Ag and Food Interprets . . .

- **NPFI planning big new fertilizer promotion campaign**
- **Enzymes in baby pig rations help digestion, weight gains**
- **Sulfur hangs on to large pesticide market, despite organics**
- **Higher analysis fertilizers get nod from farmers in buyers' market**
- **Prospect is for high level pesticide production this year**

Fertilizer Promotion

Sliding sales curve prompts fertilizer industry to big expansion of trade association program of research and promotion

THERE'S A TREMENDOUS potential for expansion in farm use of plant foods, and the fertilizer industry plans to tap it. Last month through its principal trade association, the National Plant Food Institute, it launched plans for an impressive increase in its industry-wide research, educational, and promotional programs. There is some disagreement in the NPFI membership about how to finance the enlarged program, but its execution is assured.

As NPFI executive vice president Russell Coleman outlined the program, it will in no way substitute for individual company effort, still a most important factor in improving fertilizer sales. Rather, the institute program will abet individual company efforts through a "unified program of action" with three major objectives:

- To broaden and strengthen fertilizer research through increased grants to universities and colleges;
- To initiate a farm demonstration program in cooperation with state and federal agencies;
- To develop more specific informational programs based on results from the research and demonstration projects.

The over-all program is aimed at localization of efforts to the greatest extent possible, so that farmers and growers in local areas will receive agronomic and economic information they can use immediately. In telling the fertilizer story to farmers, NPFI will enlist the cooperation of local newspapers, radio and television stations, agricultural publications, bankers, dealers, and professional agricultural workers.

As the first major step in implementing its expanded program, NPFI will establish regional offices in the Midwest (probably Chicago), the Far West (probably San Francisco), and the Southeast (probably Atlanta). The Northeast presumably will be covered from NPFI headquarters in Washington, D. C. Four regional managers will be responsible for determining what needs can best be served by the program in their areas, and for administering the program so that those needs are met.

Cost of the program will require the NPFI to increase its annual budget, now about $0.5 million per year, to more than $0.8 million for 1957–58, and over $1 million by the time the program is in full swing in 1958–59. At the institute's annual business meeting at White Sulphur Springs, W. Va., on June 10, the members—or a majority of those present—voted approval of the expansion plans, including dues increases for the basic materials suppliers. The new maximum dues rate is 0.2% of net sales of basic materials—nitrogen, phosphate rock, superphosphates, potash, and sulfur—produced or imported for plant food use in the United States. Maximum rate for mixed fertilizers and other fertilizer materials remains unchanged at 0.05% of net sales.

It was on this point that sharp disagreement arose. Speaking for his own and five other major potash producing companies, G. F. Coope of Potash Company of America attacked the financing plans as an "inequitable

What happens to fertilizer consumption in the next 20 years depends on many influences. Projection A reflects the conservative—probably pessimistic—view that trends of the past three seasons might prevail. Projection B, considered a reasonable forecast, assumes future growth at approximately the rate set in the decade following World War II. Projection C, probably optimistic, indicates potential based on essentially universal adoption of extension service recommendations for plant food use, with the increasing farm product needs of an expanding population taken into account

allocation of costs"; his own company, he declared, while heartily endorsing the basic program, would resign from the institute if the proposed financing plans were adopted. So, probably, he added, would the other major potash producers—except one.

The "one" is International Minerals & Chemical, whose president, Louis Ware, promptly made it clear that his company fully supports both the basic program and the financing plans.

The reason for this split is simple. Potash Company of America and the other five companies mentioned by Coope (American Potash & Chemical, Duval Sulphur & Potash, National Potash, Southwest Potash, and United States Potash division of U. S. Borax & Chemical) are members of the American Potash Institute. To it they pay approximately 1.25% of their sales (six times the new maximum rate approved by NPFI), in support of programs "substantially the same" as the new program of the NPFI. International Minerals is not a member of the Potash Institute.

The API program benefits the entire fertilizer industry, Coope maintains, and its existence will make the NPFI program that much easier and less costly to operate. For this reason, he feels, some financial concession should be made to the potash companies which support the API.

Final outcome of the argument over financing is yet to be determined. Even if some of the potash producers should drop their NPFI memberships, according to Coope, they would plan to continue their financial support of its programs at the levels of the recent past. As of two weeks after the NPFI meeting, all but one of the API group had tendered their resignations.

