PROCEEDINGS OF THE 22nd, ANNUAL MEETING FERTILIZER INDUSTRY ROUND TABLE 1972

November 1, 2, 3, 1972
Sheraton-Peabody Hotel
Memphis, Tenn.

THIS ISSUE OF THE

PROCEEDINGS

DEDICATED TO THE MEMORY

OF

HOUSDEN LANE MARSHALL

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1951-1971

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Note: There were more participants who did not announce their names when asking or answering questions.

Table of Contents

Wednesday, November 1, 1972

Morning Session
Moderator: Herman G. Powers, Chairman

CHAIRMAN POWERS: Good morning! On behalf of your Directors, I extend to you a most cordial welcome to the 22nd Fertilizer Industry Round Table.

Every man in this room has one thing in common. In fact, every human being in this city, state, country and the world has this same thing in common – Appetite. Of all the common denominators, man's appetite for food is the oldest and never ending.

The second thing that is common to every person in this room is that in some way he is part of the Industry that plays a most important part in satisfying man's appetite to live on the Universe.

The third thing that is common to everyone in this room is that he has a desire to improve himself – to be a better man in his Industry. He has elected to come here today and devote some of his time to learning more about the Industry in which he makes his living.

These three points are common to every man in this room.

Your Directors have met several times since the last Round Table and our main effort has been to arrange a program designed by your requests – a program that is *your* Round Table, *your* forum. I am sure that some of you can appreciate that it is a most difficult job to provide a program that appeals to everyone. There are certain things on our minds today that are far from our concerns of yesterday. Taking priority in our surveys were requests for discussions on the Occupational Safety and Health Act. And along with that, that continues and will continue, the environmental problems that we are faced with in our industry. Also, in our program we want to keep up, so we have some speakers on new production techniques including speakers from overseas. There will also be discussion on the problem of P_2O_5 world supply. Getting back to home – *analysis guarantees,* that all of us in the production business and selling business are faced with this problem.

So, this is your forum for exchanging ideas. For some it will be the one opportunity you have this year to expose yourself to some facets of your Industry that are not routine. By learning something about these, you will be a better member of your Industry.

Last year we took on the tables in the afternoon and had a very favorable response. I like to look at these tables as part of our program that maybe we could consider a solution oriented approach, where you can get down with some of the speakers on an informal basis and ask questions and have a fruitful discussion.

And last, but not least, the forum gives you the opportunity to make contacts with others in your Industry on a social basis whether it be in the halls or at dinner together, or what have you. I think we have a very challenging, a very interesting program for you and we will now get started.

As is the pattern of life – a gentlemen that was most active in the affairs of the Fertilizer Industry Round Table from its very beginning is no longer with us – Doc. Marshall. Al Spillman will make a few remarks to you about Doc.

HOUSDEN LANE MARSHALL
1902 – 1972

Albert Spillman

With a heavy heart and much sadness I report to you that Housden Lane Marshall, our Secretary-Treasurer for 21 years, and one of the Founders of Our Round Table, died on May 27, 1972, at age 70, at Montgomery County Hospital, La Plata, Maryland, after a short illness.

Housden known to all of us and throughout The Fertilizer Industry was a most faithful, hard working Secretary-Treasurer, always working to improve the image of our Round Table. Housden was a kind man, cheerful, agreeable and always ready to help. He lived and loved our Round Table. All of us are indebted to Housden for a great job well done.

Housden was born in Cleveland, Ohio, and moved to Washington, D.C. at an early age. He graduated from McKinley High School, Washington. He received his B.S. and Masters Degrees from The University of Maryland, with a major in Chemistry.

From 1930-42 Housden was employed doing fertilizer research for U.S.D.A., Beltsville, Maryland and at T.V.A., Knoxville, Tenn., 1942-44. He was with Virginia Smelting Co., Norfolk, Va., working on Fertilizer Chemical

Research, 1944-46, and with Southern Acid and Sulphur Co., Little Rock, Ark., 1946-49. Olin-Mathieson purchased Southern Acid in 1949, at which time "Doc" was transferred to The Olin Fertilizer Plant in Baltimore, Md. with the Title "Chief Chemist". He retired from Olin in March, 1967.

