FROM THE GROUND UP

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AGRONOMY NEWS

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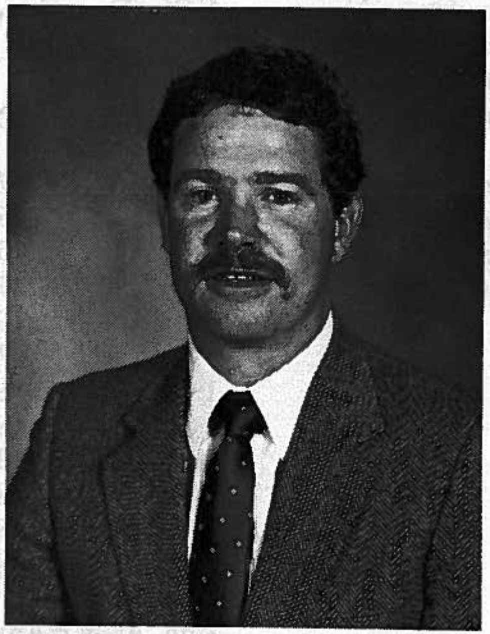
SHANAHAN ASSUMES VARIETY TESTING-EXTENSION AGRONOMIST POSITION

Dr. John Shanahan, previously half time Extension forage specialist, assumes full time Extension responsibilities January 1, 1992. His new assignment includes conducting the variety testing program and the educational responsibilities with small grains.

John grew up on a grain and livestock farm in eastern Nebraska. He received his BS degree in Agronomy from the University of Nebraska in 1977, his MS in Plant Breeding in 1979 and his PhD in 1982 in Crop Physiology at Colorado State University. He has acquired extensive research experience in variety testing and crop management during the last 13 years. John assumes his new duties with high qualifications.



John, Shelly and daughter Katie hope to become better acquainted with you. John's hobbies include outdoor activities such as hiking, skiing, fishing and sailing.

Give John a call at 303-491-6201, welcome him to the staff and his new responsibilities. ▫Croissant

The Agron-O-Gram *was published for the last time in November. We have undergone a transformation! This is the same newsletter with a new name,* From the Ground Up, *and a new format.*

Let us know what you think and how we can best meet your needs.

FERTILIZER PRICE TRENDS

A look at Table 1 shows that, in general, the price of fertilizer tends to be lower in the fall compared to the spring. However, you will note from the table that the price of ammonium nitrate was unchanged in 1991.

USDA expects fertilizer supplies for 1992 to be adequate at slightly higher prices, with planted crop acreage being a major determinant. Doane analysts are currently projecting a 2% increase in next year's acreage for all crops. It is expected that spring prices for fertilizer will probably increase about 4% as they did last spring. Now may be a good time to lock in fertilizer prices for next spring.
□Follett

Table 1. Fertilizer price trends since 1986. (Doane's Agricultural Report)

	AN	Anh. Amm.	Potash	Phos.
		($/ton)		
1986 April	171	225	111	190
October	164	174	107	182
1987 April	157	187	115	194
October	154	180	135	206
1988 April	166	208	157	222
October	170	191	157	221
1989 April	189	224	163	229
October	180	180	153	204
1990 April	180	199	155	201
October	181	191	150	205
1991 April	184	210	156	217
October	184	188	148	211

AN=Ammonium Nitrate;
Anh. Amm.=Anhydrous Ammonium;
Potash=Muriate of Potash;
Phos.=Super Phosphate

LEAD IN SOIL

Lead is usually found in soil as a result of automobile emissions or from paint chips scraped off the sides of older buildings. At the Colorado State University Soil Testing Laboratory, soils are screened for lead contamination when they are analyzed for the "routine" soil analysis. In the routine analysis, soils are extracted with ammonium bicarbonate-DTPA (AB-DTPA). The AB-DTPA extracts are then analyzed by inductively coupled plasma (ICP). Although the routine analysis is primarily set up to analyze for zinc, iron, copper, and manganese, the use of the ICP allows for the analysis of lead as well.