Prior to the convention several of the potash producers had offered to go as far as doubling their contributions to the NPFI, but no compromise had been reached. Following the general business meeting, the institute's board of directors authorized the president to appoint a committee which would evaluate the total dues structure of the institute to determine whether any inequities exist. Members of the board are urging all the potash companies to retain their memberships for at least a year, pending the outcome of the dues structure study.

Questions of financing aside, the fertilizer industry is heartily in favor of NPFI's plans for greatly augmented promotional activities. Producers are convinced the untapped potential for fertilizers is immense, and they are eager to start realizing that potential.

Just how large is the fertilizer market? Virtually all agricultural leaders agree that fertilizer usage should be at least twice the present consumption. And some eye-opening estimates by speakers at the NPFI meeting make a mere 100% increase sound small.

According to E. T. York, Jr., of the American Potash Institute, increases of as much as 1000% would be desirable in some states, and many areas need as much as 300% more fertilizer for greater efficiency and profit.

If average crop yield is plotted against fertilizer consumption, York noted, the resulting curve shows an initial sharp rise followed by a gradual leveling. Eventually, the curve becomes essentially horizontal; additional use of fertilizer produces no further increase in yield. American agriculture, though, is still operating on the steep upward portion of the curve, York declared, and can increase its fertilizer usage severalfold before reaching the point of no economic return.

Sharing this view of the big market that remains to be sold, agricultural economist Gordon B. Nance of the University of Missouri declared himself to be "morally certain" that if the farmers who have the required cash or credit bought all the fertilizer they could use profitably, they would buy "five or six times as much plant food as is now produced."

Businessmen invest millions each day in securities which at recent prices return up to about 5% on investment, Nance declared. Fertilizer, by comparison, pays dividends that are almost unbelievable to business investors or even to farmers.

In a recent test of returns from fertilizing corn, said Nance, the first $6.00 worth of plant food per acre returned 291%; an additional $6.00 worth returned 227%. It was necessary to apply $40 worth per acre before returns on the last addition declined to 5%.

The fertilizer industry has had a couple of thin years, but sales are looking up this season. If the attitudes of speakers and listeners at the NPFI meeting are a criterion, the industry's total-sales curve is in the process of resuming its steady climb.

Enzymes in Pig Feeds

Enzymes help digestion of baby pigs. More work may confirm their benefits

Last year 90 million hogs, valued at $3 billion, were produced in the United States. By any standard, this is big business. It's not surprising then, that a proposed change in growing techniques should be subjected to careful scrutiny, and at least some criticism.

Mainly on the basis of research work done at Iowa State, several hog feed formulators are now advocating early weaning of baby pigs with enzyme-supplemented feeds. Thus far, only a handful of farmers are following this program. Supporters of early weaning and enzyme additives, however, led by Damon Catron at Iowa State, foresee a bright future with important benefits to the farmer. The critics, including many agricultural station workers who have made their own tests, feel that results are inconclusive. But everybody does agree on one point: the role of enzymes in animal nutrition needs further study.

The enzyme pepsin is the center of all the controversy. Pepsin, along with pancreatic amylase, is lacking in very young pigs, say Iowa State researchers. Not until four or five weeks of age do baby pigs secrete a full supply. However, this isn't a serious problem if pigs are weaned after five weeks, as most of them are now. But early weaning is an established trend, and the backers of enzyme additives think that two-week weaning will be common in the future. Since vegetable-based feeds are harder to digest than sow's milk, early weaned pigs need enzyme-supplemented feed. Thus, enzyme feeds have a double hurdle to jump; both early weaning and enzyme additives must be proved and accepted.

Proteins, from Milk or Plants

Early weaning, although requiring special feeds and housing, can claim many advantages such as less sow-to-pig disease spread, savings on sow feed costs, more rapid rebreeding, and more pigs that reach maturity. Most important in early weaning is the switch to a dry feed that can successfully take over the sow's job; it was Iowa State's work on such feeds that led to its enzyme research.

Iowa State found that pigs could be weaned at one week on a dried skim milk feed. But this was an expensive process with dried skim milk costing 12 to 16 cents per pound. Next, soybean oil meal was tried as a protein source. Lactose was added to make up the skim milk carbohydrate fraction. This mixture, although giving a 25% saving on feed costs, failed to produce the weight gains obtained with dried skim milk. Iowa State's

explanation for this: pepsin, needed to digest proteins, and pancreatic amylase, which works on starch, are lacking in baby pigs. Enough of these enzymes are present to handle the more digestible milk proteins and starches, but the pig's growth rate falls off when other feeds are used.

