Ag and Food Interprets . . .

- Fish farming is catching on in the South, may spread to Midwest
- Symphilids—near relatives of insects—do great damage to truck crops
- Preliminary returns show drop in 1957–58 fertilizer tonnage
- Bulging harvests push soilless farming into background
- Industry committee and control officials sponsor Magruder sample work

Fish Farming

Fertilizing fish ponds sets off a chain reaction that can quadruple the average catch

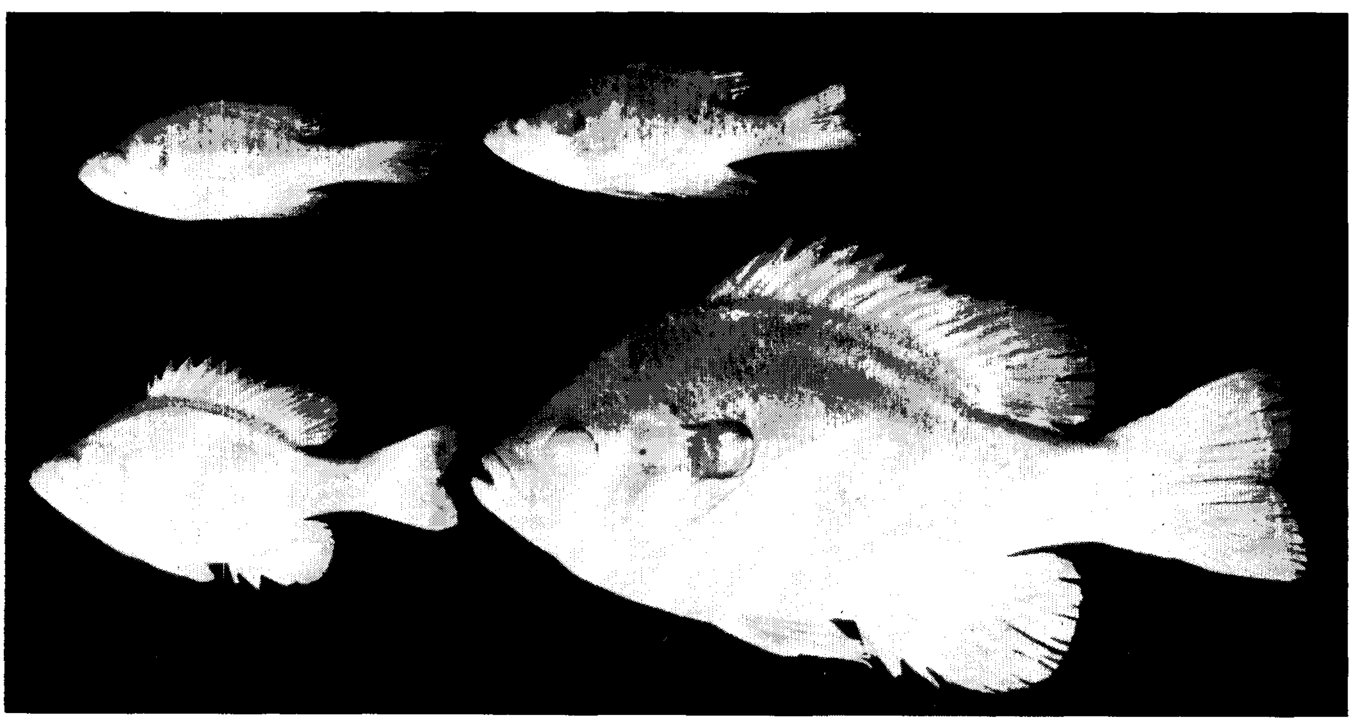
HERE's some good news for anglers: fertilizing ponds to grow more and bigger fish is still growing in the South. And the idea may well spread into the Midwest and Far West, although it is not likely to get much play in the Northeast. This is good news for fertilizer producers, too, for it offers another growing market—and one that can take up off-season slack in production.

Adding fertilizer to ponds favors the growth of microscopic water plants, and increases the amount of food in the water. Actually the fish don't eat the fertilizer, but grow instead as the end result of a chain reaction. Fertilizers provide the plant nutrients which promote the growth of water plankton—the small forms of plant life found in ponds. Fertilizers cause these plants to increase in great numbers, making fish food plentiful. Insects that feed on the plants also help fatten fish.

Fertilizing fish ponds is akin to fertilizing soils. No special formulas are needed for ponds, since most commercial fertilizer types, such as 10-10-5, 12-12-4, or 8-8-2, are often suggested. (Mutual Fertilizer, however, markets its Hydro-Pak especially for pond fertilization. It is a high-concentration fertilizer.) The type of fertilizer used varies with conditions in individual ponds; each must be studied to determine nutrient needs in the same way soils are evaluated.

Pond fertilizer is usually applied from early spring through fall. The amount added varies widely, and runs anywhere between 400 and 1200 pounds per acre, added in 100-pound increments during the season. A farmer can tell when the right amount of fertilizer has been added by the appearance of the water. It should take on a greenish brown color. Another way is to put his arm in the water up to the elbow. If the farmer still sees his hand, not enough fertilizer. The water, by the way, remains safe for swimming, and filtra-

The two bluegills on top are the size used for stocking ponds. On the bottom are bluegills one year later, the left one from an unfertilized pond, the one on the right from a fertilized pond



Adding fertilizer to fish ponds may put an end to the picture of the lazy angler. An average catch from fertilized ponds runs about 200 pounds of fish per acre per year, compared with 50 pounds from a natural, unfertilized pond

tion makes it safe for domestic purposes.

Farmers build ponds in most cases as part of water and soil conservation programs. They stock them with fish—usually bluegills and bass for recreational purposes, in the ratio of 1000 to 100 per acre. State and federal hatcheries often provide young fish without cost.