Housden was a member of The American Chemical Society, The American Men Of Science and The Alpha Chi Sigma Chemical Fraternity. He is survived by his wife Agnes, a son Dr. John H. L. Marshall, Memphis, Tennessee, and three daughters, Mrs. Paula Clark Marshall Gray, Port Tobacco, Md., Mrs. Lane M. Debevoise, Potomac, Md. and Mrs. Eugenic M. Tomorria, Silver Spring, Md. and ten grandchildren.

On behalf of the Round Table members, our Sectretary-Treasurer, Paul Prosser, sent a letter June 6, 1972, to Mrs. Housden Lane Marshall and I quote.

"Dear Mrs. Marshall: All of us were shocked and saddened on learning, through your letter June 1, 1972, of the passing of Mr. Marshall. On behalf of all the Directors and Members of The Fertilizer Industry Round Table, may I extend to you, our sincere sympathy and offer our condolences to you and the other members of your family. "Doc" Marshall will long be remembered with affection and respect by all of the members of The Round Table. His many years of unselfish work on its behalf, and his stout defenses of its structure and aims will not be soon forgotten. We all acknowledge our indebtedness to him for those effective and productive efforts" End of Quote."

Continued by Spillman. "Now Housden, I am talking to you. We miss you at this meeting and we are grateful to you for the guidance and advice you have given us for the past 21 years. We are going to do our best to keep the Round Table operating on the highest level possible and we shall always be thinking of you." "God Bless You."

It will be appropriate at this time for all of us to stand in silent prayer for one minute to register our great sorrow and devotion for our Departed Friend Housden Lane Marshall. Thank you very much.

CHAIRMAN POWERS: We are most fortunate to have as our Keynote Speaker, Dr. Theodore C. Byerly of the United States Department of Agriculture. Dr. Byerly whose title is Assistant Director of Science and Education and Coordinator of Environmental Quality Activities, works directly in the office of the Secretary, comes to us with a most distinguished career. Dr. Byerly was born in Iowa, got his doctorate at the University of Iowa, has been a teacher, and served in many research projects and in administrative capacities in the Department of Agriculture. In his present position Dr. Byerly is responsible for the corrdination of all the Department of Agriculture programs related to environmental quality and for coordination of such activities with other agencies. Dr. Byerly holds a Borden Award for 1943, the U.S.D.A. distinguished service award for 1965. Of the many societies of which he is a member, one is the American Association for the Advancement of Science Council and various committees of many others. It is now my pleasure to introduce you to Dr. Byerly.

FERTILIZER, FOOD, FIBER, FORESTS, AND THE ENVIRONMENT

Theodore C. Byerly

The Cultivated area of the world amounts to about 1.42 billion hectares, a little more than 10 percent of the land surface. The population of the world is expected to reach about seven billion in Year 2000 which may be compared to about 3.65 billion in 1969.

The world can feed itself in Year 2000 by increasing yields on the present cultivated area, increase the cultivated area, or tighten belts.

The first course would require greatly increased use of fertilizer with some increase in eutrophication of waters. The second course would sacrifice grasslands and forests with loss of wildlife habitat and increase in wind and water erosion and consequent increase in sediment in our air and water. The third course would increase the proportion of the world's people undernourished or malmourished.

Table 1 shows the number of people in the world and its major geographic regions and certain of its largest countries in 1950 and 1969. As a whole, the population grew by 46 percent during this period. Population is likely to be double the 1969 figure by Year 2000.

Table 2 shows the land resource total and by principal use for the world its principal regions and for certain major countries.

Table 3 shows the plant nutrients consumed in the world, principal regions, and certain major countries in 1950 and 1970.