In their studies of baby pig enzymes, Iowa State researchers have tested 1545 pigs in 26 experiments. These tests, wherein a variety of feeds and enzymes were evaluated, were backed up by assays of the glands that secrete digestive enzymes. This work, plus separate studies in Canada, pointed out pepsin deficiency as the chief offender. The younger the pig, the greater the deficiency.

Iowa State's results with pepsin pig feeds have been variable, but nonetheless promising. The additional weight gained during the period from one to five weeks of age ranges from −8% to +40%, with an average gain of 6%. The wide range emphasizes that there still is much to learn.

Although adding pepsin to pig feeds does appear to permit the use of cheaper protein sources, it still isn't entirely attractive to the farmer on a cost basis. Supplementing pig feeds with 0.25% pepsin, the level Iowa State found to be best, adds $18 to the cost of a ton of feed. This seems high to feed formulators accustomed to additives which add only a few cents, and very seldom more than $5.00, per ton. Assuming that the value of pepsin can be firmly established, much education will still be needed to put across the point that in the long run pepsin will save money.

Today there seems to be less general enthusiasm for enzyme feeds among industry and experiment station experts than there was about two years ago when Iowa State's work received its first major publicity. But Catron is ready to answer anyone who doubts the value of early weaning and enzyme feeds.

Criticism

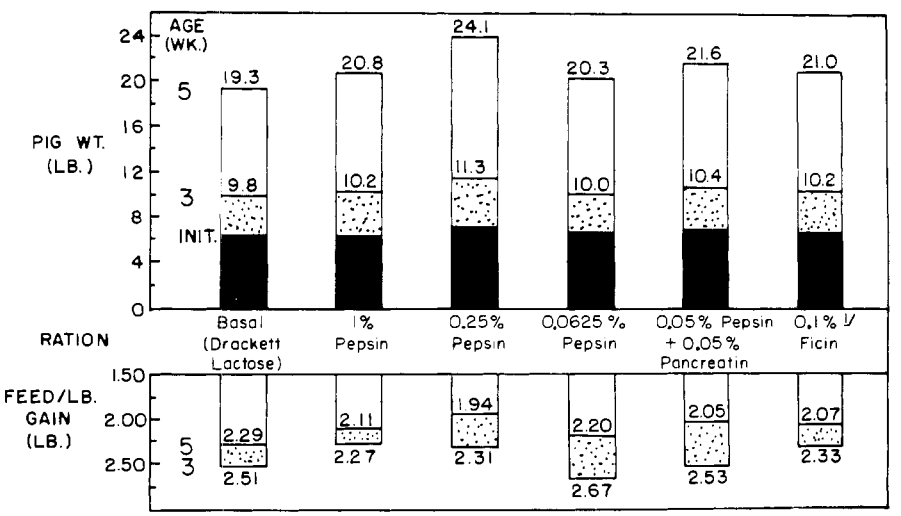
The doubters would seem to have good reasons for their apprehensions. A dozen or more agricultural stations have tried duplicating Catron's work on enzymes, nearly all without success. The full explanation of this unique discrepancy can't be made with the facts now in hand, but until more is known Catron offers some plausible assumptions.

First, believes Catron, the best possible basal diet is needed for enzyme studies. If the basal diet is deficient in certain nutrients then the limiting factor is not necessarily enzymes but specific required nutrients instead. Another variable is the rate of food passage through the intestinal tract. Two of Catron's experiments have shown better response to enzymes with faster food passage. Under sterile laboratory conditions the food remains in the system longer, thus allowing proper digestion even if there is a shortage of enzymes. Catron is concerned, of course, about the lack of agreement between his work and that of others, and with his associates is pursuing research to find out more about the variables.

Pepsin as a commercial product is an old, established material. Extracted from the linings of hog stomachs, it has been sold for pharmaceutical and industrial uses for over 70 years. Pig feeds present a promising new use, so the work that is going on is being watched by many. One industry man estimates the potential market for pepsin in pig feeds at 3000 tons annually.

