Ag and Food Interprets . . .

- **Potash producers optimistic despite new mines, imports**
- **Can large-scale recovery of fluorine from rock phosphate become economic?**
- **Rock and super argument catches Illinois ACP in crossfire**
- **Ethyl alcohol promotes efficient feed use in ruminants**
- **Contract farming may mean marketing changes for chemical industry**

Trend: More Potash

New mines, imports might supersaturate already saturated market, but producers are hopeful

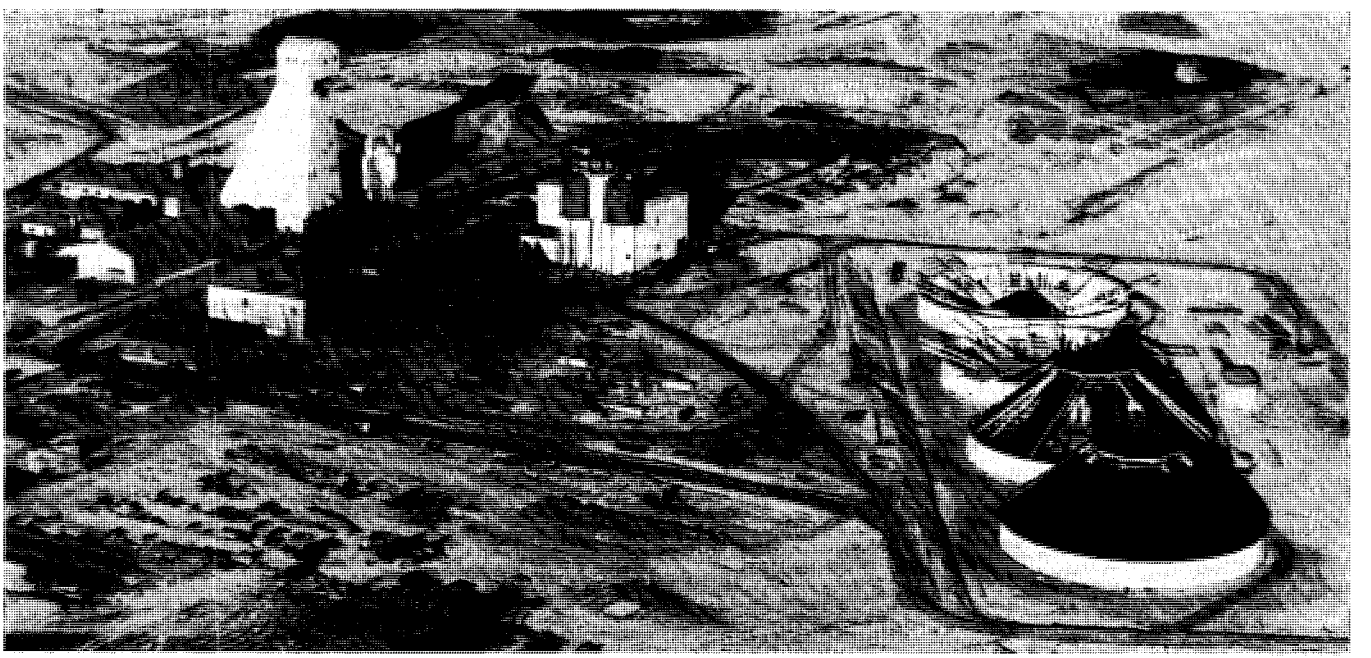
Potash Co. of America will start to bring ore out of its new Canadian potash mine late this year. Delhi-Taylor, strictly in oil until now, plans a $20-million potash mine and mill in Utah. Farm Chemical Resources Development Corp., by sinking a shaft in Carlsbad, becomes firm No. 7 in southeastern New Mexico's potash population.

Add to this activity National Potash's coming on the scene last year, and the result can mean one of two things—depending on who's viewing the picture and from what angle. Observers on the outside looking in see even greater over-capacity and stockpiling than exist today. On the other hand, those connected with the industry or close to it, perhaps by looking through rose-colored glasses of various shades, see little cause for alarm.

Producers admit an overcapacity now, and some oversupply. During the war years, fertilizer makers and farmers bought potash as fast as it became available. Today, however, the trend is to wait until the last minute to take delivery. As a result, says one onlooker, companies in New Mexico are bursting at the seams with inventories.

But all isn't so bad, PCA claims. Much of the potash stored in New Mexico will move later, on contracts already signed. The situation is not one of market glut—even a temporary one—as some analysts describe it, the company states. "We're optimistic or we wouldn't be spending $20 million

Potash Co. of America, Ltd., has its new mine at Saskatoon, Saskatchewan, well under way. It expects to be bringing up ore late this year. At right are four warehouses for muriate. Steel structure at left is partially complete concentrator building



on our mine in Canada," adds John Hall, PCA sales manager.