Table 4 shows wheat and rice yields in 1950 and 1970.

In 1969, food and fiber used by the people of the United States required an estimated 16.8 million metric tons of nitrogen for its production.[3] About 15.1 million metric tons were required to produce the animal protein we ate and about 0.9 million tons to produce the vegetable protein.

The people of the United States ate about 1.2 million metric tons of nitrogen of which about 70 percent was animal protein.

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[3] Accumulation of Nitrate. National Academy of Sciences, pp. VII plus 106 illustrations. Committee composed of Martin Alexander, Chairman, Thomas J. Army, Frederick J. deSerres, Charles R. Frink, Victor J. Kilmer, Thurston E. Larson, Norton Nelson, W. H. Pfander, Gerard A. Rohlich, Perry R. Stout, and Sylvan H. Wittwer. Published in 1972.

TABLE 1. World and Major Area and Country Populations 1950 and 1969 (Billions)

Area	Year 1950	Year 1969	Area	Year 1950	Year 1969
World	2.50	3.65	Africa	0.19	0.27
Europe	0.39	0.46	Oceania	0.012	0.02
North America	0.17	0.22	U.S.S.R.	0.18	0.24
Latin America	0.16	0.28	Mainland China	0.55	0.83
Near East	0.10	0.17	United States	0.15	0.20
Far East	0.75	1.13	Brazil	0.053	0.09

Table 2 shows the land resource total and by principal use for the world its principal regions and for certain major countries.

TABLE 2. Land and Land Use -- World's Principal Regions and Certain Major Countries - 1969

Region	Land	Cultivated Land	Grassland	Forest & Woodland	Other Land
World	13.39	1.42	3.00	4.05	4.88
Europe	0.49	0.15	0.09	0.14	0.11
North America	1.97	0.22	0.28	0.74	0.73
Latin America	2.06	0.12	0.50	1.00	0.43
Near East	1.20	0.08	0.19	0.14	0.81
Far East	1.12	0.27	0.11	0.45	0.29
Africa	2.51	0.19	0.82	0.56	0.94
Oceania	0.85	0.05	0.46	0.08	0.26
U.S.S.R.	2.24	0.23	0.39	0.91	0.72
China	0.96	0.11	0.18	0.08	0.59
(U.S.A.)	0.94	0.19	0.26	0.30	0.20
(Brazil)	0.85	0.03	0.11	0.52	(0.19)

Cultivated land per capita varied from about 0.25 hectare in Mainland China to about 2.5 per capita in Oceania in 1969.

Table 3 shows the plant nutrients consumed in the world, principal regions, and certain major countries in 1950 and 1970.

TABLE 3. Plant Nutrients Consumed (Thousands of Metric Tons)[1]

Region	Nitrogen 1950	Nitrogen 1970	P_2O_5 1950	P_2O_5 1970	K_2O 1950	K_2O 1970
World	4,277	25,792	6,101	17,945	4,484	15,461
Europe	1,897	9,074	2,555	7,305	2,533	7,044
North America	1,208	6,924	2,076	4,497	1,303	3,815
Latin America	117	1,172	107	786	55	618
Near East	94	693	33	339	5	40
Far East	617	3,546	295	1,464	145	1,202
Africa	33	399	141	467	27	230
Oceania	18	187	466	1,171	15	194
U.S.S.R.	281	3,798	442	1,748	422	2,319
China[2]	?	?	?	?	?	?
U.S.	1,173	6,679	1,964	4,177	1,243	3,625
Brazil	11	1.44	12	237	13	186

1/ 1970 Production Yearbook. FAO, Rome.

2/ Fertilizer production and use in Mainland China is reported to have increased very substantially. (Brown, G. S. 1970. The Agricultural Situation in Communist Areas. ERS-Foreign 314. USDA, Washington, D. C.)

Table 4 shows wheat and rice yields in 1950 and 1970.

