Nitrates scare is newest green assault on farming

Is the threat to drinking water just a pretext to strangle an area essential to our survival—agriculture—as was done with nuclear energy? Wolfgang Lillge, M.D. exposes the hoax.

The following article was adapted from the German Fusion *magazine, by permission of the author. It was translated from the German by John Chambless.*

Almost one-third of the land in the Federal Republic of Germany is to be classified as a "water-protection area," according to the European Commission's draft guidelines, by which the Brussels bureaucracy of the European Community intends to bring nitrate contamination of the soil under control. In Germany, the entire state of Schleswig-Holstein, large parts of Lower Saxony, Hesse, and North Rhine-Westphalia, the Rhine-Neckar region down to the Lake Constance, and Bavaria south of the Danube River would be classified as "nitrate-sensitive zones." The EC Commission also intends to identify all of Denmark and the Netherlands as nitrate sensitive, along with the northern part of Belgium, the southeast of England, and many regions of France, Spain, and Italy.

In these new water-protection areas, the yield of natural and artificial fertilizers, as well as animal husbandry ("maximum number of manure-producing animals" per hectare) will be greatly restricted. The draft provides that stable manure may be produced only in maximum amounts of a limit of 2 milk cows, 16 fattening hogs, or 5 sows per hectare. The production of mineral fertilizer will be precisely defined and carefully supervised. According to the information bulletin *Agra-Europe* of Dec. 27, 1988, the Brussels officials assume that these plans will have "perceptible economic consequences." Thousands of farms may be ruined.

While this is not the first blow against farmers by the EC Commission, this one strikes at the heart of agricultural productivity: Without nitrate or nitrogen fertilizers, modern farming is simply impossible.

For quite some time, the media have intimidated the public with reports that the drinking water is poisoned with thousands of substances that cause cancer or make us deathly ill. Nitrate is said to be especially insidious, because it is more harmful to children and because some of the most powerful carcinogens are produced from it, for example, a substance called nitrosamine.

The medical effects of nitrates

The relevant publications and other investigations more or less tacitly presuppose as a "popular consensus" that nitrates and its metabolites are harmful to human beings and that the measures taken to limit nitrogen contamination are justified. The buzzwords are "cancer," of course, and "cyanosis" in small children. But if we examine the known facts from medical and toxological research, everything appears in a quite different light.

1) Nitrate (NO_3) itself is a relatively non-poisonous substance. According to the World Health Organization (WHO), which is one of the major sources for the ideas of global environmentalism, a daily intake of 3.65 milligrams per kilogram of body weight for children is justifiable. That equals 255.5 mg per day for a man who weighs 70 kilos, or 160 pounds.

The average West German citizen consumes about 50-70 mg of nitrate from food (not counting drinking water), but this varies considerably depending on the type of food. The nitrate in drinking water is normally 20-30% of total nitrate consumption, which can increase to 50% or 60%, depending on the nitrate content of the water. In no case, however, does it ever reach that very low threshold that the WHO views as

still within the harmless range.

2) Nitrate is absorbed in the small intestine, and 85% is excreted in the urine and 2% in the stool. Larger amounts of nitrate concentrate in the salivary glands, and undergo a cycle there: Nitrate is excreted from the salivary glands, absorbed again by the gut, and then returned in part to the salivary glands. Even if nitrate consumption is completely halted, there is, therefore, always nitrate in the body.

Nitrate is also produced in the body itself (through metabolic reduction processes and by bacteria in the intestine). Quantitatively, the same amounts can be obtained as through nitrate consumption from food. That is, external sources alone do not account for the amount of nitrate available in the body.

3) Nitrate is chemically reduced through the presence of the enzyme nitrate-reductase, which is found in many bacteria, into nitrite (NO_2). Bacteria that can reduce nitrate to nitrite are widely distributed, and include coliform bacteria, *Clostridia*, vibrios, staphylococci, and streptococci. These bacteria are found in human beings in the oral cavity, esophagus, and intestinal tract, and, under certain circumstances, also in the urinary tract.