Another major producer predicts firms will overproduce for the next few years. Yet this company, too, considers long-term consumption prospects good. Others in the industry agree, but their actions are more conservative for the most part. Chief candidate for the optimists' club is International Minerals & Chemical, which hopes to have a mine going in Canada late this year or early next. "There is some excess capacity in the industry at present," it says, "but within four years, IMC expects that potash demand will increase some 700,000 tons a year."

This estimate is somewhat surprising even to the American Potash Institute, the industry's trade association, whose figures show that total potash deliveries have gone up only a little more than 500,000 tons (K_2O) over the past six years. Data just compiled on deliveries in 1957 put the figure at 2,360,924 tons. The 1956 score was 2,307,961, meaning very little increase for 1957. Nevertheless, API statistics add up to steady growth in deliveries since 1935, when the institute was organized in its present form.

Output Close to 2 Million Tons

Domestic output of potash, for the fertilizer year 1956–57, hit 1,940,000 short tons K_2O. The year ending June 30, 1958, should show an increase to 1,960,000, according to the weighted average of estimates turned up in a survey by the ACS Division of Chemical Marketing and Economics (C&EN, March 10, page 21).

The one thing in the cards that has many people puzzled is Delhi-Taylor's move in Utah. Joseph Turner, U. S. Geological Survey, says seams there are far below the surface, some 3000 to 3500 feet down. Other firms have looked around in the state, but the deepness and low grade (19 to 20% K_2O) found in previous explorations have sent them scurrying back to Carlsbad.

For its part, Delhi-Taylor appears to have no doubts about the commercial value of going into Utah. The grade of potash the firm found in Utah (while searching for oil) competes with that at Carlsbad, claims Harold Hobbs, Delhi secretary. In fact, says Hobbs, some of Delhi's will-be competitors say Delhi has the best potash holdings in the U. S. Actually, the company has two beds—one at the Cane Creek anticline and one nine miles away at Seven Mile anticline.

Just when Delhi will start to develop the beds depends on the outcome of talks aimed at opening markets for the potash. If results favor Delhi, it will sink $20 million into a mine and mill. After the shaft goes in, plans call for a 1200-foot conveyor to link the mine with a 6000-tons-a-day beneficiation plant, also planned.

Why does an oil producer consider the potash field? Aside from finding a commercial deposit by accident, Hobbs says, "history has shown a nice increase in consumption of potash and a stable price structure." He agrees with other potash people, too, that population growth and the increasing desire of farmers to get the most out of their land point toward more fertilizer use.

Potash Grade, Income Tax Dictated PCA Move to Canada

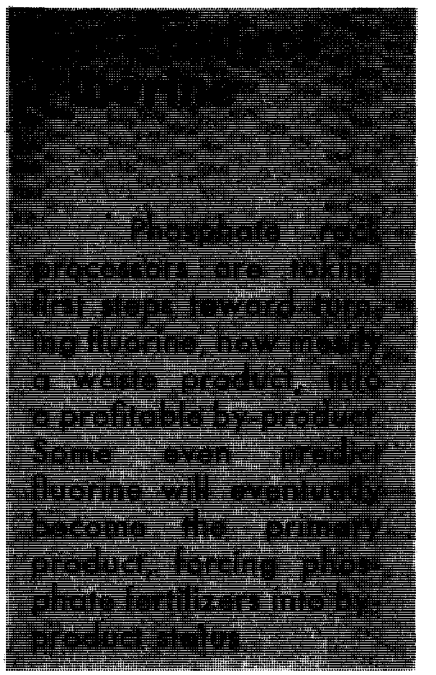
PCA's move into Canada was made because the potash grade there is better than that at Carlsbad, and because the company will be exempt from income tax during the first three years of operation. Also, the company's ore body at Carlsbad is being depleted at a rapid rate, says president G. F. Coope. In a report to stockholders he observes, "Although this situation has not approached a critical state, it was felt that an important obligation of mining management was to do everything within reason to ensure ore reserves not only for the next 20 years or so but for a very long term." Once the $20-million Canadian mine gets going, PCA will probably cut back output at Carlsbad.

And PCA is letting no grass grow under its feet as it gets ready for the next fertilizer year. It is out now with 1958–59 agricultural grade potash prices which, it says, will let fertilizer makers and wholesalers save as much as 6 cents a unit K_2O or $3.60 a ton muriate of potash if they take delivery in the first three months of the season. In this way the company also bids to reduce stockpiles earlier.

No other producer has yet listed its price differentials. IMC agrees with the principle of favoring those who buy out of season, but has not said whether it will follow suit.

Phillips Petroleum, which along with Farmers' Union and Kerr-McGee has an interest in Farm Chemical Resources, says it is too early to say when FCR's New Mexico mine will start up or what its output will reach.