TABLE 4. Wheat and Rice Yields in 1950 and 1970 (100 kg/hectare)

Region	Wheat Yield 1950	Wheat Yield 1970	Rice Yield 1950	Rice Yield 1970
World	9.9	14.8	16.3	22.6
Europe	14.7	24.5	43.0	48.4
North America	11.5	20.3	25.6	51.2
Latin America	10.5	13.6	17.0	19.0
Near East	9.2	10.2	23.6	36.1
Far East	7.8	12.0	14.4	19.8
Africa	6.0	7.6	9.9	14.4
Oceania	11.3	11.7	31.1	53.3
U.S.S.R.	8.4	14.4	14.5	36.4
China	6.9	? 2/	23.7	?
United States	11.2	20.9	25.6	51.2
Brazil	7.4	10.1	15.8	16.4

Brown (1970) reported an excellent cereal crop in Mainland China in 1970.

2/ Brown, G. S. 1970. The Agricultural Situation in Communist Areas. ERS-Foreign 314-USDA. Washington, D. C.

TABLE 5. Estimated Nitrogen Inputs and Utilization for the Land Area of the United States (1970)[1/]

Inputs		Utilization	
Source	Millions of Metric Tons	Product	Millions of Metric Tons
Non-symbiotic Nitrogen Fixation	1	Fiber	< 1
Symbiotic Nitrogen Fixation	4	Vegetable Food -N	2
Rainfall	6	Animal Food - N (excludes fish)	15
Chemical Fixation	7	Other	4
Mineralization of Soil-Organic Nitrogen	3		
TOTAL	21	TOTAL	21

1/ Values aggregated and rounded.

Nitrogen budgets are still in the stage of estimates based on calculations from limited empirical data. Those given by the Committee on Nitrate Accumulation (op cit.) for the United States are shown in the following table.

The Committee estimated a net annual retention of nitrogen in soil and water of about 1.5 million metric tons in the United States. About one-third of the nitrogen inputs was from chemical fertilizer. As production continues to increase in the U.S. to meet domestic and foreign market demands, nitrogen inputs or efficiency of nitrogen utilization must increase or, hopefully, both. The Committee estimated 50 percent recovery of nitrogen inputs in harvestable vegetation with a wastage of 25 percent of that product to pests, spoilage, and other causes, thus a 37.5 percent net efficiency of fertilizer nitrogen use. Surely there is ample opportunity for improvement in efficiency.

Alternately, we might curtail our appetite for animal protein foods. Our diet is much higher in such proteins that that of most of the world's people. We used an estimated 15.1 million metric tons of nitrogen to produce 0.84 million metric tons of nitrogen in the animal food products we ate in 1969. Thus, about 18 tons of nitrogen were used to produce each ton of nitrogen in animal food eaten. Production of 0.36 million tons of nitrogen in the plant protein we are used only about 0.90 million metric tons of nitrogen or about 2.5 tons of nitrogen for each ton of plant protein food nitrogen.

The people of the world could be nutritionally well fed on 11 grams of nitrogen daily intake compared to our daily intake of about 16 grams. Let us assume that the average person in the world would eat seven grams of vegetable protein nitrogen, three from animal protein sources other than fish and other aquatic food products, and one gram from these latter food sources. Three grams animal protein nitrogen per person per day is equivalent to the protein nitrogen consumed in 80 pounds of utility beef on a carcass basis or 80 pounds of ready-to-cook broilers per year.

This suggested diet would contain about one-third of the animal plus fish protein in the current U.S. diet. It would be more than adequate to meet nutritional protein requirements.

Such a diet would require world input of about 190 million metric tons of nitrogen on cultivated and grazing lands. The rate of application of chemically fixed nitrogen to cultivated lands would be about 90 kg/hectare assuming only the present area to be under cultivation. This average rate is somewhat less than current usage on maize in the U.S.[4] This chemically fixed nitrogen in Year 2000 would be about five times 1969 usage at 1969 efficiencies. Phosphorus and potassium usage will also need to increase very sharply.