Fish, like crops, should be harvested if the owner wishes to maintain a balanced pond. It is desirable to remove about 50% of the fish annually, and an ideal way to do this is to sell fishing rights. What fisherman would turn down the chance to fish in a pond that is known to have fish? When ponds are stocked and fertilized the fish are there; hence fish-right selling has blossomed in the South. It is a neat way for a farmer to pick up a secondary income. Some farmers even rent rowboats to fishermen.

An average catch from fertilized ponds runs about 200 pounds of fish annually per acre, compared to less than 50 for natural or unfertilized ponds. Such hauls are good for morale; capitalizing on this observation, some firms maintain ponds as part of their employee relations programs.

In Arkansas, fish farming is a commercial business. Rice farmers there rotate fish with rice crops every two years. Common practice in Arkansas once called for rotating rice crops with soybeans, oats, or cotton every two or three years. These crops were not as profitable as rice, and most gains from them took an intangible form, such as reducing weeds and grasses and in general improving the soil for the next rice crop.

Fish farming offered a way to increase direct income, and with demand for rice declining, the idea took on still greater financial appeal. Farmers at Lonoke even formed the Arkansas Fish Farmers' Cooperative to market the fish so produced—bass, goldfish, minnows are examples.

Commercial fish farming has boomed in Arkansas, but has not yet gone too far elsewhere. Some feel the commercial use of ponds—both for raising marketable fish and for the sale of fishing rights—is still in its infancy. The baby seems to be doing all right, with the fish farming business already grossing an estimated $20 million annually.

Biggest problem, though, is sustaining interest. Where farmers are doing reasonably well in other pursuits, they may not be inclined toward fish farming as a source of income. But where conventional farming is not paying well, fish farming can often be a way to more profitable farm operations.

Fertilizing ponds, however, like other farm practices, must be tied into a sound management program. Without careful management, pond fertilization may simply increase survival of large numbers of fish, rather than stimulate their growth. Thus it can lead to growing large numbers of very small fish. Poor results can occur also if the farmer simply uses what fertilizer is available on the farm. Many state agricultural stations have made recommendations for their own areas and have, in many cases, also prepared booklets which discuss pond building and fertilization methods.

Symphilids

Wanted: a chemical to give better control

EVERY SO OFTEN, farmers run across a pest which no commercial chemical will control well, but which does not do enough damage on a national scale to warrant spending much development money on chemicals for control. Such a pest is the symphilid—better known (although incorrectly) as the garden centipede.

Symphilids are near relatives of insects, entomologically, but they are enough different that chemicals tailored to control insects do not always work well against them. No one knows exactly how much damage symphilids do in a year, but it is probably tens of millions of dollars. In Oregon and Washington alone, for example, losses from symphilids are estimated at about $3 million annually. Other states throughout the country have their problems with these pests, although on a smaller scale than in the Northwest.

Damage from symphilids is greatest on the West Coast because there are so many truck farms there. In Oregon, symphilids are classed as the fourth most important crop-and-forest-insect pest, and the number one root-nibbling enemy of vegetables and small fruits. In California, although they do not rank that high, they do cause significant damage, particularly in the rich farming area between San Francisco and Sacramento.

These "centipedes" (they actually have only 12 pairs of legs) eat asparagus at a great rate, and are fond of strawberries, corn, beans, cabbage, and other crops—even Easter lilies—as well. They stay in the soil through all their life cycles, the depth of their penetration depending on the temperature, moisture content, and amount of food. In summer they are mostly within a foot of the surface, but in winter they can and often do go down as far as six feet. They are particularly damaging to asparagus since fields are kept in that crop for at least eight years and often up to a dozen or more, giving the symphilids a long time to multiply under conditions of plentiful food supply.

Many chemicals will kill symphilids in a treated area. Unfortunately, other individuals can readily move in from nearby untreated areas or from depths in the soil to which the treating chemical did not reach. USDA researchers have noted instances of symphilids' moving 30 feet or more to reinfest a treated area.

Whole Farms Should Be Treated

As a result, one major need in treating against symphilids is to treat as large an area as possible, such as a whole farm, to slow down the rate of reinfestation. As for chemicals, most authorities prefer soil fumigants. They also prefer that a fumigant be not specific against symphilids but be lethal to many other soil pests, such as nematodes, wireworms, white grubs, and rootworms, as well.

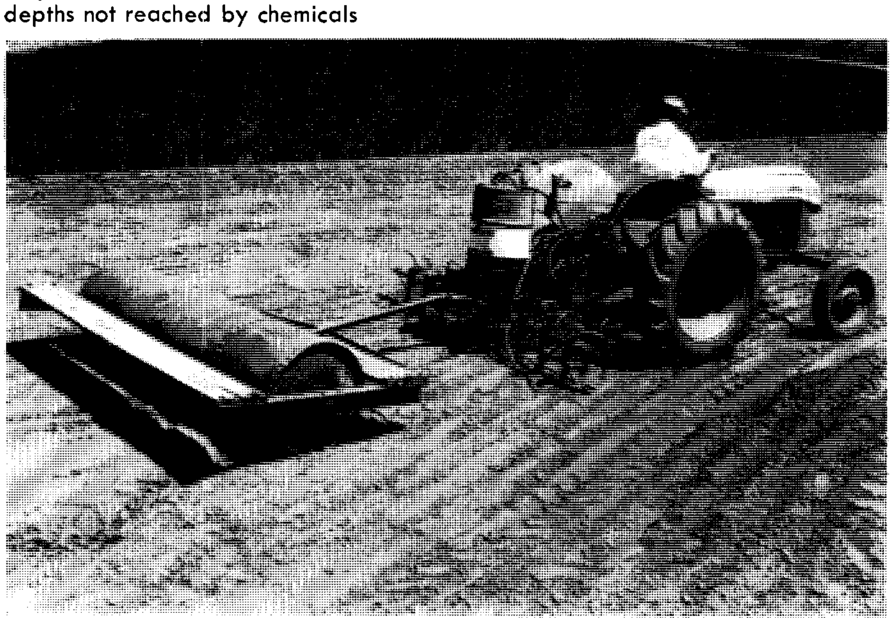
Thus, most chemicals now in use against symphilids are nematocides—Nemagon, Telone, for example—or broad spectrum fumigants such as Vapam and ethylene dibromide. Others work, too. Parathion gives good control in some cases but does not last long enough for many uses; lindane lasts long enough for many, but imparts an off-flavor to some root crops grown in the treated soil. In greenhouses one of the favored treatments uses no chemicals at all—the soil is sterilized with steam.