It appears certain that more potash is coming to market. Competition will get sharper among American producers, and each, in addition, will be struggling against foreign encroachment. East Germany, Russia, France, and Spain have been dumping potash on the East and Gulf Coasts; so far, they've been getting away with it, much to the dislike of U. S. firms. But the problem is "definitely serious," says IMC, and could lead to some real fireworks in the future.

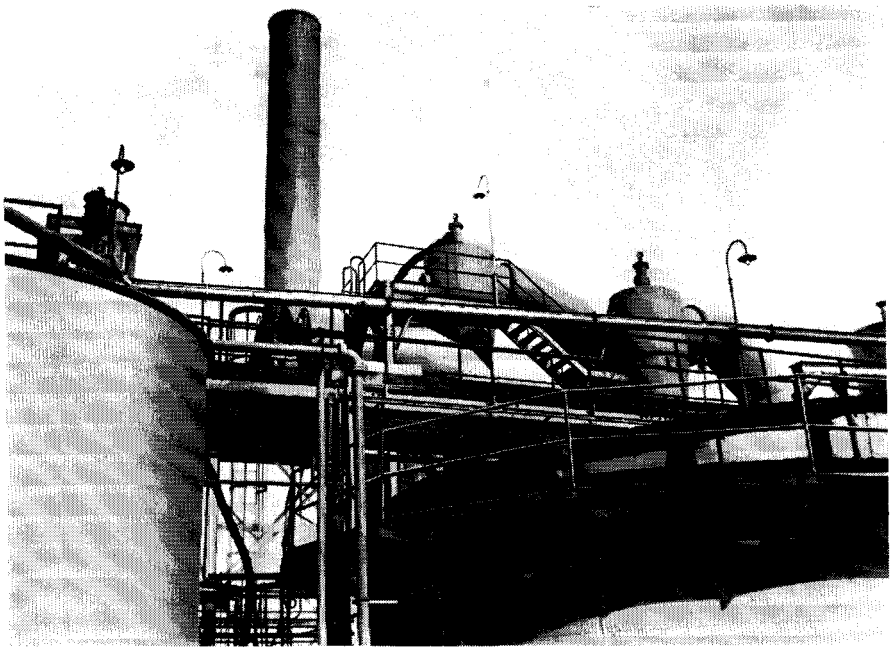


INCREASING OUTLETS for fluorine may eventually turn one of phosphate rock processors' biggest headaches into a source of profits. The fluorine in phosphate rock (ranging from 2.5% to 4%) has up to now been regarded primarily as a nuisance, particularly when it is evolved during manufacture of phosphatic fertilizers.

True, some small quantities of it have been recovered and marketed as fluosilicates. But most of it is thrown away. And this loss, added to the necessity of removing fluorine from all exhaust streams to prevent pollution, makes it a costly and wasteful impurity.

Actually, this fluorine represents a considerable natural resource, particularly in view of dwindling domestic fluorspar reserves. It is enough, in fact, to displace fluorspar as a source of fluorine for much, if not all, chemical and aluminum production needs.

Phosphate rock production last year was around 14 million tons, some 10 million tons of which was chemically processed. At the usual rate of fluorine evolution (about $^1/_3$ of that present in the rock), some 100,000 tons of fluorine was thus evolved,



USI's phosphoric acid plant at Tuscola, Ill., recovers sodium silicofluoride. It is sold for use in water fluoridation and for industrial uses. Eventually, it is predicted, fluorine may become a profitable side line for many rock processors

while 200,000 tons was carried along as impurity in phosphate fertilizers. U. S. consumption of fluorine for aluminum and chemical uses during the same period was around 150,000 tons.

Fluorspar Reserves Not Large

Recent estimates of American phosphate reserves show that they are equivalent in fluorine to the world's fluorspar needs for some 600 years at the present rate of consumption. Domestic fluorspar reserves, however, are not large. The latest Bureau of Mines survey, completed in 1956, shows only some 22 million tons of high grade reserves (above 35% calcium fluoride) and about 12 million tons of lower grade ore (15% to 35% calcium fluoride).

But these two considerations do not mean that all phosphate rock processors should rush to sell their waste fluorine to the chemical industry. Nor does it mean that the fluorspar industry is about to roll over and play dead.

At present, fluorine can be obtained from fluorspar at lower cost than it can in most cases from phosphate processing. And, although domestic reserves are low, there are still large deposits of fluorspar in other countries, particularly Mexico. (In 1957, fluorspar imports were twice as great as domestic shipments.)

For a rock processor to recover fluorine, he must treat gas streams containing water, air, carbon monoxide, carbon dioxide, sulfur compounds, and rock dust, most of which are present in larger quantities than the hydrogen fluoride, silicon tetrafluoride, and fluosilicic acid to be recovered.