Whether much of that potential will ever be realized is still open to question. But as the prospect is viewed by one of the researchers who was not able to duplicate Catron's work, "the enzyme story is just now beginning to unfold. If through concentrated research effort we are able to find the key, a whole new concept of livestock feeding will be revealed."

Basic baby pig ration of Drackett protein and lactose is made more effective by adding enzymes. Pepsin, at 0.25%, gave the best results in this Iowa State test



Pesticide Sulfur

While gradually losing out to the newer pesticides, sulfur still serves a large-tonnage market

One of the oldest pesticides known, elemental sulfur has for years been used in bigger tonnages than any other insecticide or fungicide. But its role is declining.

Rapid advances in synthetic organic pesticides have cut sharply into sulfur's markets. Back in 1950, sulfur production for pesticidal use exceeded 535 million pounds. By 1954, it had dropped to about 315 million. Estimates are that last year's production fell below 300 million. Industry observers expect a slow, gradual drop-off in elemental sulfur's pesticidal use in the years ahead.

Twenty years ago, a list of agricultural chemicals would have included relatively few materials—sulfur, lime-sulfur, arsenicals, copper compounds, and a handful of others. Since then, there has been an upsurge of dozens of new organics—materials often aimed directly at markets served by sulfur. Some of these are sulfur-containing compounds, such as thiocarbamates and thiophosphates.

In specific applications, many of the newer materials are clearly superior to sulfur. They're effective against more types of pests. They're effective at much lower concentrations (a cotton dust containing 40% sulfur might be replaced by one with only a few per cent of a more potent organic). In addition, the newer materials may have no adverse effect on the plant itself or on crop yields. They may be less sensitive to weathering, and their action may be less

dependent on temperature. Unlike sulfur, some of the newer compounds are capable of acting systemically.

Another big advantage of the newer organics is that they can be formulated as sprays for easy application by airplane. For example, in treating cotton by aerial application, low-volume sprays can often be more economical than high-volume dusts, such as those based on sulfur. Furthermore, fewer sprayings may be required with the newer, more toxic materials.

Yet sulfur continues to find large-scale markets. If used properly in a recommended application, it is effective, safe, and easy to use. It's readily available and cheap. It is also compatible with other pesticides. Insects don't tend to become resistant to it. Buildup in the soil can be tolerated. Furthermore, sulfur has a long tradition of use; farmers know how to handle it.

Large-Scale Applications

Today, the biggest farm use for sulfur is as an insecticide and fungicide. In dusts and sprays, sulfur is consumed in large tonnages on cotton, citrus, apples, peaches, plums, grapes, peanuts, ornamentals. In Florida and California, it controls rust mite, thrips, and gray scale on citrus. In the South, it helps control spider mites and fleahopper on cotton and leaf spot on peanuts. In many parts of the country, it eradicates powdery mildew and scab on apples and other crops.

Along the West Coast, sulfur is the time-honored means for preventing powdery mildew on grapes. In many areas, it's used against brown rot on peaches, plums, and cherries. Also important, sulfur is effective against potato leafhopper and bean thrips, as well as russet mite on tomatoes.

With the advent of the new organic pesticides, many farmers went overboard and completely eliminated sulfur from their sprays. In some cases, this was obviously a mistake. In the East, some apple growers found that failure to use sulfur led to a sudden outbreak of powdery mildew. Apple growers are now being urged to include not only captan, ferbam, and zineb in their early-season sprays, but also sulfur.

Yet in many cases, sulfur is definitely losing out to the newer pesticides. In place of sulfur, farmers are using parathion, methyl parathion, malathion, and Sulphenone to control spider mites on cotton. Instead of sulfur, they're using DDT, endrin, and toxaphene to destroy cotton fleahopper. They're using captan, Aramite, Systox, ferbam, nabam, and chlorobenzilate on apples, peaches, and other fruit.

In some Southeastern states, sulfur now is no longer recognized as an active ingredient in pesticide formulations. In some dusts, sulfur is regarded primarily as a diluent or carrier for DDT, BHC, lindane, and other insecticides.

Demand for Finer Forms

Once widely used by grape growers along the West Coast, "flowers of sulfur" was one of the earliest forms of agricultural sulfur available in the U. S. As a major disadvantage, however, this material is relatively coarse. Smaller particles adhere more firmly to plants and provide greater coverage per unit weight of material. Furthermore, sulfur has greater fungicidal and insecticidal properties if it is more finely subdivided. Greater surface area promotes the formation of sulfur vapor—although the exact mechanism of sulfur's pesticidal action is not fully understood.