If a sample contains more than 100 ppm lead, the lead content of that sample is reported on the sample report form. Excessive lead concentrations are rare and seem to occur where mine tailings were used as an amendment or where paint chips contaminated the soil. The most common levels of lead found in Colorado soils range from several ppm to 35 to 40 ppm. The average lead content of U.S. soils is 20 ppm with a range of less than ten ppm to 70 ppm.

In the natural state, the primary form of lead is as galena (PbS). During weathering, Pb sulfides slowly oxidize and have the ability to form carbonates and also to be incorporated in clay minerals, in Fe and Mn oxides, and in organic matter. The solubility of lead can be greatly decreased by liming. A high soil pH may precipitate lead as hydroxide, phosphate, or carbonates, as well as promote the formation of Pb-organic complexes. The presence of lead near the soil surface in most soil profiles (even uncultivated soils) is primarily related to the accumulation of organic matter. Organic matter should be considered the important sink of lead in polluted soils.

The contamination of soils with Pb is mainly irreversible and accumulation of lead will continue even if inputs are low. Increased levels of lead in soils are likely to limit enzymatic activity of microorganisms and as a result, increase the accumulation of incompletely decomposed organic matter.

Plants are able to take up lead to a limited extent depending on the species; however, lead uptake is reduced by liming and by low temperatures. When lead is present in soluble forms in nutrient solutions, plant roots are able to take up large amounts of this metal. In soil, lead is much less available. However, plants grown in soils with low cation exchange capacity (CEC) can take up more lead than plants grown in soils with higher CEC's.

Airborne lead from soil dust can also be taken up by plants by being absorbed by foliar cells. Although it has been suggested that most lead pollution can be removed from leaf surfaces by washing with detergents, there is likely to be a significant translocation of lead into plant tissues.

Lead levels in soils that are toxic to plants range from 100 to 400 ppm depending on the plant species. Although a very low Pb concentration may inhibit some vital plant processes, Pb poisoning has seldom been observed in plants growing under field conditions. The low chance of lead poisoning may de due to low lead concentrations in the soil and low lead availability even under contaminated soil conditions. Natural lead levels in plants growing in uncontaminated soils ranges from 0.1 to 10 ppm on a dry weigh basis.

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Lead can be found in appreciable quantities in soils near highways and urban sites. While most of the lead plants take up remains in the roots, it is not advisable to grow vegetables in soils contaminated with lead. ☐Self

RISK ASSESSMENT AND PERCEPTION

The U.S. Geological Survey recently released a water monitoring report showing that the herbicide atrazine was detected in every one of 146 water samples collected in the Mississippi river basin. Today, virtually every water monitoring study that is conducted in areas where agricultural chemicals are used will probably report detections of these chemicals. The fact that we are finding so many chemicals in our water is largely due to an ever increasing ability to measure chemicals in smaller quantities. Advanced laboratory techniques now allow the detection of atrazine, for example, in levels as low as 20 parts per quadrillion. For perspective, it can be noted that 1 part per quadrillion is mathematically equivalent to one second in 32 million years. This level may have no relevance to public health, but the report of any amount of pesticide in drinking water causes public concern about the risks associated with these chemicals.

Public perception of risk from pesticides is not driven by scientific data or assessment in all cases. The overall odds of getting cancer in our society is greater than one in four. EPA health standards for groundwater contamination by a pesticide are based on a lifetime exposure level that would conservatively increase that risk by one in one million, yet many feel this is still unacceptable. Drinking water standards are calculated on the assumption than you will drink 2 liters of contaminated water every day for 70 years. It has been estimated that these efforts by the EPA will save 75 cancer deaths per year at a cost of $88 million. In contrast, 400,000 people will die annually from smoking related deaths and 100,000 will die from alcohol related deaths.