By the time all the impurities have been separated and fluosilicic acid recovered, the fluorine costs more than its equivalent in fluorspar, except for those uses which can take fluosilicates directly. And fluosilicate sales are small—only about 20% of the amount which could be made this way.

Another factor of economic significance: A considerable portion of the fluorine is evolved in manufacture of normal superphosphate at plants whose individual outputs are too small to justify recovery and purification of the fluorine. One way around this is reported to be under consideration by a major aluminum company. The fluorine user (in this case, the aluminum company) would gather from a number of these small rock processors the impure fluosilicates they recover, transport them to its plant, and manufacture the fluorine products it needs.

More Fluorine Needed

Major new fluorine needs are developing. One of the biggest of these is in the aluminum industry, which uses large amounts of cryolite and aluminum fluoride in its melts. Already some aluminum makers are buying fluosilicic acid from rock processors. From it, they make sodium fluosilicate and then synthetic cryolite and aluminum fluoride. Since natural cryolite is at a premium (the only commercially worked deposits are in Greenland), potential markets here are large—they could reach as high as 125,000 tons (as F) annually by 1965.

Western Phosphates Considers Process

Western Phosphates of Garfield, Utah, has under study a process for recovering more than the usual one third or so of contained fluorine from its rock. In this case, the company plans to sell fluosilicic acid to United Heckathorn. Heckathorn will process the acid to cryolite and sell it to the aluminum industry in the Pacific Northwest. At the moment, negotiations for this arrangement are still under way.

Chemical uses for fluorine are the other major market. Demands for elemental fluorine, hydrogen fluoride, fluorocarbon propellants and refrigerants, resins, elastomers, and oils are expected to increase to some 250% of today's levels. This growth industry will then be taking some 250,000 tons of fluorine annually.

The economic picture is changing, too. Fluorspar costs will continue to rise as high grade ore reserves are depleted. Recovery costs for rock processors may well go down as technology provides more efficient ways to recover fluorine. Studies now under way at TVA, for example, point to processes which rock processors could use to produce cryolite, aluminum fluoride, or even hydrogen fluoride itself in some cases—and all at competitive costs. When all these factors:

- Increasing markets for fluorine
- Decreasing fluorspar and cryolite reserves
- Necessity of recovering fluorine in some form to overcome pollution possibilities
- New technology

are added up, the ultimate result becomes clear. Eventually, phosphate rock processors should have a profitable fluorine business on the side. And, in the opinion of some, it may even become the major product, with phosphate fertilizers becoming by-products. This day is still a long way in the future (estimates vary from five to 25 years) but the first steps are being taken now.

Rock or Superphosphate?

Rock phosphate argument in Illinois catches ACP in crossfire

THE AGRICULTURAL Conservation Program finds itself in a squeeze in Illinois, where the fertilizer industry and phosphate rock miners are at odds over two practices promulgated by ACP. The two practices, 10 and 13, are designed to encourage farmers in establishment or re-establishment of permanent grass-legume pasture for soil protection.

Practice 13 allows government subsidy for spreading raw rock phosphate on croplands. For payment it requires that the land be devoted to eligible legumes or grasses, either at the time of phosphate application or through subsequent seedings in 1958 or 1959. And it is specific to rock phosphate—other forms of phosphorus are excluded from its benefits.

Practice 10 permits cash payment for the use of superphosphate, but bars cost-sharing for superphosphate or potash when used in connection with a nurse crop. Spokesmen for the fertilizer industry point to these regulations and charge discrimination in favor of phosphate rock producers.

Ban on Super for Nurse Crops Discriminates

Fertilizer people say that practice 10's ban on superphosphate for nurse crops effectively bars their product from use. They point out that it is invariably possible to grow corn or some other cash crop while waiting for the required seeding of legumes or grasses to come in. Few farmers, they add, would forego the income that such a crop offers. Especially is this true when the farmer can collect his allowance and also have the nurse crop, simply by using rock instead of superphosphate.

Practice 13 allows payment of $8.00 per ton to the farmer for using rock phosphate; and since rock delivered and spread on Illinois farmland costs about $21 a ton, a sizable saving is realized by the farmer. Under this inducement rock was applied to more than 500,000 acres during 1955 in the Illinois ACP program.

The statistical summary of the ACP says that $2.3 million of the $6.5-million Illinois program went for rock phosphate. And all but 15% of the remaining funds went for lime to reduce soil acidity. On the other hand, availability of phosphorus in raw rock is a function of the soil's acidity, decreasing as the soil becomes more alkaline. Thus the fertilizer industry feels that the existing situation is inherently ludicrous.