[4] Statistical Reporting Service. 1971. Cropping Practices 1964-1970. SRS 17. U.S. Department of Agriculture, Washington, D.C.

The Committee on Nitrate Accumulation stated that: "For example, a predominantly vegetarian diet with small amounts of milk and meat can be had for as little as 23 pounds of plant-available nitrogen per capita per year; in contrast, 179 pounds of farm-site plant-available nitrogen per capita per year were required to support the 1968 American diet."

Projecting these cited adequate diet requirements, world food requirements for a population of 7.3 billion about Year 2000 would be about 80 million metric tons for the vegetarian diet or almost 600 million metric tons at the 1968 American diet level.

The lower level is substantially less than current input levels. The 1968 American diet level seems to me to be unlikely to be achieved on a world basis.

Man uses only a small portion of the animal world biological primary production of dry matter either directly or through secondary productivity of food producing animals. Rodin et al[5] estimate total primary productivity as about 232 billion tons. This includes *all* underground and above-ground parts and all aquatic primary production. Man's direct and indirect use of this material as food probably amounts to no more than five percent now and is not likely to exceed ten percent in Year 2000.

It is possible that single cell proteins grown on cellulose materials, petroleum components, animal wastes, and leaf proteins may contribute substantially to animal and human food production in the future. Urea already has an important place in ruminant feeding.

There are more than a few problems to be solved. Among then is probably future cost of chemically fixed nitrogen. Abundant low-cost energy for use in fixation has kept fertilizer nitrogen prices down. There is widespread concern that future demand for energy will increase more rapidly than supply. Environmental pollution control will increase costs. Oil and gas supplies are clearly limited. Coal and oil shale are still abundant. However, the use of coal will necessitate increasing costs to control pollution. The Third Annual Report of the Council on Environmental Quality[6] estimates that 10.65 percent of average 1970 revenues of the electric energy generating industry in the Tennessee Valley Authority region will be required in 1976 to cover the full cost of air and thermal pollution controls. The CEQ estimate of these costs for all regions was seven percent of the 1970 average revenues.

Phosphorus without the use of phosphate fertilizers yields are limited by the release of phosphorus from its insoluble salts.[7] It is estimated that these natural rates of

[5] Rodin, L. E., N. I. Baxilevich, and N. N. Rozov. Productivity of the Main World's Ecosystem. August 31, 1972.

[6] Council on Environmental Quality. 1972 Environmental Quality. Third Annual Report. GPO, Washington, D.C. 20402. PP. i-xxvi and 1-450. Illus.

[7] Hasler, A. D. 1971. Man in the Living Environment. The Institute of Ecology (10E). Madison, Wisconsin. PP. 1-267. Illus.

mobilization would support a world population of between one and two billion people.

The 10E Report assumes that fertilizer use must increase 2.7 times faster than population in order to keep food production per capita at its present level. 10E assumes exhaustion of known phosphorus reserves at present rate of use in about 400 years. With double the present world population, 10E estimates exhaustion of known reserves in about 64 years.

The 10E Report lists 25,000 million tons of known phosphate rock averaging 31 percent P_2O_5 (thus, 7,900 million tons) P_2O_5 equivalent. The Report estimates undiscovered reserves as no more than an additional 25,000 million tons of phosphate rock or a total estimate reserve of 15,800 million tons of P_2O_5 equivalent.

Emigh (1972)[8] estimated quantifiable reserves as 1,298,000 million tons of phosphate rock or 402,380 million tons P_2O_5 equivalent. Emigh also reported that there are large but presently unquantifiable additional additional reserves. Emigh's estimate of known reserves is thus 50 times that of the 10E Report.

World usage of phosphorus increased about three fold from 1950 to 1970, nitrogen by about six fold, and potassium by more than three fold.

Forest fertilization to obtain high yields is a new and growing practice. Weyerhauser (1972)[9] practices controlled fertilization about every five years.