The once fast-increasing demand for finer grades spurred the development of a whole range of sulfurs. Farmers can now choose from among sulfurs that are ground, colloidal, micronized, or produced by flotation or other processes—all in a variety of particle sizes. The preferred material depends on the application.

Today, the most widely used sulfur is a dusting material of intermediate fineness (at least 93% passing through a 325-mesh screen) and containing a conditioning agent to promote dustability. Also in large demand are wettable sulfurs of subsieve fineness (with a surface average diameter of 5 microns).

To promote wettability and adhesion, agricultural sulfurs frequently contain special additives or are fused with inert carriers. Dextrins, calcium caseinate, or synthetic organic compounds act as wetting agents. Adhesion is promoted by glue, sulfite liquor, or other materials. To enhance effectiveness and versatility, sulfur is frequently mixed with other fungicides and insecticides.

Additional Applications

On a more limited scale, sulfur finds other uses. It's added to the soil to overcome excessive alkalinity or destroy harmful soil microorganisms. It's also added as a plant nutrient to sulfur-deficient soils. It's burned in enclosed areas to form sulfur dioxide for preserving cut, dried fruit. It's boiled with lime to produce calcium polysulfides for lime-sulfur sprays.

Foremost among the producers of agricultural sulfurs is Stauffer, which is also the world's largest purchaser and refiner of sulfur. Also prominent among U. S. companies supplying agricultural sulfur are Food Machinery & Chemical, Olin Mathieson, California Spray-Chemical, Pittsburgh Plate Glass, Sunland Industries, Florida Agricultural Supply, U. S. Phosphoric, and others. The South alone has dozens of small grinders and formulators of sulfur dusts and sprays.

For many growers, sulfur is still the backbone of their pest control programs. Says one industry spokesman: "Sulfur will always be a major agricultural chemical as long as it remains a low-cost material. . . . Long after many of its present competitors have been displaced by other newer materials, sulfur will still be enjoying most of its present markets."

Fertilizer Use, 1955-56

USDA report spots shifts in fertilizer product use. In last year's buyers' market, higher analysis items got farmers' nod

CHOICE OF A PRODUCT LINE could well make the difference between growth or standstill, even between profit and loss, for fertilizer dealers and manufacturers trying to survive a consumption downturn and fierce competition. Some help in adjusting the product to the geographical area in which they operate is available in the annual Scholl-Wallace-Fox-Crammatte report on fertilizer consumption in the U. S. (released recently by USDA). The final report for 1955–56 shows up some interesting shifts in usage.

- Of all the direct-application materials containing nitrogen, increases in use were registered only for anhydrous and aqua ammonia, the ammonium phosphates, and urea.
- In phosphates, the only direct-application materials that showed gains were phosphate rock, basic slag, and the ammonium phosphates.
- In mixtures, 5-10-10 displaced 3-12-12 from the top of the best-seller list, the latter having held the lead for six consecutive years. Four ratios (1-4-4, 1-2-2, 1-1-1, and 1-3-3) ac-

counted for 50.6% of the total mixtures sold. Fifteen grades accounted for 62.5% of the total tonnage of mixtures.