Illinois Users Consume 650,000 Tons a Year

The situation has indeed produced some unusual effects. For instance, some 450,000 to 650,000 tons of raw rock was applied annually to Illinois farms from 1950 to 1955. In Missouri, which has a similar practice in its code, the annual amount spread is about 150,000 tons, while the rest of the United States combined uses only about 25,000 tons. Aside from Illinois and Missouri, 25 counties in Kentucky and 18 counties in Indiana have practices allowing payment for applying rock phosphate to cropland.

ACP's position is that it does not want to support any soil building program which might add to an already embarrassing surplus of corn and small grain. Superphosphate, it feels, would increase the yields of these crops, whereas raw rock would not. Industry spokesmen reply that after the four-year rotation—corn after legume after small grain after corn—rock would increase corn and small grain yields anyway.

With this reasoning ACP has no argument. On the other hand, its immediate concern is increased use of grasses and legumes needed for soil protection. Superphosphate, it contends, would serve to increase immediate crop surpluses since its phosphorus is readily available. A relatively small proportion of the plant food in superphosphate would be left for legumes and grasses in the next planting and thus would contribute but little toward soil protection. Characteristics of phosphate availability from rock place it on the opposite side of the balance.

ACP Willing to Change

Bearing these points in mind, ACP is willing to change the practices under either of two conditions. There must be agreement not to harvest a nurse crop—or, alternatively, there must be agreement not to spread superphosphate until after the nurse crop has been harvested.

On the face of it, these conditions should seem agreeable to all. But at this point another group is heard from. At one time in the past, Illinois ACP proposed changes in the practices which would permit the use of superphosphate, but it ran into a hornets' nest. The proposal brought a deluge of protests, traceable largely to members of the rock phosphate mining industry in Tennessee. It was noted that the miners most concerned about the proposed changes were those who had no facilities for beneficiation or other treatment of the raw ore. At any rate, the whole thing got so hot it was dropped.

What is the fertilizer industry doing about the situation now? Aside from protests by individual companies against what they feel is unfair discrimination, there seems to be no concerted effort to bring about changes in the Illinois practices. But this is not to say that superphosphate producers are not pressing at all for such changes. They are. And there are signs that some headway has been made.

Washington Recommends Equal Footing

From the Washington end, ACP has sent to its offices in Illinois and other states changes which have been proposed for the 1959 program. Among these changes is one which would place raw rock on the same basis as superphosphate. Illinois' ACP Development Group has objected to this change and has recommended a somewhat more liberal use of superphosphate on grass and legume seedings under the program.

Whether the proposed changes for the 1959 ACP will be put into effect will not be finally determined until the current Department of Agriculture appropriation bill is passed. Congress seems inclined to keep ACP the same in 1959 as in 1957 and 1958. This is indicated by the House report on the bill which includes the statement that "The committee feels that the 1959 program should be continued on the same basis as the 1957 and 1958 programs."

It is too early to predict the outcome of the situation. But it seems fairly safe to make another prediction: if proposed changes for more liberal use of superphosphate are made, rock phosphate producers will immediately charge discrimination in favor of superphosphate.

Liquid Feed With Alcohol

Source of available hydrogen promotes livestock's effective use of urea and low-cost feeds

Cattle lap, do not drink Morea liquid feed supplement fed free choice

UNTIL LATE last year, Morea, an alcohol-containing feed supplement for ruminants, was only in the test marketing stage. In 1958, about 600,000 head of cattle are expected to receive this feed supplement—compared to only 150,000 last year.

The unusual feature of Morea is the fact that it contains ethyl alcohol. But the alcohol, present in relatively low concentration, is not used to supply the animal with energy. Its purpose is to provide the proper chemical environment in the rumen for the most effective use of urea and other feed ingredients. It is used specifically to promote the metabolism of rumen microorganisms which, in turn, provide necessary nourishment to the animal.

In the rumen, the bacteria convert simple substances into amino acids, proteins, carbohydrates, and other materials. This process enables the animal to transform low-grade materials into the food it needs, and also to produce what the farmer wants—meat and milk. But the rate at which these microorganisms perform and the efficiency of their operation depend on the chemical content of the rumen.

Several years ago, Philip C. Anderson, president of Feed Service Corp. in Crete, Neb., and Janet L. C. Rapp, the company's research biochemist, noted that the microorganisms in the rumen can convert urea and carbohydrates efficiently to amino acids and other materials only if the rumen contains a ready source of unoxidized hydrogen. For proper growth and multiplication, the rumen bacteria must operate under reducing conditions.

Normally, the required hydrogen is obtained by the breakdown of various plant proteins in the feed. In this way, the microorganisms bring about their own reducing conditions—a process that takes time and also uses up energy. Since they must first produce these reducing conditions, says Anderson, the bacteria are unable, in a given period of time, to handle the maximum quantity of feed ingredients needed by the animal.