The Forest Service is evaluating the practice on a pilot basis in several locations. Fertilization by FS is operational on the Florida wetlands.

Efficiency of Nitrogen Use

Recovery of fertilizer in harvested crops varies widely. The law of diminishing returns applies for particular locations, soils, seasons, and crops. The more nitrogen added, the less is returned per unit added.

Soils vary widely in both the amount of nitrogen they contain and in the proportions of that nitrogen which can be mineralized. Mineralization is a prerequisite to assimilation of nitrogen by plants.

The amount of mineralizable nitrogen in a soil is one of the factors determining the amount of nitrogen which must be added to obtain maximal yield. Stanford and Smith (1972)[10] found that the rate-constant for mineralization of widely differing soils incubated under standard conditions did not differ significantly among a group of soils varying from 5 to 40 percent in the portion of contained nitrogen which was metabolized. It is likely that tests for mineralization can be applied with high predicitive value for the amount of nitrogen which will be supplied by the soil itself. Such estimates could be used as a guide to amount of nitrogen needed for each crop, location, and anticipated yield.

In testimony before the Illinois Pollution Control Board, Stanford stated[11] that a 100 bushel/acre yield of corn required assimilation of 120 pounds of nitrogen by the corn plant. Illinois soils studied provided from 46 to 144 pounds of nitrogen. Recovery of fertilizer nitrogen was about 50 percent. One hundred fifty to 250 pounds of spring applied nitrogen was required for maximum yield of 120 to 172 bushels per acre.

With respect to water pollution, the Council on Environmental Quality Third Annual Report (op cit.) states: "The problem of nutrients (phosphorus and nitrogen) is worsening dramatically in all types of basins probably because of increased use of fertilizers." This statement was based on a contract study performed by "Enviro Control" performed for CEQ.[12]

Enviro-Control used data collected by U.S.G.S. in basins characterized by Enviro-Control as indicated in the following table.

Increase in pollution was attributed principally to non-point sources; i.e., to runoff rather that to such point sources as municipal and industrial sewage. The Enviro-Control association of increase in pollution was stated as follows: "Our findings reflect that water quality trends were sensitive to the dramatic growth in fertilizer use."

Eutrophication

A recent report of the "Phosphorus Technical Committee" to the Lake Michigan Enforcement Conference noted an apparent decrease in nitrate nitrogen in the open waters of the Lake. The report concluded that phosphorus is the plant nutrient determining biological productivity in the Lake. Inflow of phosphorus appears to be sufficient to produce eutrophication in offshore areas such as Green Bay and the southern portion of the Lake. Phosphorus sources include direct point sources from municipal and industrial sewage outfalls into the Lake (4 million tons per year) and indirect point sources from such outfalls on Lake Michigan tributaries (Ca 9 million tons per year). In addition, about two million tons per year reach the Lake on sediment and another two million on plant and animal wastes washed into the Lake. The report concludes that point sources can and should be reduced by more than 80 percent by sewage treatment but that non-point sources are probably only about 50 percent controllable.

The major opportunity for further control of non-point sources is through the small watershed program conducted by the Soil Conservation Service in cooperation with local individuals and agencies responsible for land use.

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[8] Emigh, G. D. 1972. World Phosphate Reserves – Are There Really Enough. Reprint from Engineering and Mining Journal. McGraw-Hill, Inc., New York, New York. 10036.

[9] Weyerhauser. 1972. Weyerhauser High Yield Forestry. Weyerhauser Co., Tacoma, Washington. Form No. PA-55.

[10] Stanford, G. and S. B. Smith. 1972. Nitrogen Mineralization Potential of Soils. Soil Science Proceedings 36:465-472.

[11] Stanford, G. 1971. Nitrogen Fertilizer Use for Corn. Hearings, Illinois Pollution Control Board, Urbana, Illinois.

[12] Enviro-Control. 1972. Final Report. National Assessment of Trends in Water Quality. Enviro-Control, Inc. Washington, D.C.