Another point: all stages in the life cycle are present in a symphilid population, since the pests breed more or less continuously. Control is therefore based more on their movements in the soil (hit them in the summer when most of them are near the surface) than on catching a susceptible stage in the life cycle (there doesn't seem to be any particularly susceptible stage).

The picture, then, is neither all good nor all bad. Presently available chemicals and techniques give some measure of symphilid control—better in some areas than in others. But there is still much damage being done to crops. USDA claims, in fact, that the extent of the damage they actually do will not be known until regular soil treatments—like those now made for wireworms and other soil pests—are made against symphilids.

To bring that day closer, USDA is screening new chemicals now at its Farmingdale, Long Island, laboratory (no results ready for publication). What it is looking for: a material which can be applied on a growing crop or at planting time; a material which will control other soil pests, too. Such a chemical would, USDA feels, be much better accepted than a control for symphilids alone.

Vapam is one of the nematocides that give some control against symphilids, but they move back into treated area from those areas left untreated or from soil depths not reached by chemicals



Fertilizer Use, 1957–58

Early returns indicate slight slip in total tonnage, with most of decrease in the South. Primary nutrient use gains

EARLY RETURNS indicate fertilizer use dropped 1.5% to a total of 22,358,000 tons in the year ended last June 30. These preliminary figures come from USDA's Walter Scholl, who annually polls fertilizer manufacturers to keep tabs on fertilizer use in the U. S. and territories. All of the drop occurred in mixed fertilizers, which showed a decrease of 3.1% to 14,252,000 tons; direct application materials, on the other hand, increased 1.2% for a new high of 8,106,000 tons.

On a primary plant nutrient basis, however, total fertilizer use actually showed a small upswing of 1.4%, to 6,465,000 tons.

More than half of the decrease in fertilizer consumption (on a tonnage basis) was accounted for by decreases in the South Atlantic and East South Central states, and the territories. Most states in the northeastern, north central, and western sections of the country used more fertilizer in 1957–58 than they did in 1956–57.

The Mixture Picture

Consumption of mixed fertilizers increased 160,000 tons in 25 areas and decreased 611,000 tons in 26 areas. Areas in which the principal increases and decreases occurred matched closely with those areas having corresponding changes in consumption of all fertilizer.

Fifteen grades represented 64% of the tonnage of mixed fertilizers consumed in the continental U. S. They are, in order of tonnage consumed: 5–10–10, 4–12–12, 5–20–20, 4–16–16, 10–10–10, 3–12–12, 12–12–12, 3–9–9, 5–10–5, 6–12–12, 5–10–15, 4–10–7, 2–12–12, 0–20–20, and 6–8–8. Of these, 14 also were the grades used in largest tonnage in 1956–57 (grade 3–9–6 having been replaced in the top 15 by grade 5–10–15). Although tonnages of these individual grades changed, the combined total of these 14 was nearly the same in both years (8,651,000 tons in 1957–58 and 8,703,027 tons in 1956–57) and represented over 60% of the consumption in each year. In every region except the Mountain and Pacific states, the tonnage of the 15 grades listed represented over 30% of the total tonnage of mixed fertilizers consumed. In the Mountain and Pacific states, the trend is to grades having generally less potash than shown by the average of these 15 grades.

Direct Application Materials

In 32 areas, consumption of materials for direct application was 463,000 tons higher and in 19 areas 363,000 tons lower than in 1956–57. Use of materials increased in all states

Kinds of Fertilizers Consumed, Year Ended June 30, 1958, by Region, in 1,000 Tons[a] (Preliminary)

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Territories	Total: Consumption	Total: Change from Year Ended June 30, 1957
Mixtures	379	1722	4586	3285	1191	1778	630	75	381	225	14252	−451
Chemical Nitrogen Materials	13	71	725	363	489	523	449	231	861	116	3841	135
Ammonia, anhydrous	...	3	22	57	139	51	140	41	122	2	577	124
Ammonia, aqua	...	...	...	[b]	8	...	5	31	289	51	384	3
Ammonium nitrate[c]	7	30	126	134	243	285	106	62	103	...	1096	−9
Ammonium sulfate	1	6	11	97	12	11	98	57	227	53	573	57
Nitrogen solutions	1	4	83	59	82	9	25	7	47	...	317	71
Sodium nitrate	1	9	239	1	[b]	130	49	[b]	[b]	[b]	429	−64
Urea	1	3	4	11	4	1	19	19	27	10	99	−10
Other[d]	2	16	240	4	1	36	7	14	46	[b]	366	−37
Natural Organic Materials	25	36	21	38	12	2	8	5	321	[b]	468	−12
Dried manures	5	13	4	6	4	1	3	1	260	[b]	297	3
Sewage sludge, all	7	14	8	29	8	1	3	4	55	[b]	129	−2
Tankage, all	2	8	4	[b]	[b]	...	...	...	1	...	15	−4
Other[d]	11	1	5	3	[b]	...	2	[b]	5	...	27	−9
Phosphate Materials	33	85	104	727	557	248	217	176	251	13	2411	−5
Ammonium phosphate[e]	...	1	2	14	149	4	91	76	135	2	474	74
Basic slag	...	...	20	...	...	132	3	...	...	...	155	−8
Phosphate rock & colloidal phosphate	[b]	7	18	565	218	18	18	[b]	[b]	3	847	11
Superphosphate: 22% and under	32	70	50	58	42	75	59	16	72	5	479	−81
Superphosphate: Over 22%		3	6	75	132	6	43	73	28	3	369	−5
Other[d]	1	4	8	15	16	13	3	11	16	...	87	4
Potash Materials	4	8	79	191	45	49	31	2	13	13	435	−26
Potassium chloride	2	5	35	187	45	41	29	2	6	11	363	−13
Other[d]	2	3	44	4	[b]	8	2	[b]	7	2	72	−13
Primary Nutrient Fertilizers	454	1922	5515	4604	2294	2600	1335	489	1827	367	21,407	−359
Secondary & Trace Nutrient Materials	[b]	5	98	3	3	5	4	44	776	2	940	−3
Gypsum	[b]	4	96	2	...	2	...	35	743	[b]	882	−9
Other[d]	[b]	1	2	1	3	3	4	9	33	2	58	6
Not Classified	1	0	1	0	1	0	2	0	6	0	11	...
All Fertilizers	455	1927	5614	4607	2298	2605	1341	533	2609	369	22358	−351