But if the feed already contains a rich source of available hydrogen, the efficiency of synthesizing amino acids and other materials can be greatly increased. With hydrogen supplied, the microorganisms can multiply more rapidly and can also produce better quality protein, says Anderson. The animal, as a result, not only gets more to eat in easily digestible form, but also receives higher quality nutrients.

Anderson and Rapp considered several hundred compounds as possible hydrogen donors. Their conclusion: the required hydrogen could be supplied most effectively and economically by ethyl alcohol. In the rumen, the alcohol, in the presence of coenzyme I (cozymase) and various proteins, is converted to hydrogen and acetaldehyde (which is later used to accelerate the utilization of carbohydrate).

Addition of alcohol to feeds results in numerous benefits. For example, beef cattle:

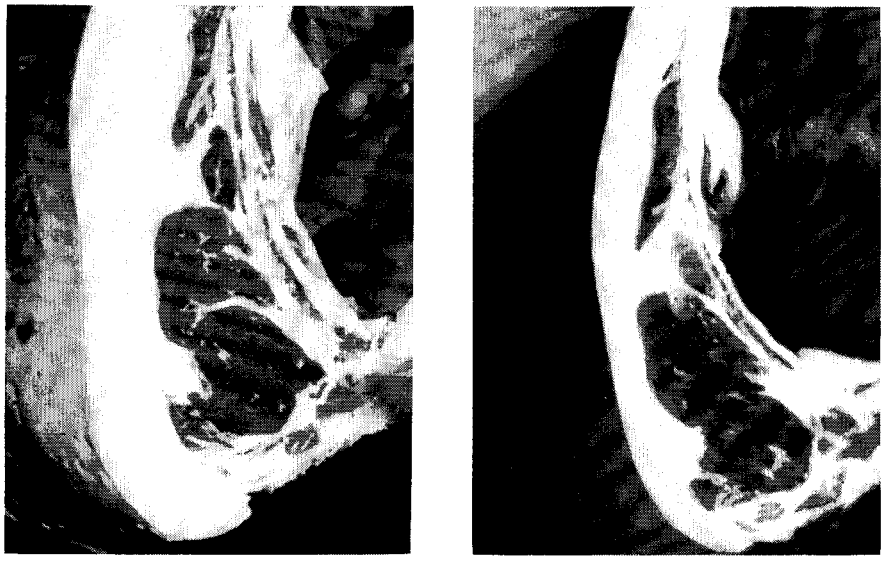
- gain weight more rapidly
- consume and convert more feed per day
- reach the marketing stage earlier
- are able to eat cheaper, higher-cellulose feeds
- produce better quality meat.

Feed Service Corp. remains the nation's major producer of the patented (U. S. 2,808,332) new liquid supplement. Six months ago, Feed Service granted U. S. Industrial Chemicals an exclusive license to make and distribute the product in most parts of the U. S. east of the Mississippi and west of the continental divide. Meanwhile, Feed Service continues to serve its expanding markets in the Midwest.

Feed Service and U.S.I. manufacture only the Morea premix, not the final feed. This premix contains urea (as a nitrogen source for protein synthesis), ethyl alcohol (as a hydrogen donor), phosphoric acid (as a source of phosphorus), and trace minerals and vitamins. This formulation is then sold to authorized mixer-distributors who combine one part by weight of the premix with two parts by weight of molasses (which acts as a carrier and energy source). As distributed in tank trucks to local farms, the feed contains 67% molasses, 10% urea, 6% alcohol, 3% phosphoric acid, 4% trace minerals and vitamins, and 10% water.

Morea feed supplement is used mainly in the feeding of livestock, dairy cattle, and sheep. It could also be given to goats and other ruminants. It's used not only to supplement the feeding of low-cost roughages such as hay, ground corn cobs, and cottonseed hulls, but also with full grain rations.

Recent studies conducted by a large midwestern packer in conjunction with Iowa State College showed that, when lambs were fed the Morea supplement, they made 17% greater weight gains than those fed the company's standard ration. The feed saving per unit of



Prime beef from sister animals. Meat at left from animal fed full grain ration. At right is beef from animal fed Morea supplement with less grain, more roughage. Cover fat is minimized and marbling improved

weight gain was about 3%. The profit obtained per lamb was $1.15, compared to only 83 cents for lambs fed the conventional way. For the past 12 months, the company has been conducting similar studies on beef cattle. Results will probably be announced within the next few weeks.

Tests by Feed Service indicate that, when beef cattle are fed Morea, their total feed cost for a specified weight gain is about 10 to 20% less than with conventional feed. Average weight gains are reportedly increased by 15 to 25%.