A clear nitrite formation takes place only at a density of 10^6 bacilli per milliliter, which according to the principles of infection theory, is already classified as pathological.

Nitrite-forming bacteria do not come from drinking water, which must be perfectly clean from a bacteriological standpoint. Bacteriological colonization and, therefore, nitrite formation is, of course, considerable with unhygienic preparation and storage of food and drink. A further source of nitrite formation is bacteriological colonization in the oral cavity. Preventive measures, such as oral hygiene, play a role in the amount of bacteria existing in the mouth, as does age.

4) The health of infants can, under certain circumstances, be endangered during the first three months of life by very high concentrations of nitrite, because approximately 80% of the hemoglobin in infants is still "fetal hemoglobin." This hemoglobin is oxidized by nitrite approximately twice as fast into methemoglobin as the later dominant hemoglobin-A. In methemoglobin, the complexly bound iron molecule is transformed from the bivalent to the trivalent form such that oxygen cannot bond to it. If the concentration of methemoglobin goes beyond a certain value, then symptoms of internal suffocation occur (cyanosis).

Further, in infants, the function of the methemoglobin reduction enzyme has not been fully acquired, so the methemoglobin produced is only slowly reconverted. Since the stomachs of infants produce only small amounts of acid, there is also the possibility of bacterial colonization of the upper intestinal tract and the reduction of nitrate to nitrite through that avenue.

Fluid throughput in infants is considerably higher than in adults. An 11-pound baby takes in 0.85 quarts of liquid daily—the equivalent of 11.6 quarts in a 160-pound adult. So, high nitrate concentrations in drinking water do have a

Who runs the U. S. nitrate pollution scare?

A mobilization of state and federal initiatives is under way in the United States to penalize farmers and others for polluting groundwater. Although the name "Greenie" isn't commonly used, this mobilization parallels the Green campaigns against farming, and residential and industrial infrastructure development in Europe.

In Congress this spring, Sen. Wyche Fowler (D-Ga.) introduced a bill called the "Farm Conservation and Water Protection Act," which places potential drastic restrictions on agriculture, including the threat of fines and heavy regulation, in the name of protecting public water supplies. While this bill is not expected to be enacted as is, it is expected that it will influence the next five-year farm bill that is to be passed in 1990.

On the state level, similar initiatives are coming before legislatures. In Minnesota, for example, the 1989 legislative session passed a comprehensive bill setting heavy regulations for farmers in "environmentally sensitive areas." Local governments are even passing laws about where, when, and whether manure can be spread.

None of these bills contain provisions for dealing with the real U.S. water crisis, which requires resuming construction and repair of waterworks of all types—water and sewage treatment, irrigation, locks and dams for river channel maintenance. The U.S. "Greenie Groundwater" bills are all punitive against food, farming, and people.

The blueprints and public propaganda for these Green bills were worked out early in the 1980s by the Washington, D.C.-based group, the Conservation Foundation. This Greenie think-tank published numerous books and articles on the danger of runoff of chemicals from what they term "non-point" pollution sources, such as farms. The Conservation Foundation claims that public demand for dams and large-scale water treatment programs is a plot by civil engineers to cadge pork barrel contracts.

When William K. Reilly, the former head of the Conservation Foundation, became the new administration's head of the Environmental Protection Agency last January, he immediately cranked up the groundwater scare campaign. By the end of 1989, the EPA and the U.S. Department of Agriculture plan to release a national study of the presence of chemicals in groundwater that is intended to scare the public into accepting sweeping attacks on technology-intensive farming.

more intense effect on infants.

5) There are various references concerning the number of cases of methemoglobinemia. One investigation in 1962 found 1,000 cases up to that point, of which 8% were fatal. Another count two years later yielded 100 cases in West Germany. A third investigation for Europe and North America yielded approximately 2,000 cases, 160 of which were fatal. There is, therefore, considerable deviation in the numerical data for this disease.