[a] Because of rounding, totals of items may not add to column or class totals.
[b] Less than 500 tons.
[c] Minor quantities may have been used for other purposes than fertilizer.
[d] Includes quantities undesignated by kind.
[e] Includes all grades: 11–48, 11–50, 13–39, 16–20, 20–52, 21–53, and 27–14 reported.

of the New England and East North Central region and most states in the West North Central, Mountain, and Pacific regions. Decreases were recorded in most of the southeastern and South Central states and in the territories.

Nitrogen Use Increases

Chemical nitrogen materials were the only class of materials that showed an increase in 1957–58. Their total was 3,841,000 tons, up 135,000 from the previous year. Use of anhydrous ammonia increased 124,000 tons for a total of 577,000 tons; nitrogen solutions were up 71,000 tons to 317,000 tons; and ammonium sulfate was up 57,000 tons to 573,000 tons. Use of anhydrous and nitrogen solutions increased in all regions in which they are used except in the East South Central, while ammonium sulfate increased in all regions except the territories. Use of other nitrogen products was generally lower than in the previous year.

Total use of natural organics decreased 12,000 tons to a total of 468,000 tons, but dried manures increased 3000 tons to 297,000 tons.

Ammonium phosphate and phosphate rock (including colloidal phosphate) were the only phosphate materials which showed increases. Total phosphate use in direct application materials decreased 5000 tons to 2,411,000 tons. Ammonium phosphate materials were up 74,000 tons to a total of 474,000 tons; phosphate rock (including colloidal phosphate) increased 11,000 tons to 847,000 tons. Superphosphate (of the 22% and under variety) dropped 81,000 tons for a total use of 479,000 tons, while higher grades of super showed a loss of 5000 tons for a total use of 369,000 tons.

The consumption of potash materials decreased 26,000 tons altogether, and was lower in every region.

Primary Plant Nutrients

The 6,465,000 tons of primary plant nutrients consumed in 1957–58 consisted of 2,264,000 tons of nitrogen, 2,280,000 tons of available P_2O_5, and 1,921,000 tons of K_2O. These quantities represent an increase of 129,000 tons (6.0%) for nitrogen, and decreases of 24,000 tons (1.0%) for available P_2O_5, and 17,000 tons (0.9%) for K_2O. Although the total tonnage of fertilizers carrying primary nutrients was 359,000 tons below consumption in the preceding year, the lower tonnage contained 88,000 tons more primary nutrients than the larger tonnage in 1956–57. This increase was due to the greater use of the chemical nitrogen materials.

The total consumption of primary nutrients contained in mixed fertilizers amounted to 4,313,000 tons, comprised of 848,000 tons of nitrogen, 1,789,000 tons of available P_2O_5, and 1,676,000 tons of K_2O. These quantities represent 4000 tons (0.5%) more nitrogen, 28,000 tons (1.5%) less available P_2O_5, and 6000 tons (0.4%) less K_2O. Materials used for direct application contained 1,416,000 tons of nitrogen, 491,000 tons of available P_2O_5, and 245,000 tons of K_2O. These quantities represented increases of 125,000 tons (0.7%) for nitrogen and 4000 tons (0.8%) for available P_2O_5, and a decrease of 11,000 tons (4.3%) for K_2O.

The weighted average of the primary nutrients contained in mixed fertilizers was for nitrogen, 5.95%; for available P_2O_5, 12.55%; for K_2O, 11.76%; and for the total of those nutrients, 30.26%. The corresponding values in the preceding year were 5.74%, 12.36%, 11.44%, and 29.54%.

Nutriculture

Once-popular methods of growing crops without soil have lost their charm in the bulging harvests of the past decade

Nutriculture includes several methods of growing plants without soil—water culture, aggregate culture, and adsorbed nutrient technique.

- **It is not a new method.**
- **It requires knowledge of plant physiology.**
- **Commercial application is practical under limited conditions.**

Nutriculture is seldom superior to soil culture. These features are the same for growing crops, with or without soil:

- **Yields**
- **Nutritional quality**
- **Plant spacing and growth**
- **Water requirements**
- **Climatic requirements**
- **Insect and disease attacks**

TODAY it is hard to find a commercial producer of farm products who does not grow his plants in soil. Some vegetables are still grown by nutriculture in South Florida where hotels will pay the price for hydroponic tomatoes, cucumbers, and lettuce. But most growers who experiment in soilless farming (nutriculture) find equipment and labor too expensive to allow competition with soil-grown crops.

