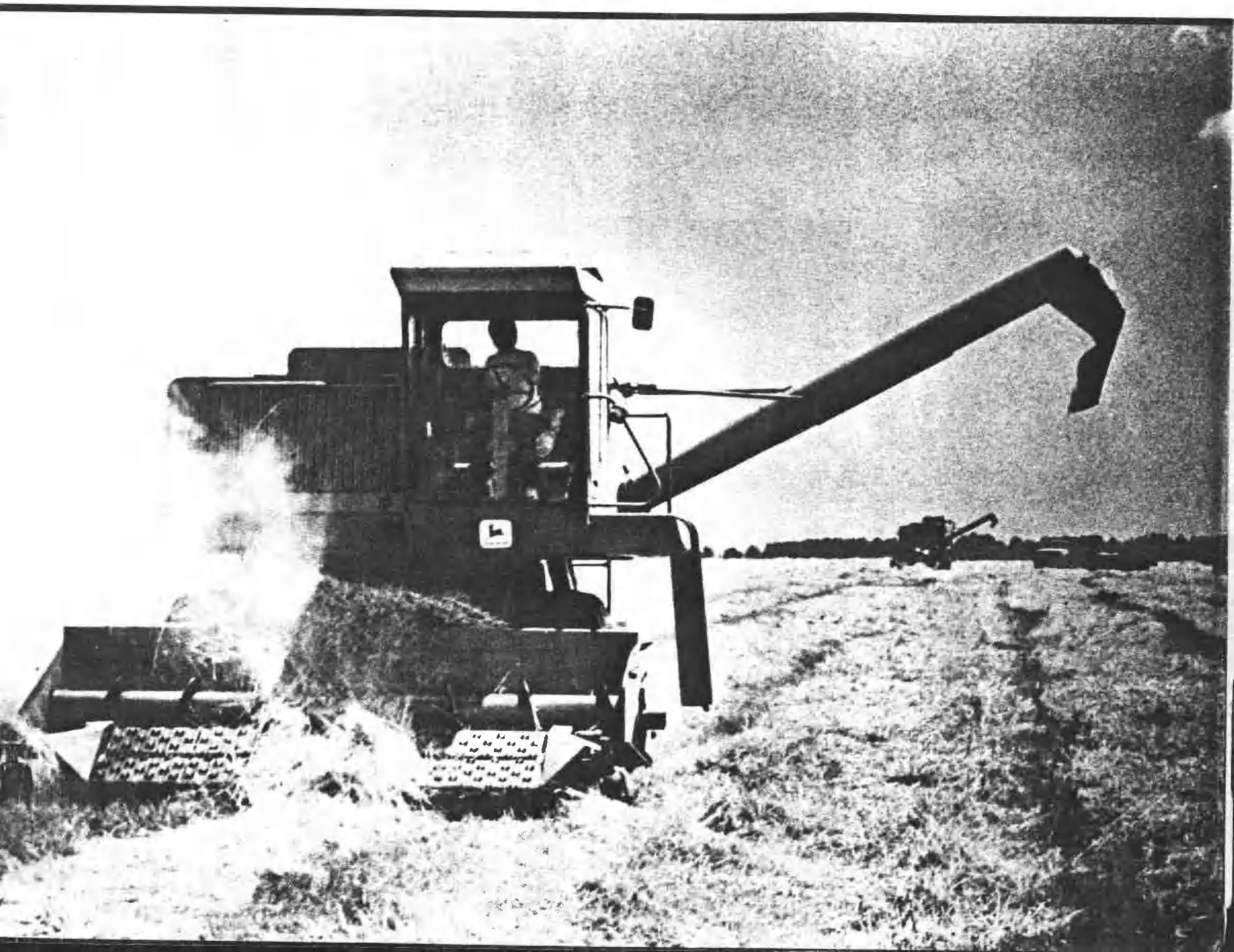
The pressure to acquire land for agricultural purposes will keep land values high in spite of varying market prices for grass seed as long as a relatively large number of growers can withstand the increased costs from environmental controls. The number of commercial grass seed farms is estimated at about 800. This number likely will decline, depending on the extent of imposed environmental controls.

Industry adjustment

Total acres of grass seed produced in the Valley are declining. About 20,000 acres of grass seed were taken out of production in 1976. The immediate uncertainties of field sanitation for disease and weed control and their effect upon increased production costs appear to be major factors.

Whether this is a continuing and more permanent trend is not known. Countervailing market prices, future technology developments, and relative production cost increases between competing regions are important factors. Historically, the grass seed industry has been able to adopt unit cost-reducing technology which has more than offset market price decreases from increased production volume. Consequently, grass volume in Oregon has steadily increased over the last 20 years in spite of generally low or declining farm prices.

Whether this will continue in the future because of the added economic pressure from environmental controls is a fundamental, complex, and as yet unanswered question.



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