6) Many of these earlier cases were caused when the infants were switched to powdered milk, which is often not free of bacteria, and which was frequently mixed with water from private wells of high nitrate concentration. Moreover, the water used to mix formula used to be frequently kept warm on old coal stoves and probably evaporated to such an extent that the nitrate became more concentrated.

7) In the last 25 years, no acute cases of poisoning have been registered in areas supplied by public water in West Germany, whereas if it were true—as the environmentalists claim—that nitrate concentration had shown a marked increase in some groundwater, the recent morbidity rate should have increased dramatically.

From earlier research, it can be concluded that increased nitrate concentrations in infants can be tolerated, and if any increase in methemoglobin ensues, it is only to a small, clinically insignificant extent. By contrast to the development of improved methods of water purification, improved hygiene in food probably plays a greater role in the elimination of incidence of methemoglobinemia.

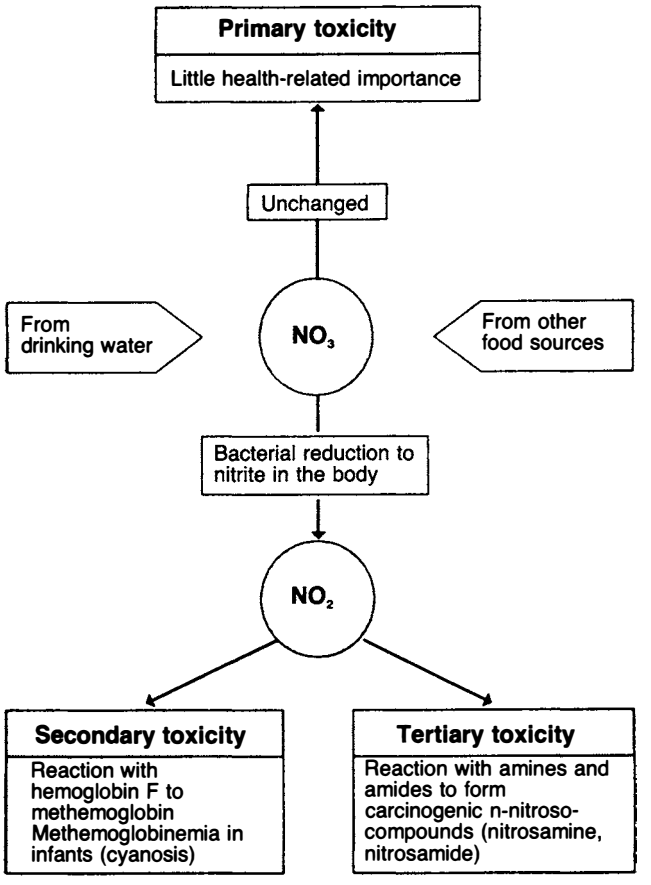
8) Proof that nitrosamine forms in the human stomach from nitrite and amine compounds has not been provided, and evidence that there is such production exists only from animal experiments. These were carried out with nitrite concentrations many orders of magnitude higher than normal—unreachable by human beings.

On the cancer front, it is debatable whether substances such as nitrosamine and other so-called carcinogens can produce any effect in such minute amounts (we are talking here of parts per billion, that is, one molecule among one billion others!) or perhaps even as a single molecule, or whether there is a definitive threshold value that must be passed before a carcinogen can cause a cell abnormality. It is in fact probable that we shall have to develop an entirely new theory of cancer formation. Even if suspicions of carcinogenicity were confirmed, the nitrate in drinking water could not account for it, and we would have to include all nitrate in all substances consumed for nourishment or pleasure, as well as the nitrate formed in the body and the nitrosamine itself contained in many foods. In fact, there is no indication that there is a higher frequency of cancer in areas with higher nitrate concentrations in drinking water.