Even in Florida, where poor soil was expected to give the method an economic break, nutriculture cannot meet its competition. Tom Eastwood, horticulturist and authority on Florida agriculture, has this to say about it: "Since crops production is feasible in sandy Florida soil which has no inherent fertility, hydroponics cannot compete costwise for many years to come, if ever. It is much cheaper to clear, drain, and ditch an acre of Florida sand than to build a $25,000 one-acre hydroponic unit." You can grow many acres in Florida's poor soil at low yields, he adds, and still ride in a Cadillac, instead of going broke in hydroponics.

Hydroponics Charmed the Public

A major influence in the fading of nutriculture's promise in this country is high farm productivity. Crop production, spurred upward by advances in soil-growing technology, has broken records nearly every year since 1950. Agriculturists now say the amount of U. S. farmland cultivated in 1958 is sufficient to feed the expected population as far ahead as 1975. Obviously, the U. S. has little need now for growing methods that are practical only when land is not available for soil growing.

Back in the 1930's, before the U. S. accumulated food surpluses, hydroponics became a glamorous subject. It fascinated people both as a business and as a hobby. At the height of its popularity, many believed water culture would some day replace soil culture, producing widespread economic and social upheavals. But some scientists questioned the claims being made for water culture as a means of crop production. They doubted that skyscraper farms could supply fresh fruits and vegetables for city populations or that restaurants could grow their salads in the basement.

Among the doubters of water-culture's wonders were staff members of the University of California's college of agriculture at Berkeley. These men decided it was time for an impartial appraisal of the method. D. R. Hoagland and D. I. Arnon did the job for the university, comparing tomatoes grown in nutrient solution, in fertile soil, and in sand. Yields from these plantings, cultivated under the same general conditions, were about the same. And tomatoes from the three harvests could not be distinguished in flavor and quality tests.

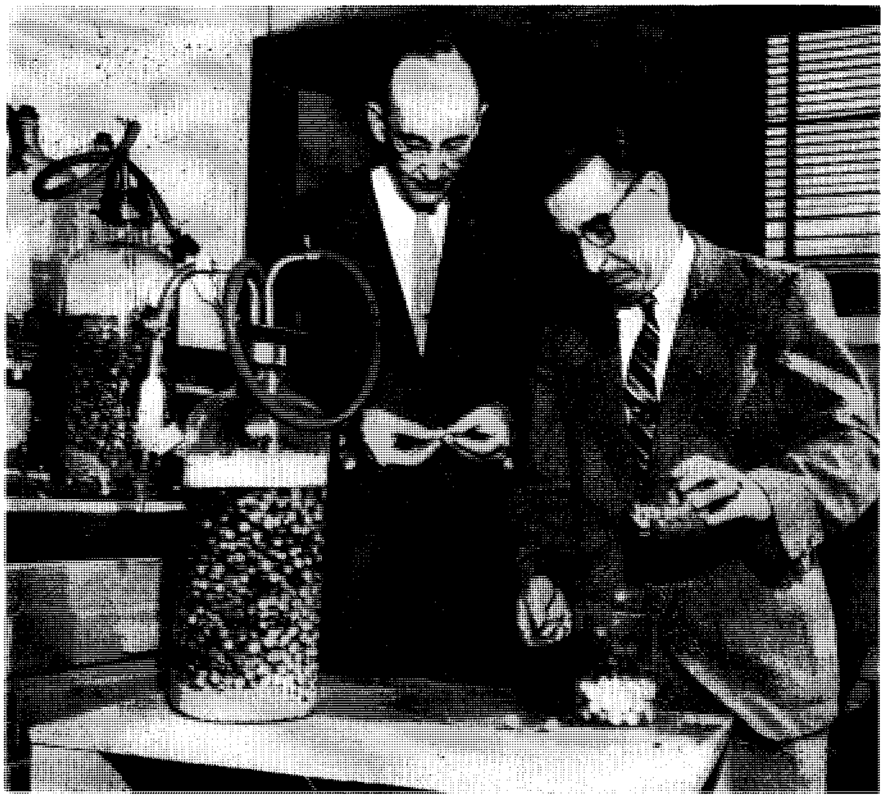
Hoagland and Arnon published their first circular on hydroponics in 1938. Since then, they say, commercial application of water culture has not been as widespread as its most ardent followers expected. Two factors, in their opinion, have limited the displacement of soil farming by nutriculture, and will continue to do so: First, economics of the processes favors soil farming; second, commercial growers may understand soil management, but they seldom are familiar with nutriculture methods.

Some Nutriculture Survives

If nutriculture makes any progress commercially in the near future, it will be in developing specialized products that do not face severe competition from soil crops. A few such projects already exist and manage to survive. Occasionally a new one shows up.

Among the "going" commercial operations in nutriculture is the chrysanthemum culture of Carolina Wholesale Florists of Sanford, N. C. In this system, chrysanthemum cuttings—as many as 20,000 a day—are set in vermiculite in trays and fed by subirrigation with nutrient solutions. The plants grow through four production stages, reaching full bloom in about 90 days.

Use of light control and disbudding, as practiced in many greenhouses, improves quality of Carolina's chrysanthemum plants and blossoms. Humidity and temperature controls regulate growing conditions. This in-



Reynold Overbeck and Radcliffe Robinson, chief scientists at Battelle Memorial Institute, check yields of morel mushroom pellets grown by nutriculture technique

Nutriculture techniques are used frequently in experimental work on such factors as the effect each plant food element has on growth of plants

stallation, which also expands and treats its own vermiculite, is often called a "flower factory" when compared to usual greenhouse production.

Growing ornamental plants, generally a luxury product, would seem a "natural" for a nutriculture system such as Carolina uses. But so far this industry has not adopted the techniques to any extent. Instead it has taken another tack. Some greenhouse operators, reports Neil Stuart of USDA's Ornamental Plant Section, simply borrow from nutriculture. They buffer their soils and apply small amounts of nutrients to their plants every time they water them.