TABLE 6. Trend from 1965-1970 in Total Phosphorus Organic Nitrogen and Ammonia in River Basins in the United States

Type of Basin	Trend (No. of Stations) Better	No Trend	Worse
High agriculture and/or population	0	10	15
High agriculture and low industry and population	1	0	4
Low agriculture			
High population or high industry	4	4	14
Undeveloped	2	5	5
TOTAL	7	19	38

The program consists of upstream watershed conservation measures including vegetative cover of highly erodible areas such as water courses, road sides, and development sites and water management structures such as sedimentation pools, water retention structures, and channel improvements.

From this report, I conclude that not more than 20 percent of the phosphorus reaching Lake Michigan can be attributed either indirectly or directly to fertilizer use. I support the finding of the Committee that acceleration of the P.L. 566 small watershed program, including emphasis on implementation of conservation measures by land owners is desirable.[13]

The contribution of chemically fixed nitrogen is undertain. Such nitrogen seems no more and no less likely to leach than mineralized nitrogen from other sources.

With respect to trends in our waters, Viets and Hageman[14] stated: "The authors of this paper cannot conclude that there is any trend in nitrate in surface waters, although they would not deny that the total nitrogen and total soluble nitrogen in many lakes and rivers may have increased significantly. It should be noted that the 10 p.p.m. NO_3N related to public health standards for water is far in excess of the 0.3 p.p.m. total soluble nitrogen sometimes regarded as sufficient for eutrophication."

I began by stating three possible courses of action to produce food, fiber, and forest products. These were (1) to increase yields on the present cultivated area of the world, about 1.42 billion hectares; (2) increase the area under cultivation; or (3) to reduce the quality, and sometimes the quantity, of the human diet.

I conclude that increased development and application of technology, including efficient use of chemical fertilizers, is the generally perferable course. There should be some new areas brought under cultivation, generally such areas should be those of potential high productivity, not subject to heavy erosion or soil degradation. We, in the U.S., for example, have transformed several million acrea in the Delta and Southeast from woods and grasslands to the production of soybeans. More than a million acres have been so transformed in Louisiana alone with demonstrated increase in farm income and community growth in business and jobs.[15]

Increased use of fertilizer as a part of improved technology also including crop plants of high genetic yield capacity and pest resistance, pest control, water management, and appropriate planting and harvest is, in my opinion, essential.

Equally essential is the efficient use of fertilizer to achieve economic returns from its use and to minimize fertilizer contribution to eutrophication.

CHAIRMAN POWERS: Now that we have justified the necessity for some of the ways that we've got to think about – some of the things we are faced with to becoming a better Industry. One of those things is the Occupational Safety and Health Act.

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[13] Zap, H., et al. 1972. Report of the Phosphorus Technical Committee to the Lake Michigan Enforcement Conference. Mimeo. EPA.

[14] Viets, Frank, and Richard Hageman. 1971. Factors Affecting the Accumulation of Nitrate in Soil, Water, and Plants. Agriculture Handbook No. 413, ARS, USDA, Washington, D.C.

[15] Corty, F. 1972. The Impact of Land Clearning and Soybean Production. Louisiana Agriculture 16:6, 7, and 9. Louisiana University and A&M College, Baton Rouge, Louisiana.

As most of you possibly know, Ben Day is the Assistant Vice President of a number of services for the Fertilizer Institute and in this position he is responsible for implementation for the Institute's technical safety and transportation programs. Ben was formerly Director of Technical Services for TFI and is a graduate of the Apprentice School of the Newport News Shipbuilding and Drydock Company, Virginia State University. Ben is a native Virginian and presently lives in Alexandria with his wife and three children. It is now my pleasure to present to you, Mr. Ben Day who will talk on Personal Experiences with OSHA.

MY EXPERIENCE WITH OSHA

Ben F. Day

Good morning: I have been asked to speak to you for a few minutes relative to my experience with the Occupational Safety and Health Administration.