This brief overview of what we know about the medical effects of nitrate makes clear how shaky the ground is, that the concrete measures introduced to reduce soil nitrates stand on. Apart from the plans to establish giant water-protection areas, in 1986, the EC Commission reduced the amount of nitrate permitted in drinking water from 90 to 50 mg/L. This low maximum was constantly characterized in the debate as "precautionary." Since, however, the problem of methemoglobinemia virtually no longer exists for us, these "precautions" are being undertaken now as a simple matter of "eliminating the risk for ill infants," which was a similar concept used during the campaign against nuclear energy. With the growing panic over various "environmental poisons," a second argument has been pushed into the foreground: the need to lower the "probability of production of carcinogenic nitrosamine" by further limiting nitrate concentrations.

Of course, in the same breath it is conceded how flimsy the basis for this argument is. Thus, it's said, "The results of

FIGURE 1
The toxicity of nitrate



Nitrate (NO_3) is itself virtually completely harmless; through bacterial reduction of nitrate, small amounts of nitrite (NO_2) are produced, and, through further reductive steps, nitrosamine, but detectable in only trace amounts.

Source: Rohmann, Sontheimer, Nitrates in Groundwater.

research on nitrosamine from the last 15 years show that the chronic threat to health through nitrate is essentially more difficult to assess than the acute threat to infants." Terms such as "potential teratogenicity" of nitrate and the "possibility of endogenous nitrosamine formation" are to fraudulently replace scientifically established knowledge of possible cancer dangers (see **Figure 1**).

Meanwhile, it is impossible to get a clear view of the mass of research work concerned with the danger of cancer being produced from nitrosamine—research which has produced no concrete results that could justify the drastic measures being preemptively implemented. We have reason to wonder if "the danger from nitrate" is only a pretext to strangle an area essential to our survival—agriculture—as was done in an analogous way with nuclear energy.

Nitrates and agriculture

Agriculture is as impossible to conceive apart from nitrates as is human life apart from oxygen. Every plant needs nitrogen for growth, primarily in the form of nitrate, and the more intensive an area is cultivated, the more nitrogen must be supplied to supply the need of the plants (see **Figure 2**). Every weekend gardener knows that, as most certainly does the farmer, who has thoroughly studied these connections as part of his training.

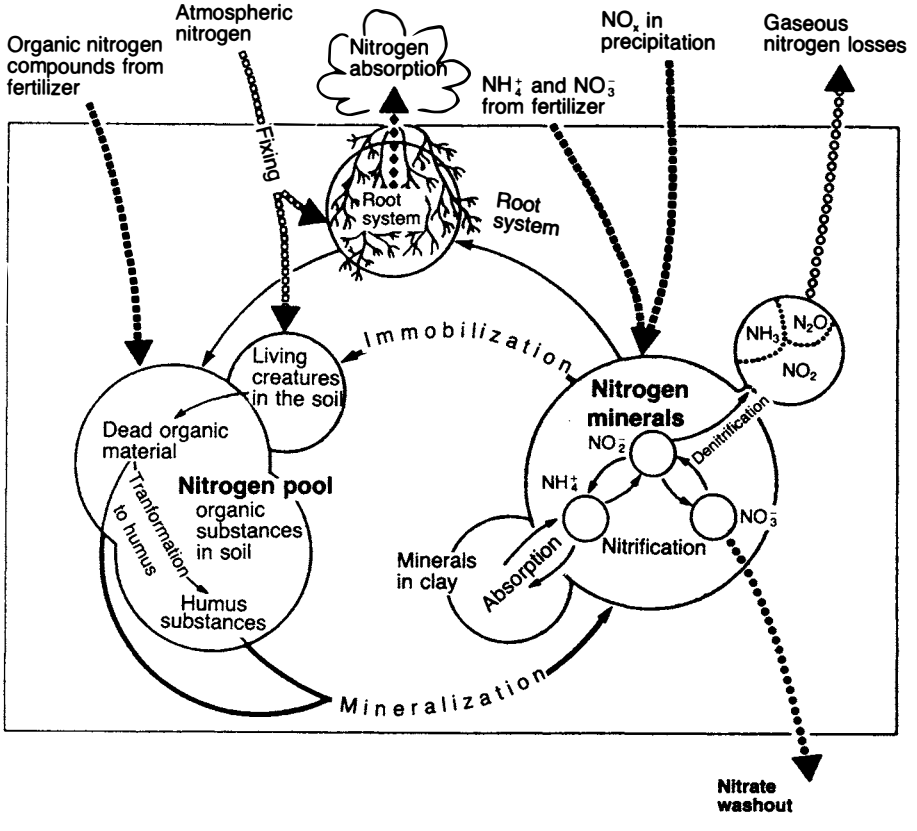
Let us look at some of the important facts about nitrate in agriculture and its effects on groundwater.