A chemical is classified as a carcinogen if it causes genes or cells to replicate in an imprecise manner so that a proliferation of incomplete cells results. Toxicologists study the dose response of a chemical to determine the level of danger it represents. Due to various constraints, lab experiments are performed at dose levels that produce easily measured responses in test animals. Test species are commonly fed 100 to 10,000 times the amount that would have any impact on human health and mathematical models are then used to interpolate human response. If the risk is judged to be too high, the product is restricted or outlawed.

In setting regulatory standards, health agencies use the following terms:

- No-Observable-Adverse-Effect-Level (NOAEL) in mg/kg/day
- Uncertainty Factor (UCF) - ranges from 10 to 1,000. When in doubt, use 1,000.
- Acceptable Daily Intake (ADI) - ADI=NOAEL/UCF
- Maximum Contaminant Level Goal - (MCLG) - MCLG=ADI x 7
- Maximum Contaminant Level (MCL) - Highest allowable level for drinking water. Set as close as possible to the MCLG.

Industries such as agriculture cannot afford to ignore or minimize the public perception of risk, because these public concerns drive regulatory policy in many cases.

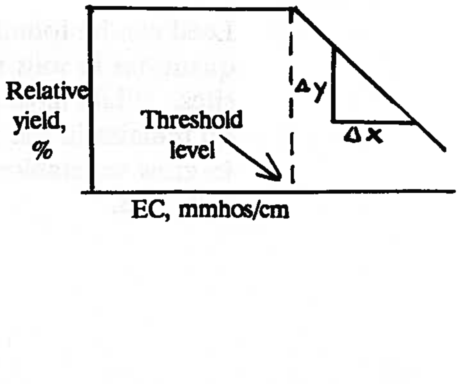
Obviously, there is a great deal of uncertainty in all of these factors, so regulatory agencies tend to be extremely conservative to protect public health. There are currently 64 chemicals with EPA established MCL's, including 17 pesticides. This list will continue to expand until most pesticides we use are included.

Environmental health problems and risks associated with pesticides in the environment do exist and should not be minimized. However, as scientists and educators, our goal should be to accurately communicate what is known about these risks and convey useful information about risk to the public. We must also honestly admit that we do not know about the full risks associated with pesticides and groundwater contamination. Industries such as agriculture cannot afford to ignore or minimize the public perception of risk, because these public concerns drive regulatory policy in many cases. □Waskom

SALINITY RESEARCH IN AGRONOMY

The Mined Land Reclamation Division of Colorado Department of Natural Resources funded a study to determine the salinity tolerance of some cool season forage grasses and some legumes usually used for revegetation purposes. We used a continuous flow hydroponic system to carry out this research work. In the case of a hydroponic system, we can carefully design the salt concentrations so that plant nutrients will not become deficient at high levels of salinity. Therefore, we are able to measure the osmotic (water availability index) and toxic effects of salts. As I explained in the Agron-O-Gram, September 1990, salinity tolerance can be measured by determining threshold and slope of relative yield decrease in response to level of soluble salts in water bathing plant roots. This is illustrated in Figure 1.

$$slope = \frac{\Delta y}{\Delta x} = \frac{\%\ relative\ yield\ decrease}{mmhos/cm}$$



The following table shows our results.

Genotype	Cultivar	Threshold EC	Slope
Alsike clover	Alsike	2.0	18
Cicer milkvetch	Monarch	1.5	23
Creeping meadow foxtail	Garrison	1.5	20
Smooth bromegrass	Manchar	1.5	21
Reed canarygrass	Ioreed	2.3	22
Timothy	Climax	1.5	17

Source: Jim Ippolito, M.Sc. Thesis, Dept. of Agronomy, CSU (in preparation)

Conclusion: The threshold levels for all the genotypes studied were very close (ranged from 1.5 to 2.3), but slopes indicated that Monarch cicer milkvetch, Ioreed reed canarygrass, Manchar smooth bromegrass and Garrison creeping meadow foxtail were less salt tolerant than Alsike alsike clover and Climax timothy. ☐Soltanpour

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Sincerely,

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