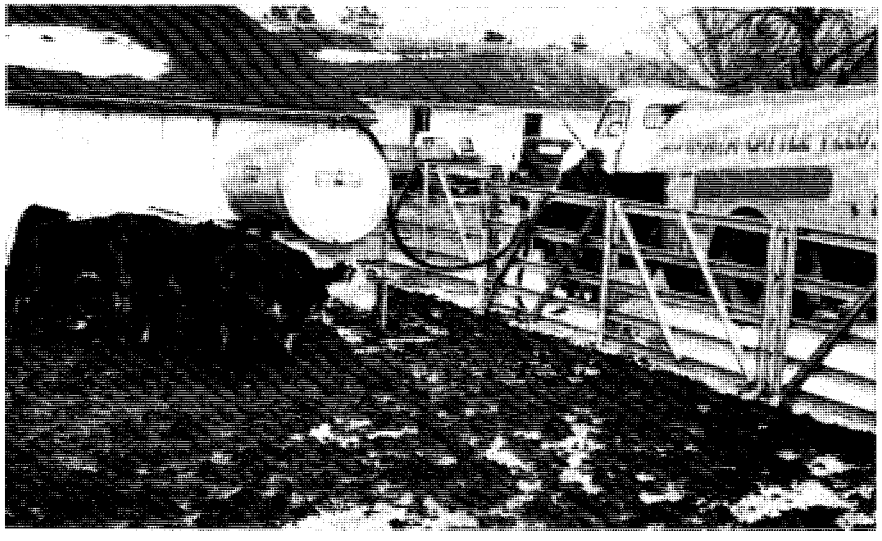
With dairy animals, says Feed Service, farmers are able to boost their profits by $8.00 to $10.00 per head per month. Reasons: lower feed costs and larger amounts of milk and butterfat. In tests recently conducted by an Iowa dairyman under the supervision of the Dairy Herd Improvement Association, cows fed Morea supplement showed an 8% increase in butterfat production.

As Feed Service emphasizes, improved quality of meat is one of the supplement's biggest single advantages. The meat, the company says, is more tender and flavorful, and of higher quality. There is less cover fat and more of the desired marbling of fat. In the case of lamb, there is also less possibility of an undesirable tallowy or muttony flavor.

Since Morea is a readily pourable liquid, less labor is involved in handling. Pumping into a storage tank mounted over a feed trough does the job quickly and easily.

And Morea supplement can be fed free choice, along with limited amounts of grain and unlimited amounts of cellulose-containing roughage. Some farmers, on the other hand, prefer to mix a prescribed amount of Morea in with their regular feed ration.

Morea is metered into tanks, minimizing farm labor required



In either free-choice or controlled feeding, metabolic control mechanisms in the rumen prevent the animal from eating too much Morea. The critical factor here is the amount of urea consumed, since the animal tends to maintain, on a dry-weight basis, a 2% nitrogen (equivalent to a 12.5% protein) level in the rumen. As a result, the average animal will consume only about two pounds of the supplement per day.

This limitation on intake eliminates the possibility of untoward effects from the alcohol (intoxication or dizziness, for example). As Anderson points out, the ethyl alcohol is completely metabolized in the rumen. It never builds up to a high enough concentration to enter the blood stream.

Early Development of Feed

Feed Service's production of urea-containing feeds dates back to 1951. The feed introduced at that time contained molasses, urea, phosphoric acid, and trace minerals. With this product, however, feeding results were never really satisfactory. It was not until 1954 that the advantages of adding alcohol were discovered. Test marketing of the improved product began shortly afterwards.

Throughout the past two years, U.S.I. has worked closely with Feed Service on this development, partly in its role as a supplier of alcohol and partly through its over-all interest in animal nutrition. At present, U.S.I. is building a plant at Anaheim, Calif., to make the premix and has plans for a unit at Tuscola, Ill.

Morea in combination with molasses is now being sold by about 40 mixer-distributors, mainly in the Midwest. Heaviest demand is in Nebraska, Iowa, and Illinois, but Feed Service is also selling in more than a dozen other states. U.S.I. is just beginning to open up markets in California, Utah, the Pacific Northwest, and the Southeast.

Use of Morea supplement is spreading to other parts of the world. Puerto Rico has a plant in operation, and a large Italian farm cooperative in Rome has recently been licensed. Companies in Denmark, France, Australia, and South America have expressed keen interest in the material.

So far, most of the detailed testing of Morea in the U. S. has been done by Feed Service and by various users classed as reputation feeders. To

date, most of the work at agricultural experiment stations has been on specific phases of the effects of ethyl alcohol and phosphoric acid on the microbial breakdown of cellulose. Research has been done at Iowa State, Kansas State, Rutgers, and a half dozen other colleges. Obviously, much more study is needed on the effects of alcohol-containing feeds on animal metabolism, growth, and development.