1) The portion of mineralized nitrogen (nitrate) in the soil that is absorbable by roots, is extracted through the formation of plant masses. After the harvest, the soils are more or less "leached."

In order to replenish the soil's nitrogen reserves, the farmer uses mineral fertilizers. These are not at all products alien to nature, as is often deliberately suggested by the designation "artificial fertilizers." They are chemically identical with plant foods that are liberated through weathering of soil materials or mineralization of organic substances and absorbed by plants. "Natural" nutritive substances do not suffice for optimal growth, so that a mineral fertilizer must replace the minerals that the plants absorb from the soil.

If primary and trace substances, along with other growth factors such as water, soil, air, pH values, and light, are

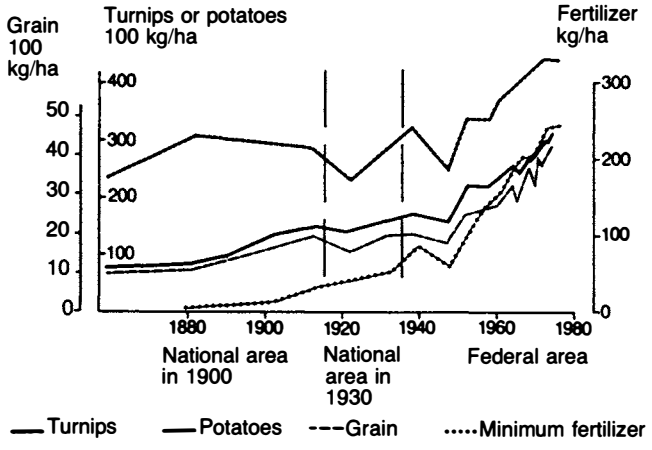
FIGURE 2
The nitrogen cycle



Nitrogen in the soil undergoes a complex cycle in which nitrogen inputs in the form of fertilizer are only one part of the nutritive supply available to plants.

Source: Rohmann, Sontheimer, Nitrates in Groundwater.

FIGURE 3
Agricultural harvests and expenditure of mineral fertilizer in Germany

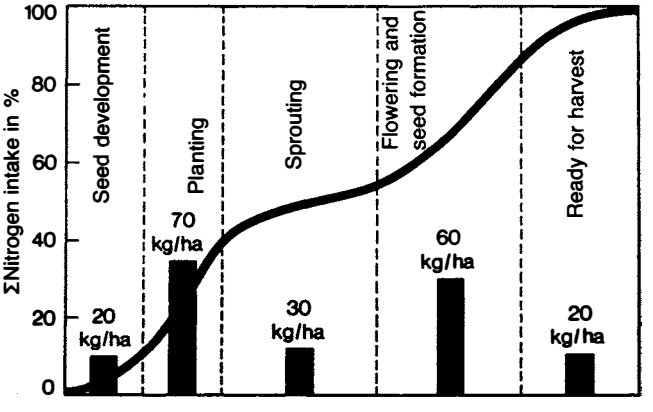


Source: DFG, Nitrate-Nitrite-Nitrosamine in Water.

provided optimally, then nitrogen, primarily taken up as nitrate, is the most important factor in plant nutrition determining harvest yield.