An extension of this practice shows up among growers in San Mateo County, Calif. R. H. Sciaroni, extension service farm advisor in that area, says some flower growers now have elaborate mechanical setups for injecting fertilizers into their irrigation water. Even producers of field vegetable and flower crops are using water-soluble fertilizers more and more.

Sprouted Cereal Grains

Another development in nutriculture that might prove useful in limited application is incubator culture of sprouted cereal grains for cattle feed. The method is expensive and time-consuming compared to supplying animals with forage. But if another drought hits U. S. cattle-raising areas, interest in incubator grains will undoubtedly spring up again.

One manufacturer of grass incubators is Buckeye Corp. of Springfield, Ohio. This company says its incubators grow "green grass for cattle the year 'round." Its equipment consists of tiers of shallow hydroponics trays that receive nutrient solutions from overhead tanks. Fluorescent tubes furnish light for the plants, and an air-conditioner keeps temperature and humidity constant. Grains sprouted in the incubator grow in mats without soil or other bed material. They achieve 6 to 8 inches of growth in about a week. The whole grass mat is then removed from the tray and fed to the cattle in chunks.

Incubator salesmen, in the past, have been inclined to go overboard in claiming nutritional and other health benefits for their sprouted grains, reports A. G. Caldwell of Texas A&M College. However, research on the subject, conducted in England by S. Bartlett and coworkers, has taken some of the steam out of their "sell." Ac-

cording to these researchers, any advantages derived from feeding sprouted grains to cattle are small or nonexistent under normal conditions of cattle management. Dairy cattle on this diet showed no differences in yield of milk, its fat content and vitamin levels, or in the growth-promoting properties of the milk.

Mushrooms

The mushroom, a popular food no matter how it is grown, appears doubly attractive as a product of nutriculture. This has been true of a tissue or mycelium that tastes like the morel mushroom. A vat culture for the tissue was worked out for Yorktown Products Co. by R. F. Robinson and R. S. Davidson of the biosciences division of Battelle Memorial Institute.

The morel species, considered by gourmets to be the world's finest tasting mushroom, has never been successfully cultivated. But large quantities of the morel-like tissue can be grown in tanks of aerated nutrients in 72 hours. Its producers compare this culture to common varieties of shed-grown mushrooms which require some 60 days to mature.

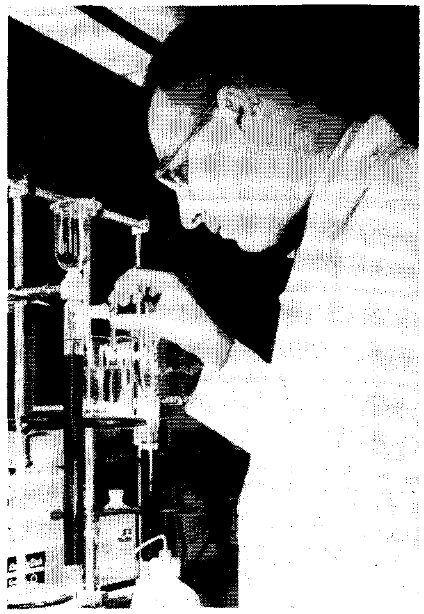
Robinson believes development of the mushroom tissue points the way to growing many types of foods in any climate. Further, he says, vitamins and other nutritional food ingredients may be "grown into" the mycellium pellets.

Still Important in Research

Nutriculture was first developed, some 100 years ago, as a research tool for studying plant genetics, nutrition, and pathology. And it is still used extensively in laboratories today. USDA uses the technique for research, even though it does no research on the method itself as a route to crop production.

Reports of nutriculture in new research applications include one from Argonne National Laboratory which maintains a "radioactive garden" for studying mechanisms of plant growth. Here scientists grow plants in a radioactive atmosphere of carbon-14. No soil is used in this greenhouse garden, says Argonne. Instead, seeds are planted in gravel and fed with nutrient solution. The plants breathe carbon dioxide containing C^{14} atoms, or take up water containing a tracer. All organic compounds in the plants become uniformly labeled with the radioactive carbon.

Argonne's "hot" garden provides means for isolating plant compounds and for studying effects of radioactivity on plant tissues. Among its crops: rubber, onion, artichoke, kidney bean, opium poppy, soybean, tobacco, buckwheat, snapdragon, sugar beet, peas, and alfalfa.



Improvement in analytical techniques is one aim of the Magruder work, but fertilizer firms are interested in it because of possible dollar savings

Magruder Sample Work

NPFI, fertilizer control officials assume joint sponsorship of check sample program from Royster Guano