Direct-Application Materials

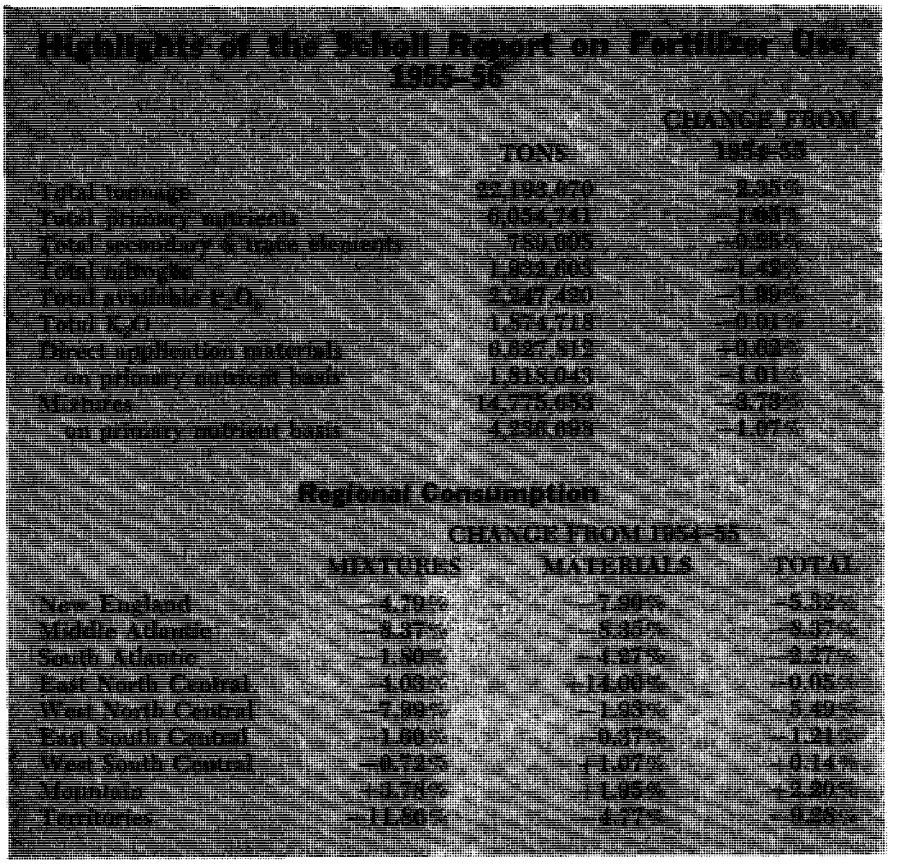
Making up the more than 6.5 million tons of direct-application materials were: 3,271,952 tons of chemical nitrogen materials; 2,478,315 tons of phosphate materials (which includes the ammonium phosphates); and 404,839 tons of potash materials. Nitrogen materials slipped from the 1954–55 consumption level by 1.8% (on a primary nutrient basis) and phosphates (on an available P_2O_5 basis) by 0.05%. Potash consumption (on a K_2O basis) was up 1.24%.

Compared with the previous year, the principal changes in consumption of the chemical nitrogen materials in 1955–56 were increases in the tonnage of urea (35%), aqua ammonia (34%), and anhydrous ammonia (18%). The largest increases in urea use were in the East North Central, West South Central, Mountain, and Pacific Regions, which together accounted for 73% of the 92,373 tons of urea sold throughout the U. S. and Territories. Most of the increase in aqua ammonia was in the Pacific region, which took 77% of the total 309,948 tons. Increases in anhydrous consumption were mostly in the Pacific and South Central Regions, which combined took nearly 60% of the total 418,454 tons.

Phosphate rock was the only phosphate material that showed a large increase in consumption (330,812 tons, or 57%). Nearly all of it went into Illinois and Missouri, which took 85% of the 27,737 tons (on an available P_2O_5 basis). Traffic in ammonium phosphate materials of all kinds increased 23,011 tons. DAP tonnage increased from 1508 tons in 1954–55 to 7523 (on an available P_2O_5 basis) in 1955–56. DAP tonnage for use in mixtures and direct application was 13,854. Use of basic slag increased by 20,882 tons. Superphosphate containing 22% P_2O_5 or less fell 11% to 122,500 tons (on an available P_2O_5 basis) for direct application. Superphosphates containing more than 22% P_2O_5 decreased 5% or 12,217 tons for direct application use.

Among the individual potash materials used for direct application, 58 to 62% grades showed the largest increase in quantity (10%, to a total of 309,230 tons).

In 1955–56 for materials containing only nitrogen, P_2O_5, or K_2O, the respective national weighted average primary nutrient contents were 32.35, 16.55, and 55.64%, compared with 31, 19.37, and 54.56 in the previous year. The increase for nitrogen and potash reflects greater use of higher analysis materials, whereas the decrease for phosphate materials was caused by the big jump in use of phosphate rock, which averages only 3% available P_2O_5.