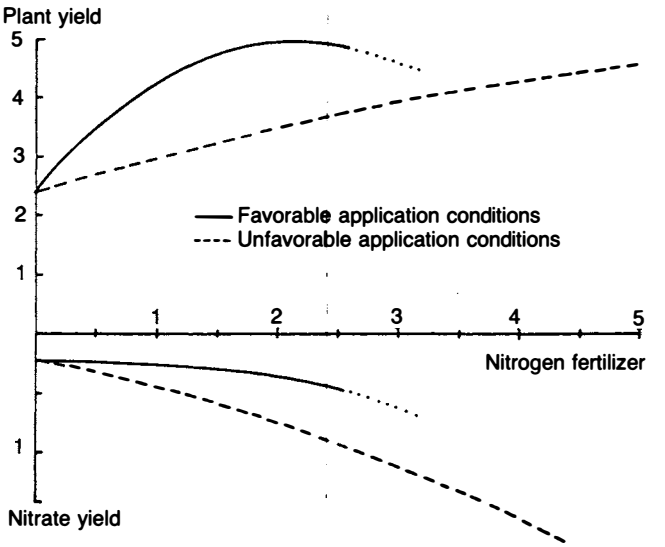
The optimum in fertilizer has increased over time due to various factors: technical improvement of soil preparation, and extension of genetic productive potential through plant breeding. That is, new varieties can better use an increased supply. Today's harvests are three times as great as those of a century ago—the result of improved accommodation to the natural needs of plants and the increase of soil fertility (see **Figure 3**).

FIGURE 4
Development stages of grains and the nitrogen intake in different growth phases



Source: Rohmann, Sontheimer, Nitrates in Groundwater.

FIGURE 5
Harvest yield and nitrate washout



The connection between harvest yield and nitrogen washout is shown for increasing nitrogen input under favorable or unfavorable fertilizing conditions.

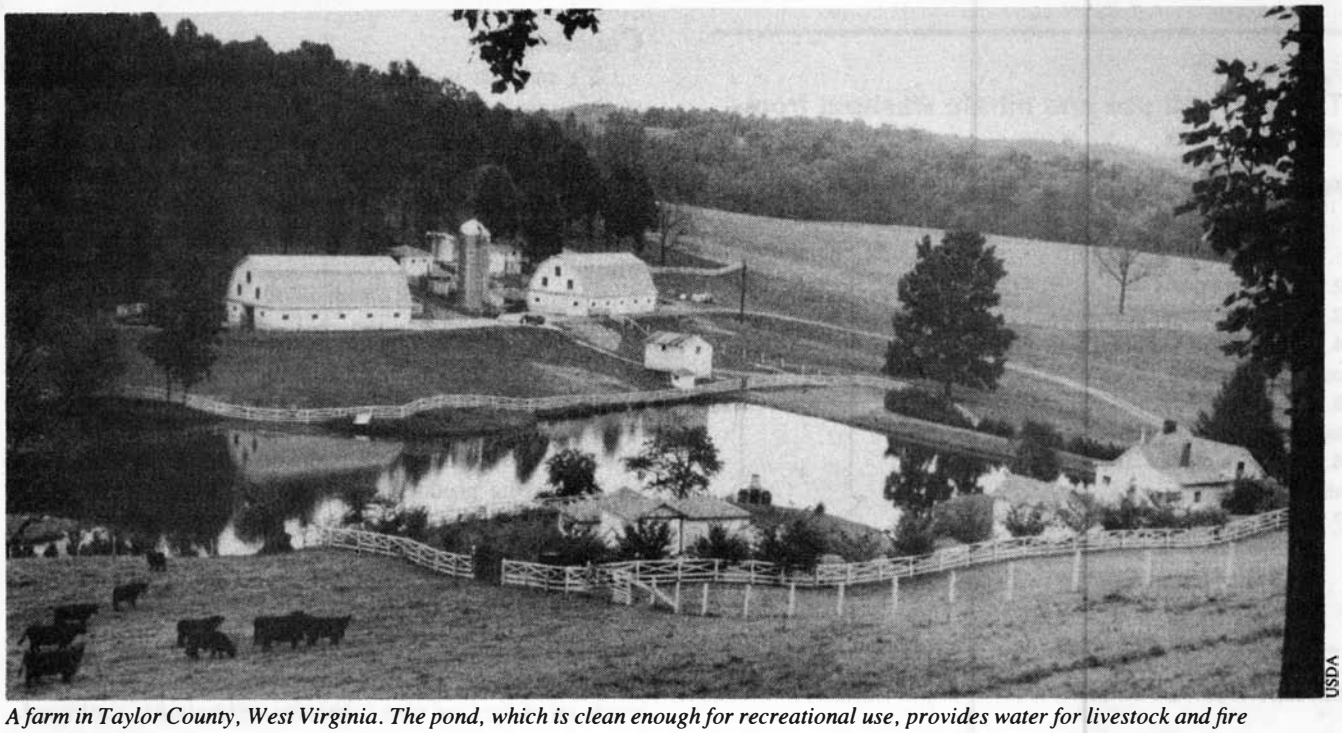
Source: H. Vetter, Agra-Europe.