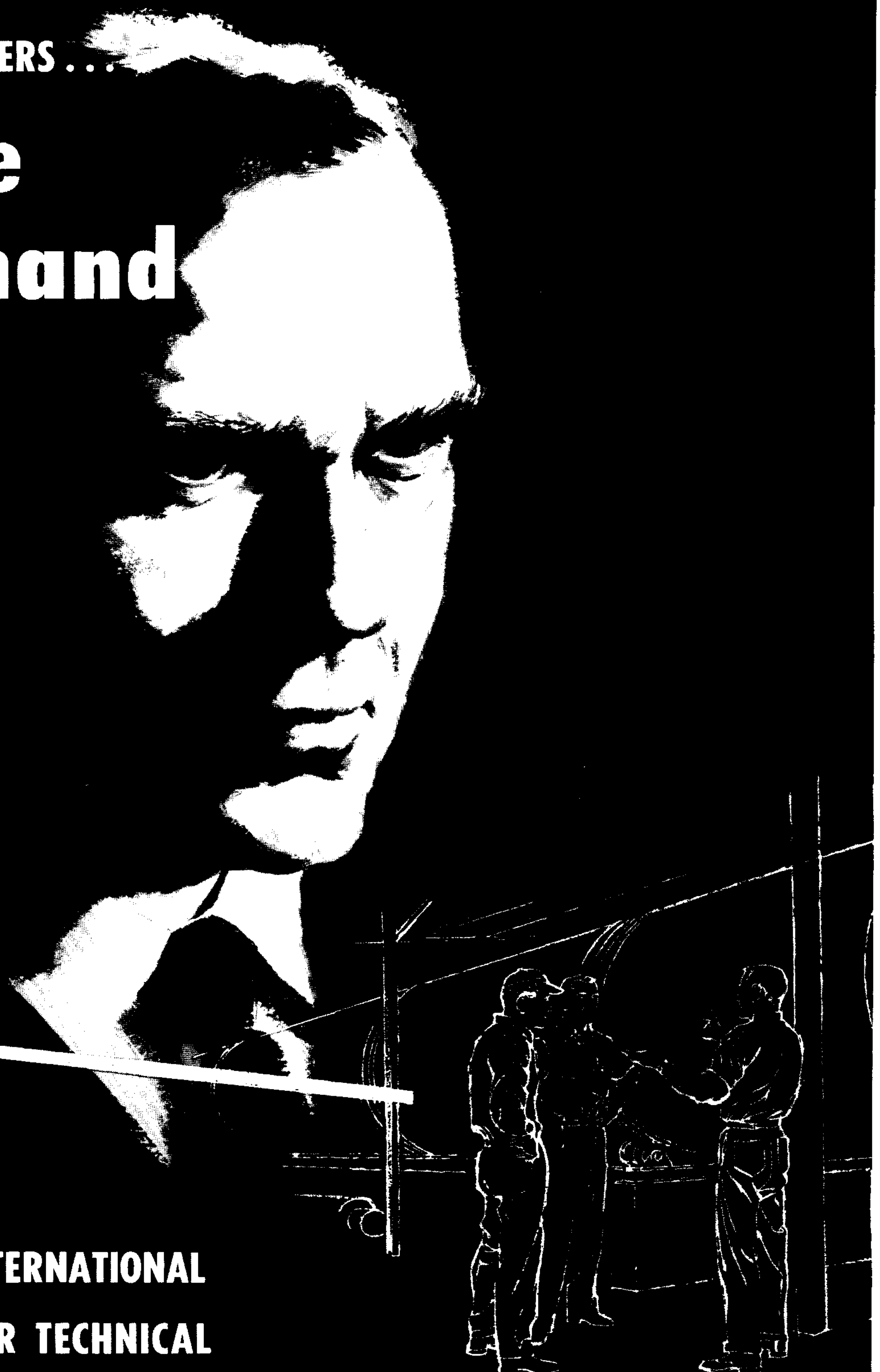
The Magruder Check Fertilizer Sample work, which started in 1922, has outgrown itself—to the point that it has been put under a new operational set-up. No longer will F. S. Royster Guano of Norfolk manage the project alone, as it has for 36 years. Late in January, joint sponsorship went to the National Plant Food Institute and the American Association of Fertilizer Control Officials.

Together, they have formed a supervisory committee, representing both industry and control officials, to help look after the Magruder work,

INTERNATIONAL'S FULL ORBIT SERVICE

HEADQUARTERS . . .

service command



WHERE INTERNATIONAL HELPS SOLVE YOUR TECHNICAL IN-PLANT AND PRODUCT PROBLEMS

Triple-super trouble shooter

International's Service Command helps you profit from our experience . . . complete and personalized service with no obligation . . . solves your problems in:

FORMULATION

We can help you select types of nitrogen solution and/or anhydrous ammonia; figure sulfuric acid requirements; choose type and particle size of potash; determine the proper combination of phosphoric acid and triple super to be used. Also International's technical trouble-shooters will work out problems concerning the use of steam and water in system . . . and recycle rates if granular product is being made. In short, International Minerals will help you through the full cycle of formulation problems.

CHOOSING EQUIPMENT

IMC personnel have worked with virtually every kind of equipment in the fertilizer industry. Because of this varied experience we are able to pass on to you information that will help you adapt or replace your present equipment at minimum cost.

To avail yourself of our personalized Service Command help, call on International Minerals & Chemical Corporation, Administrative Center, Old Orchard Road, Skokie, Ill.

PLANT LAYOUT

Our technical staff can help you plan plant layout changes. If you desire, our engineering department will evaluate the efficiency and cost factors of your plant layout and make recommendations that will save you money.

MATERIALS HANDLING

International Minerals processes millions of tons of materials a year. Result is valuable experience — that you can draw on — in reducing handling costs through correct use of conveyors, fork trucks, car loading equipment, etc.

STATISTICAL QUALITY CONTROL

Refer any formulation problem requiring computer applications to International's Industrial Engineering Staff. Our engineers also offer statistical quality control assistance when a process requires correction.

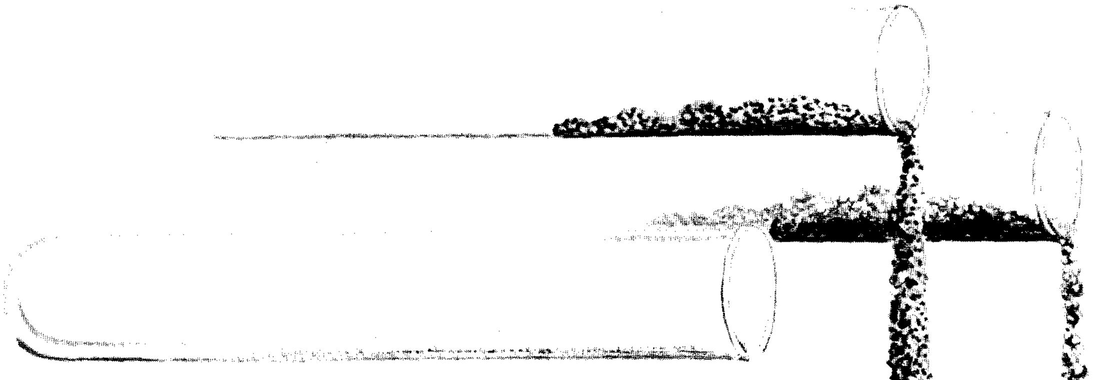
RESEARCH

International's Research Division maintains facilities at Skokie, Ill., and Mulberry, Fla., to test the action of plant nutrients. *This information is yours.* International also sponsors many university and state experiment stations, the results of which are circulated by our technical staff. You can profit from IMC research into plant food requirements for local areas and from other phases of our complete research into fertilizer production, uses and results.