Highlights of the Schell Report on Fertilizer Use, 1955–56

	TONS	CHANGE FROM 1954–55
Total tonnage	22,198,070	−2.35%
Total primary nutrients	6,054,781	−1.80%
Total secondary & trace elements	780,605	−0.25%
Total nitrogen	1,832,603	−1.43%
Total available P_2O_5	2,547,420	−1.99%
Total K_2O	1,674,718	−0.01%
Direct application materials	3,027,812	+0.02%
on primary nutrient basis	1,915,043	−1.01%
Mixtures	14,775,053	−3.78%
on primary nutrient basis	4,356,028	−4.07%

Regional Consumption

	CHANGE FROM 1954–55		
	MIXTURES	MATERIALS	TOTAL
New England	−4.79%	−7.90%	−5.32%
Middle Atlantic	−8.37%	−5.85%	−8.37%
South Atlantic	−1.80%	−4.27%	−2.27%
East North Central	−4.09%	+14.60%	−0.05%
West North Central	−7.09%	−1.93%	−5.40%
East South Central	−1.80%	−0.47%	−1.21%
West South Central	−0.72%	+1.07%	−0.14%
Mountain	+3.78%	+1.05%	+2.20%
Territories	−11.80%	−4.77%	−9.25%

Mixture Use

Mixed fertilizers accounted for 66.58% of the total quantity of fertilizer used. In 1954–55, mixtures accounted for 67.54% of the total, and the five-year average for 1949 to 1954 was 67.28% of the total. Mixed fertilizer use went down in every region of the country except the three Pacific states, which took a total of 3.78% more mixed fertilizer in 1955–56 than in 1954–55.

There were 1536 grades reported, 171 of which accounted for 96% of the total mixed fertilizer tonnage. The weighted average guaranteed nutrient content of the 15 best-selling grades was 4.8% nitrogen, 12.12% P_2O_5, and 11.3% K_2O, for a total of 28.22%. In the previous year, the averages were 4.51%, 11.80%, and 10.86% (for a total of 27.17%). For all grades sold, the national weighted average in 1955–56 was: 5.39% for nitrogen; 12.08% for P_2O_5; and 11.20% for K_2O—for a total nutrient content of 28.67%. Corresponding values for the year before were 5.24, 11.86, 10.80, and 27.90% respectively.

Among some of the grades that made big strides were 4-12-12, 5-20-20, 12-12-12, and 14-14-14. The 4-12-12 grade jumped from eighth to third place on the best-seller list with an increase of 235,000 tons for a total sale of 737,215 tons. Over 500,000 tons of that total was used in Georgia. Leaping from seventh to fourth place in the line-up was 5-20-20, registering a 135,000-ton increase for a total of nearly 700,000 tons. Now eighth on the list is 12-12-12, sales of which were over 500,000 tons, compared with about 307,000 in the year before. Some 130,000 tons of the increase went into the East North Central area. Not yet on the list of the top 15 is 14-14-14, sales of which, however, climbed 30% to a total of nearly 44,000 tons.

For the Future

Sales performance last year for the various mixtures and materials indicates that farmers are convinced of the value of high-analysis materials. In general it was these materials that showed gains (the outstanding exception being phosphate rock), although the over-all use of fertilizer was down. The materials that failed to hold their own and suffered the most were lower-analysis items.

Pesticide Situation

Prospects for this year warrant expectation that production will be maintained at high levels

PRODUCTION OF PESTICIDAL MATERIALS during 1956 was greater than ever before. So say preliminary figures in the newly-released USDA report "The Pesticide Situation for 1956–57," prepared by Harold H. Shepard. Result of the high production rate is that, although pesticide exports and domestic disappearance were higher than in 1955, manufacturers' over-all stocks at the end of 1955–56 were greater than in the previous year.

The annual survey conducted by USDA in cooperation with the National Agricultural Chemicals Association indicates that primary producers' inventories of technical chemicals, which had been about the same in 1955 as in the previous year, rose appreciably in 1956. For example, 28 firms that reported their stocks in both 1955 and 1956 had increased their holdings from 55.9 million pounds in 29 categories on Sept. 30, 1955, to 95.3 million pounds of the same compounds on Oct. 1, 1956—a rise of 71% during the crop year. Total pesticide inventories of all types had mounted to 213 million pounds, a rise of about 46% over the total reported the previous year. (In the latter case, however, the rise does not reflect a comparison of the same companies and compounds over the two years.)

DDT Still Heads List

Among insecticides, DDT continued to show the largest production, export, inventory, and domestic disappearance figures, although some inroads have been made in the domestic market by calcium arsenate and the phosphorus insecticides.