For the farmer, nitrogen that leaves the area of the roots is a complete loss. Therefore, no farmer is interested in spreading more nitrogen on his acreage than is necessary for optimal harvests (see **Figure 4**). If the farmer were to fertilize the land in accordance with the optimum that has been established by experimental research for the different kinds of cultivation, then the expenditure of nitrogen would increase from 100 kilograms per hectare (1982) to approximately 150 kilos. On the average, agriculture is, therefore, at two-thirds the optimum.

Fertilizer intensity, whether of "artificial" or "natural" fertilizers, is only one of many factors that can lead to the full development of nitrate. The entire system of plant cultivation must be taken into consideration. Concepts such as "organic gardening" are therefore slogans devoid of both definition and scientific foundation (see **Figure 5**).

2) Investigations show that, despite the increased use of fertilizers in recent decades, the seepage of nitrogen into soil at depths greater than one meter has hardly changed in comparison to earlier periods. The greatest part of the nitrogen that seeps out of the root area originates from organic substances in the soil. Fertilizer-nitrogen will, in contrast, be taken up by the plants in increased amounts; thus a higher level of fertilizer than today's level will not lead to any decrease in utilization.

Only on acreage that is not used (set-aside acreage!) or



A farm in Taylor County, West Virginia. The pond, which is clean enough for recreational use, provides water for livestock and fire protection. If the environmentalists are successful in undercutting agricultural productivity through regulations on fertilizer use, the lack of vegetation will cause an increase in groundwater nitrate concentration—just what the "Greenies" claim they want to stop.

on very badly farmed areas can it happen that more nitrogen is supplied than the vegetation of a year absorbs. That means that an increased contamination of groundwater results from barren land and "extensively" used areas.

3) During autumn, roots and harvest residues undergo extensive decomposition, that is, mineralization and subsequent nitrification. With increasing autumn and winter precipitation and corresponding water absorption by the soil, seepage water and the formation of nitrate increases. Here, the problem of liquid manure plays a role. If liquid fertilizer is applied in autumn in large amounts to uncovered fields, where it has little fertilizing effect, then the danger of nitrogen loss and entry of nitrates into groundwater is relatively great.

4) Water purification professionals have no clear picture of the hydrological laws that govern how nitrates enter the soil. The argument that intensive agriculture must be the main source of nitrates in the ground has become very trendy, but once again, a convincing proof is totally lacking. In fact, there is no simple correlation between nitrate concentration in drinking water and the amount of nitrogen fertilization.

The most important nitrate sources for groundwater have long been known. They include:

- leaky septic tanks;
- sewage plants;
- sewage sludge and garbage dumps;
- leaky or improperly managed liquid-manure containers;
- dung and manure pits;
- silage storage;
- humus-rich soils;
- fertilization in the form of commercial fertilizers (liquid manure, among others) and mineral fertilizers.