COARSE — International's coarse-textured Triple gives you the same excellent ammoniation batch after batch . . . promotes desirable agglomeration.

GRANULAR—International's granular Triple is non-crumbling, free-flowing, makes granulation easier. Sponge-like structure of granules facilitates ammoniation.

RUN-OF-PILE — International's fine-textured Triple provides uniform particle size, even density and proper moisture level that lets you ammoniate at higher rates, temperatures.



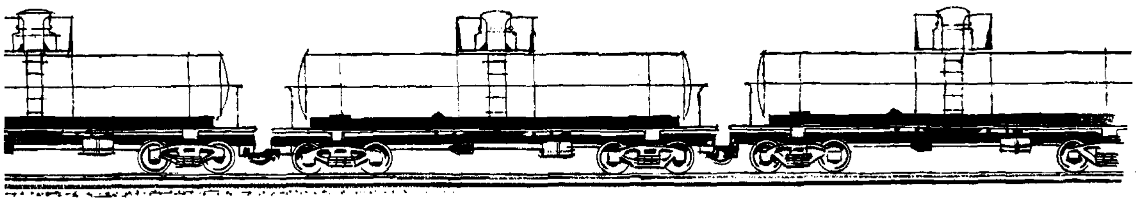
TRIPLE SUPERPHOSPHATE

Available P_2O_5 (min. guarantee) — 46.0%

Particle size:

	R.O.P.	GRANULAR	COARSE
−6 mesh	98-100%	98% min.	97%
−65 mesh	22.34%	0.5% max.	15%

Technical Service Command helps you get full value from your phosphate dollar



A complete line of triple superphosphates and phosphoric acid solves formulation problems

Now you can make International your dependable single source of all high-analysis phosphate ingredients. Benefit from International's three grades of top-quality triple superphosphate plus high purity 53%-55% phosphoric acid. And expert trouble-shooting assistance is yours — on call — from International's Service Command.

International's Full Orbit Service

Creators of Living Minerals

International Minerals Chemicals

PHOSPHATE DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois now called the Magruder Check Fertilizer Project. The program will continue to serve its original purpose: to provide the fertilizer control laboratory—industrial or governmental—with a regular opportunity to check its analytical performance against that of others.

E. W. Magruder, former chief chemist at Royster Guano, instituted the sample work and supervised it personally until his retirement in 1945. Samuel F. Thornton, director of Royster's chemical control and farm service, then took the reins, held them until last month. He will remain active under the new program as a member of the supervisory committee.

According to Thornton, nobody is sure why Magruder (now deceased) assumed the leadership and responsibility of preparing and distributing fertilizer samples to control labs each month. He does say, though, "A study of the few early records . . . makes it appear certain that the idea of a monthly check sample grew out of an informal exchange of samples at irregular intervals among a group of fertilizer laboratories."

He adds that the informal exchange apparently lasted for several years. The formal project was started when Magruder began to prepare fertilizer samples each month and send them routinely to cooperating laboratories. The cooperators ran as many analytical tests as they wished, averaged the results for phosphoric acid, ammonia, potash content, and other values, and returned their data to Magruder. He tabulated them and sent the completed listing back to the labs (29 at the outset), so that each could compare its results with those of the others.

The idea was, and still is, that those laboratories which seemed to be far off in their results would check and attempt to improve their analytical methods. The revised Magruder work, however, embraces three added facets:

- Statistical design to permit analysis of the data, and reports that are more meaningful than a simple listing of averages. The design, drawn up by statistician Edwin M. Glocker of W. R. Grace, demands that each lab run a definite number of analyses on each sample, on separate days, and submit each result—not an average. The analyses will be checked statistically. Then the analyses from each lab with their respective standard deviations and other statistical evaluations will be reported to the entire list of labs.

- Samples of predetermined composition. From time to time, the participants will get samples derived from purified salts of known composition, enabling checkers to tell each lab just how much it is in error.

- Controlled particle size. Laboratories will also receive samples of uniform particle size as well as run-of-the-mill material.

The number of participants in the Magruder check sample work has already increased to 129 since its beginning. Even with this growth, Royster has been footing the bill for preparation and distribution of samples, and collation of results. Now Law & Co., a commercial laboratory in Atlanta, will be responsible for sample preparation and distribution. And to take care of costs, the cooperative program will charge participants $18 a year for 12 samples.

While the Magruder work stresses improvement of analytical techniques, the fertilizer industry, with its narrow profit margins, is also much interested in the dollar-and-cents implications of the project. NPFI, for instance, points to sizable "losses" incurred by the industry each year as a result of overages—plant foods supplied to the buyer in excess of amounts guaranteed by the maker.

Such losses have been estimated at $5 or $6 million annually. In trying to improve methods of sampling and analysis, the stepped-up check sample work may be able to strike some of these losses from the books, the institute hopes. Of course, it could also help those firms who innocently market plant food that does not measure up to guarantees.

Vincent Sauchelli of NPFI, chairman of the new Magruder supervisory committee and a leader in bringing about the new program, sees in it the promise of more efficient operation. By putting the most modern statistical techniques to use, he says, the revised program will aid control labs infinitely more.

Thornton, long connected with Magruder work, shows a natural proclivity toward regret at giving up his adopted "child." But he concurs with Sauchelli's view, and his regret is "tempered by enthusiasm for the promising plans made for continuance of the work."