Feed Service and U.S.I. are convinced that they have a product worth promoting. But they still have a big job ahead. It's the job of educating farmers on the use and advantages of something quite new—a free-choice liquid feed supplement containing alcohol.

Vertical Integration

Trend to integrated farming will affect chemical industry from research to marketing

TO INTEGRATE OR NOT TO integrate is apparently no longer the question facing agriculture. Instead, the question seems to be: how long will it be before integration takes place in some areas? Vertical integration, or contract farming, an arrangement by which farm production and commodity processing and distribution are all tied together, is gaining momentum. In fact, it shows signs of zipping through farm segments that haven't seen much of it before—hog and steer raising, for example. And those segments of the chemical and allied process industries that deal with agriculture are coming face to face with a new system of agricultural buying and marketing.

Vertical integration isn't new; the broiler industry turned toward it strongly during the depression years. Also, contract farming is common in producing eggs for hatcheries, vegetables for canning or freezing, sugar beets for processing, and some specialty crops. Contracts involve agreements between farmers and business firms, often farmers and co-ops.

Among integrated farming activities, broilers lead the pack. As much as 90% of all broilers are now produced under contracts, which are of many kinds. Meanwhile, the fruit and vegetable packing industry (especially in the South and West) is assuming more and more control over the growing end of its business.

Evidently, part of the nation's huge livestock breeding and raising industry is next in line for integration. The feeling among many farmers, packers, feed companies, and experiment stations is that integration results in more efficient animal production, stabilized income, and an even distribution pattern. Steadying farm income is a big factor behind the integration talk, especially in the corn and hog raising Midwest.

Integration in the livestock industry has raised some eyebrows, but arguments against it are becoming academic. These arguments—one is that farmers will be "just hired hands," or share-croppers—are about the same, says one expert, as those raised 20 years ago against integrating broiler production.

Keeping in close touch with these developments are ag chemicals makers and suppliers. The chemical industry per se, the drug industry, and the feed industry are particularly affected.

Impact on Chemicals

Major impact on manufacturers and suppliers of farm chemicals will be due to changes in the number and type of farmers these companies will have to deal with. Generally, the impression is that a decrease in number of farmers (a natural result of integration) will not work against sales of agricultural chemicals or chemical feed additives. As a matter of fact, some companies feel that the development will help them.

Their reasoning goes this way. An integrated farm needs to maximize production, cut costs to the bone, to be profitable. One proved way to do this is through heavy fertilization and strict pest control with crops, efficient feeding and low morbidity with animals. Result: bigger purchases of agricultural chemicals, feed additives (and feed), and medicants. Feeling is that though there may be fewer farmers, they will be better ones.

To be sure, this opinion is nowhere near unanimous. Among the dissidents are some whose arithmetic shows that a trend to fewer farmers means diminished markets, retention of total acreage notwithstanding. Still others say that sales may increase, but the benefits of increased sales will be cancelled out by lower profits due to discount selling to large operators.

The 1958 growing season may help confirm or refute some of the opinions. This year finds more large farms (though not necessarily integrated ones) than ever before, particularly in the Midwest. How these farms use chemical products may well portend the practices of the future.

Scientific Orientation Helps

When a company or a cooperative integrates backward, that is, toward the grower's province, and then looks for ways to improve its products, it does not depend on hearsay or on guess work—as an individual farmer often does. Instead, a large "corporate farm" becomes more scientifically oriented, and is impressed only by technological results. So when a chemical company, for instance, markets a future new pesticide, the time lag between introduction and use may be considerably less than it is today. This would hold in any integrated operation—livestock, broilers, fruits, vegetables.

As vertical integration takes hold in more areas, scientific results will receive wider and more rapid circulation. Where livestock is concerned today, says a midwestern animal nutritionist, there is already a need for a much broader and swifter interchange of technical information between chemical and drug companies on the one hand, and the feed industry on the other.

Science emphasis by integrated farms is not just a fad. Rather, it is the only sound approach, experts agree. To begin with, a much larger number of animals or a larger crop acreage is handled by integrated farms than by individual farmers. Take broilers for example. Between 1934 and 1956, the span during which the broiler industry went from almost zero to 90% integration, broiler production in the United States increased by a factor of 35. With an expanding population, increases of this magnitude are often necessary; yet the individual farmer is simply incapable of coping with such spurts in market demands. The situation is similar with crops and with livestock.

In mass production of animals and crops, scientists usually determine methods of breeding for uniformity, and develop techniques for mob handling, disease control, and nutrition. The last two points are especially important to chemical, drug, and feed manufacturers. Their research emphasis on plant and animal diseases and nutrition will increase. And more research will lead to more basic farm chemicals that will have to be produced and distributed.