For convenience, I divided this presentation into three topics. These topics are:

1. A brief discussion of OSHA itself;
2. NIOSH or the National Institute of Occupational Safety and Health; and,
3. The part The Fertilizer Institute plays.

The Act itself. We're all familiar with the fact that President Nixon, late in December 1970, signed into law what has been described as the most far-reaching legislation ever passed by the Congress of the United States. The intent of the Congress is to free the place of employment from any known hazards and to make the employer responsible for removing known hazards. Remember, we are talking not only about safety hazards, but hazards to the health of the employee as well. This brings us to a basic: What is a hazard? Senator Steiger was asked this question during Senate investigation hearings. He described a hazard as a condition which may be detected with one or more of our senses (eyes, ears, nose, etc.). We know United States Department of Labor officers have gone beyond the normal human senses in detection of hazards. Compliance Officers use instruments which, in some cases, may be far more sensitive than the human senses. This places an additional responsibility on the employer. In addition to the tangible conditions, there is the intangible or judgment factor of the Compliance Officer.

Let's briefly look at safety standards, or the guides furnished to Compliance Officers, Under the Act, the Secretary of Labor is empowered to adopt certain safety standards and the Act named, specifically, the American National Standards Institute (ANSI) and the National Fire Protection Association (NFPA) as being consensus standards bodies. Recently, the American Society of Testing Materials (ASTM) has been recognized. The major problem was, and still is, that the standards adopted by ANSA and NFPA were written to be voluntary guides to an industry, yet, under OSHA, the standards were adopted as law. The Department of Labor employees were working during the time of adoption within a very tight timeframe; hence, many mistakes were made during the translation and many undue restrictions were placed on industries; one of these being that all ammonia appurtenances should be either Factory Mutual or Underwriters' approved. We will come back to this in a moment in more detail. The fact still remains that the Secretary of Labor had to adopt certain guides for Compliance Officers and, in all fairness, guides to an industry. Therefore, on May 29, 1971, the initial standards package was published in the Federal Register. It was assumed by government that, since these were consensus standards, industries had no real problem with compliance. This was not true in every case, as we will see. This initial standards package was divided into 19 general and rather broad areas of coverage – such topics as walking working surfaces; occupational health and environmental control; welding, cutting and brazing; material handling and storage. Since these areas are general, The Fertilizer Institute summarized (in layman's language) these standards in what we call our OSHA Handbook. Since the publication of the original standards package, many revisions have been published; but, as you know, changes within the federal government are quite slow and very difficult to accomplish. This brings us into what I refer to as the intangible area, or the judgment factor of the Compliance Officer. As we have said, the intent of the Act is to free the workplace of known hazards. What about those areas not, at this time, covered by standards? Our advice to our industry has been to organize and work with a safety committee; satisfy the complaints (if there are any) before they get outside of the plant or in a formal complaint procedure; perform safety inspections with the employees and listen to the employees. I think you will find most Compliance Officers do execute certain common sense factors and are reasonable in their assessment of safety conditions within a plant. Our members have reported that where effort is being made, most Compliance Officers take this into consideration. However, there is a third phase to be considered – this is the inspection of a plant at the initiative of a Compliance Officer. Upon showing proper identification, the officer may enter a plant for inspection even though no complaint has been received by OSHA. No doubt, these Compliance Officers will ask to see the records, poster and the other requirements of the Act. Here again, attitude and effort surely will be taken into consideration in analyzing the safety hazards within a plant.

Now, if we may speak briefly to our second topic, NIOSH or the National Institute of Occupational safety and Health. This is the research arm of OSHA. NIOSH plans, directs and coordinates the national program effort to develop and establish recommended occupational safety and health standards and conducts research, training and related activities to assure safe and *healthful* working conditions for every working man and woman. It is important to remember that under NIOSH an employee, if he believes a *health hazard* exists in his place of employment, may file a request of investigation under more