

# N-P-K or N-P<sub>2</sub>O<sub>5</sub> - K<sub>2</sub>O?

Wallace H. Fuller

As long ago as 1920, the soil scientists of this country proposed that *all* fertilizer nutrients be reported on an elemental rather than an oxide basis. In 1955 the Soil Science Society of America passed a resolution to change fertilizer guarantees to the elemental basis. The resolution was not acted upon immediately.

Since January 1962, however, all technical journals of the American Society of Agronomy, Crop Science Society and Soil Science Society of America have reported all fertilizer nutrients on the elemental basis and, at the author's option, on both the elemental and oxide basis. This change is now fully effective.

## Has Wide Endorsement

The change to the elemental basis of N - P - K rather than N - P<sub>2</sub>O<sub>5</sub> - K<sub>2</sub>O is endorsed by the American Society of Agronomy, Crop Science of America, American Society of Horticultural Science, Soil Science Society of America, The Association of American Fertilizer Control Officials and the Association of Agricultural Experiment Station Directors.

Presently, fertilizers are labeled by law in Arizona as a guaranteed analysis of chemical composition on the bag or tag as: *Percentage by weight* in the order of N - P<sub>2</sub>O<sub>5</sub> - K<sub>2</sub>O. This law would require amending if the N - P - K expression were adopted by industry.

## Many Reasons Listed

Reasons for change in the expression of all plant nutrient elements are:

1. There is no P<sub>2</sub>O<sub>5</sub> or K<sub>2</sub>O in fertilizers.
2. Both phosphorus (P) and potassium (K) exist in several different chemical compounds in fertilizers.
3. "P<sub>2</sub>O<sub>5</sub>" and "K<sub>2</sub>O" are not involved in plant nutrition.
4. The complex expression of "P<sub>2</sub>O<sub>5</sub>" and "K<sub>2</sub>O" does not provide pertinent information. The actual amount of the plant nutrient in a fertilizer guarantee is of foremost importance.

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5. The oxide is not the functional unit in either chemical or physical reactions in soils.
6. The current oxide labeling makes

both P and K appear in exaggeration in relation to N.

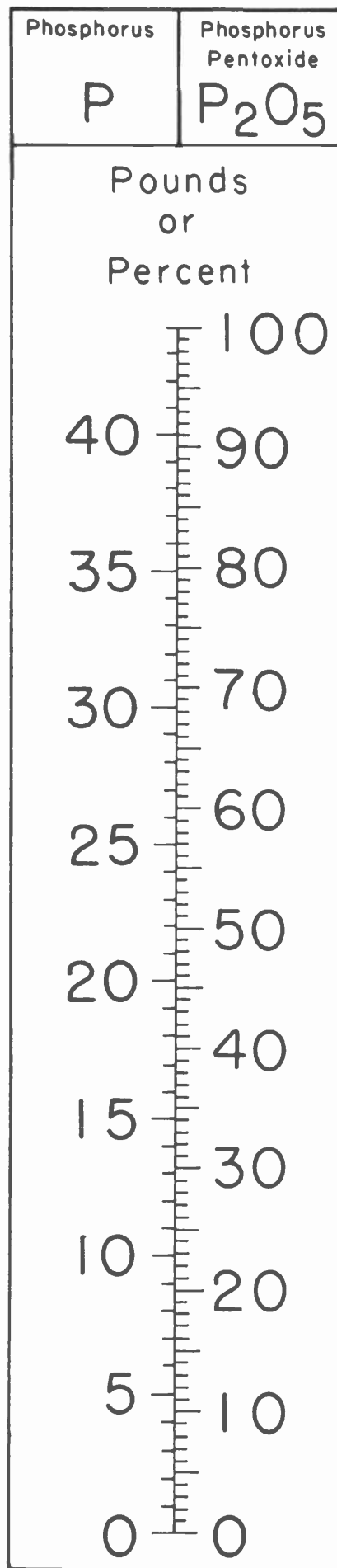
7. The current oxide labeling makes it possible to have an analysis of more than 100 percent of plant food.

8. In talking about fertilizers we use the terminology N - P - K.

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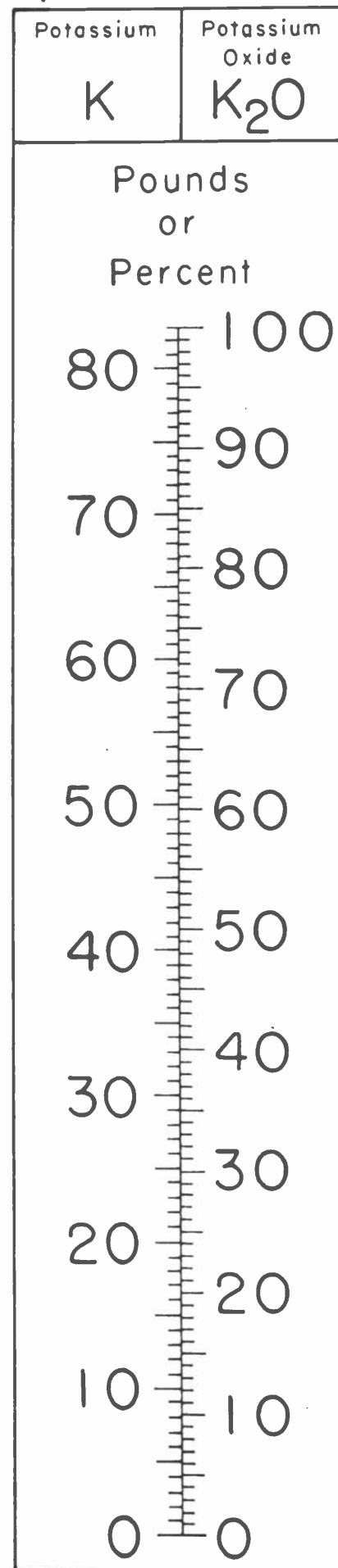
## FERTILIZER CONVERSION SCALES