A large increase in the boll weevil population of the cotton states, reported in the 1955–56 survey, was attributed at least partly to the postulated build-up of resistance on the part of the pests against the chlorinated hydrocarbon compounds. Growers' fear of such resistance is reflected in the 1955–56 consumption figures, which show a 20-million-pound domestic disappearance at the producers' level for calcium arsenate alone, compared with only 3.8 million pounds in the previous year. Further, the organic phosphorus compounds experienced an upswing in use as cotton insecticides. Use of methyl parathion, for example, increased about tenfold over the year before.

Clearly, while the general market for chlorinated hydrocarbons continues to expand, a definite trend to the use of other products in the weevil areas has resulted in expansion's proceeding at a lower level than would otherwise be expected. Manufacturers, alert to the situation, are expected to expand production of calcium arsenate and the organophosphorus compounds in 1957, and several new producers are about to enter the field.

Production of benzene hexachloride was greater last year than in any year since 1952. Preliminary estimates place output at 14.4 million pounds, gamma basis, compared with 10.7 million pounds in 1955. Producers' inventories at the end of the season were higher than in previous years, and exports dropped off in the crop year 1955–56; however, domestic disappearance showed an increase to a level greater than in the past several years. Actual consumption is estimated at about 9 million pounds, gamma basis.

Production of aldrin, chlordan, dieldrin, endrin, heptachlor, and toxaphene as a group was 80.4 million pounds in 1955–56, compared with 64.0 million pounds in 1954–55. Here, the gain is attributed partly to the increasing use of aldrin and heptachlor in the corn belt for soil insect control. In Illinois, Iowa, and Nebraska, nearly 10% of the 25.7 million acres planted in corn was treated with soil insecticides. Nearly 60% of the treated acreage in Illinois and Iowa received the insecticide in mixtures with fertilizer.

Lead arsenate suffered a decline of about 20% in production, and sales of cryolite for control of sugarcane borer in Louisiana dropped below 100,000 pounds. As recently as 1953, Louisiana cryolite sales totaled 1.9 million pounds.

This Year's Prospect

Plans for large-scale spraying of timber lands against spruce budworm, black-headed budworm, and gypsy moth should assist in maintaining this year's insecticide market at least at the 1955–56 level. Canada is planning the most extensive control operations ever attempted on the North American continent. Attacks on the spruce budworm will be made on about 5 million acres in New Brunswick and about 1.5 million acres on the Gaspe Peninsula, while about 150,000 acres of Vancouver Island will be sprayed against black-headed budworm.

In the United States, continuing control operations will include spraying about 750,000 acres in Montana, and possibly 500,000 acres in northern Idaho, against spruce budworm. A 3-million-acre spraying program is well under way in a Federal-state effort to control gypsy moth on forest lands in parts of New York, New Jersey, and Pennsylvania. Michigan will spray 31 square miles in two counties this year in its effort to control gypsy moth; in 1958 it plans to extend the program to cover adjacent areas.

In addition to the timber land program, efforts to halt the spread of the imported fire ant and the spotted alfalfa aphid call for concentrated programs of control and eradication. The alfalfa aphid, first found in this country in 1954 and now present in at least 30 states, has caused heavy reduction in alfalfa yields. Malathion and parathion were the materials most commonly used in 1956 to combat the aphid. There have been many suggestions for a publicly supported control program against the fire ant, with heptachlor, dieldrin, chlordan, and aldrin recommended.

Reduction of the European corn borer larvae population has taken place in North Central states, but the eastern states have experienced a buildup, with heaviest concentrations in Rhode Island, Long Island, New Jersey, Delaware, and Pennsylvania.

Copper Sulfate Losing Ground

In the field of the fungicides, the synthetic organics (e.g., captan, ferbam, glyodin, zineb) seem to be coming increasingly into use, at the expense of copper sulfate. Average yearly consumption of copper sulfate over the three years previous to 1956 was about 37 million pounds, but last year only 28.1 million pounds was consumed for agricultural purposes.

Herbicide production in recent years has been one of the most rapidly expanding activities of pesticide manufacturers. Compared with agricultural insecticides and fungicides as one group and with household insecticides and repellents as another group, weed killers accounted for 13% of the dollar value of total pesticide shipments in 1954, an increase from 7% in 1947. Among the herbicides, sodium chlorate last year showed the largest tonnage gains in production, while 2,4,5-T production was at its highest since 1953. Production of 2,4-D was appreciably less than in 1955.