It would certainly be sensible to eliminate as far as possible all the means by which nitrate is concentrated in groundwater before agriculture is globally portrayed as the "poisoner of wells."

After calculating nitrate washout, the groundwater nitrate content should show much higher levels than is in fact measured. During seepage, there is obviously an extraordinarily effective microbacterial nitrate reduction. And in groundwater conductors, there can even be some further nitrate reduction. Investigations in the intake area of water works have shown that 50% of the recorded nitrate is reduced in this manner.

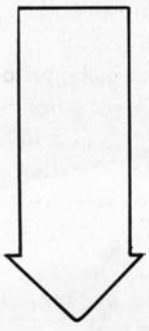
According to rough calculations, approximately 10% of the drinking water supply in West Germany has a nitrate content over 50 milligrams per liter, the accepted upper limit since 1985. If we consider the distribution of nitrate content throughout the country, it is striking that the highest values are always found in low-precipitation regions where relatively light soil types are intensively cultivated. "Anomalies" where alarmingly high contents are detected are mostly where specialty crops such as wine grapes, hops, and spring fruit, as well as root crops and vegetables, are cultivated. These regions constitute approximately 0.4% of all lands under

FIGURE 6

Types of soil use and nitrate washout from the root area

Form of use

1. Forest (except alder)
2. Permanent grass land
3. Grain with intercrop
4. Grain without intercrop, feed grain, commercial growth
5. Corn, root crops, field vegatables, legumes, grapevine cultivation
6. Vegetable garden cultivation and allotment gardens
7. Cultivated garden conversion
   a) conversion of green fields
   b) cleared forest lands
   c) reforestation



Source: H. Vetter, Agra-Europe.

cultivation. In areas of normal agricultural uses, the nitrate content is largely within the threshold value. Grasslands and forests present virtually no problems as far as nitrate washout is concerned because of the year-round presence of plants (see **Figure 6**).

Turning to what the Greens call "nitrate wells," which are small areas of high concentration, these are relatively small catchment basins, usually in rural areas, which sometimes appear in high-percolation soil. In general, however, the larger the catchment basin is, the smaller will be the contribution of nitrates from areas under intensive cultivation. Frequently, because of considerations of potential pollution of the highest water table, exploitation of that table is abandoned in favor of use of deeper tables that are almost completely free of nitrate.

5) If the limiting value is to remain 50 mg/L, it would be considerably more intelligent from an agricultural point of view to consider water-agricultural solutions for nitrate reduction rather than destroying the productive foundation of agriculture.

There are many methods for eliminating nitrate from drinking water: reverse osmosis, ion-exchange processes, and denitrification by biological processes. Only the last method allows specific elimination of nitrate; all the others lead to a more or less complete desalination of the water, which must eventually be compensated for.

Scientists at the Jülich nuclear research center and the Institute for Microbiology at the University of Hohenheim have recently developed two different processes for microbic nitrate elimination, which have already furnished promising results.

Conclusions

It's easy for someone to feel that he's stumbled into a world turned upside down when he considers the excesses produced by the fanatically conducted war against nitrates. In Germany, Gov. Lothar Späth is already assessing a "water penny" from the citizens of his state of Baden-Württemberg, which he is using to give equalization payments to farmers who suffer income losses resulting from fertilizer limitations. A total of 110 million deutschemarks is estimated for that in 1989.

On the European and West German level, a wave of laws and decrees is inundating farmers, all in the name of environmental protection. Even agricultural specialists cannot overlook that all such measures are having the same effect: They are destroying productive agriculture, and are driving the independent farmer either into ruin or into a new dependence of the sort from which he liberated himself not so very long ago.

The irony here is that, in the wake of the much praised "extensification" of agriculture and widespread set-aside of agricultural land, it is probable that even more nitrate will wash out of the land than if modern cultivation is continued, as a consequence of the natural processes sketched above.

A correctly run agriculture has always been the best form of environmental protection!