(Phosphorus and Potassium)



$$P \times 2.29 = P_2O_5$$

$$P_2O_5 \times 0.44 = P$$

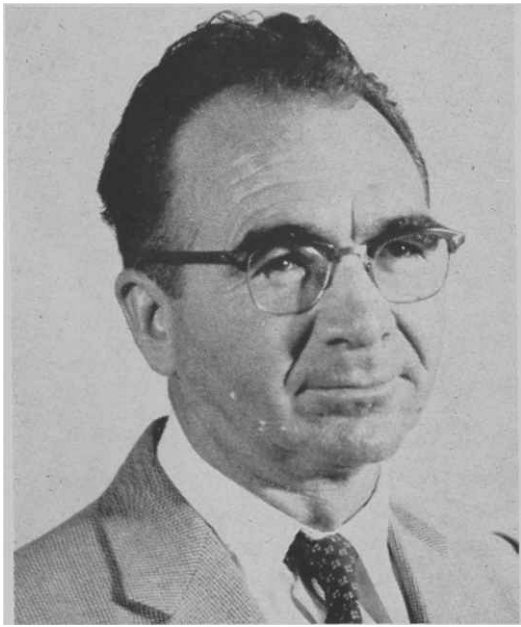


$$K \times 1.20 = K_2O$$

$$K_2O \times 0.83 = K$$

Drawing Courtesy:  
Agronomy Department  
Iowa State University  
Ames, Iowa

## Sprinkler Irrigation Group Honors K. R. Frost



Prof. Kenneth R. Frost, Department of Agricultural Engineering, University of Arizona, has been selected as the "Man-of-the-Year" for 1963 by the Sprinkler Irrigation Association.

Frost's research work in the application of sprinkler irrigation for arid regions is recognized throughout the world. The award was made by SIA President, A. E. Robison, Kansas City, at the association's recent annual convention in Tampa, Fla.

The "Man-of-the-Year" award is presented annually by the Sprinkler Irrigation Association to a person outside of the sprinkler irrigation industry for outstanding contributions toward better irrigation.

Prof. Frost received his education in agricultural engineering at the University of California. He has been involved in research and teaching subjects relating to irrigation and machinery for the past 20 years in Cali-

### Now You Pronounce It

#### Foh-Rah-Hays

If Dr. Darrel Metcalfe mumbles something that sounds like "Foh-Rah-Hays" he is merely trying to pronounce the name of a book he helped write a dozen years ago.

Sounds complicated?

Not really. Back in 1951, when he was an agronomist at Iowa State University, Dr. Metcalfe became co-author of a textbook, "Forages," which bore the sub-title of "The Science of Grassland Agriculture."

The book was so well received that it went into a second edition in 1962, and now it is being republished in a Spanish language edition for use in Latin America.

Dr. Metcalfe, now director of resident instruction in the College of Agriculture at The University of Arizona, says the publisher of the new edition is Compania Editorial Continental, S.A., of Mexico City. The Spanish language edition will be available in the fall of 1964, under the title "Forrajes," pronounced foh-rah-hays.

The publishers, as well as Latin American agronomists, feel that the text will find considerable use in the agricultural training of young Latin Americans.

ifornia, Idaho, New Mexico and Arizona.

In making the announcement of the award to Prof. Frost, SIA President Robison called attention to Frost's studies on the performance characteristics of sprinkler irrigation and related research since going to The U of A in 1950. His work on water application efficiencies, crop water requirements, and factors affecting water losses has received international recognition.

## Mystery Picture Answer

This picture on Page 6 is still a mystery, as far as we're concerned.

Your editor came upon this crumbling old drystone foundation of a house one time while chousing around the Santa Rita Experimental Range, 25 miles south of Tucson. The walls are all that is left of this house, and only part of them. Only index to age of the building is the large mesquite tree, growing directly out of the front door.

Size of the tree indicates it to be around half a century old, suggesting that the house was abandoned before Arizona became a state. Projecting further, this old home must have been occupied when Indians were a threat to the isolated ranch, and when Cochise or Geronimo was much more apt to drop in than, for example, S. Clark Martin, Bob Humphrey, Dave Wilson or "Tish" Tschirley.

### "ORCHIDS" FOR DR. R. B. STREETS

Dr. R. B. Streets' years of excellent public relations work in behalf of the garden clubs of the state was officially recognized by his being awarded the Bronze Plaque for outstanding service by the Men's Garden Clubs of America, and the Certificate for Exceptional Service by the Arizona Council of Women's Garden Clubs. Dr. Streets joined the U. of A. staff in 1924. He has been Plant Pathologist for 39 years and was the department head from 1952-60.

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### Accurate and Understandable

The greatest advantage of the "N - P - K" expression of fertilizer guarantees is its uniformity, simplicity, and accuracy. For example, few know what  $P_2O_5$  means. Numerous expressions are used for  $P_2O_5$  such as "phosphate", "phosphorus", "phosphoric oxide", "phosphorus pentoxide", "phosphoric acid." This confusion of expression readily leads to misunderstandings. In fact, very few people who use fertilizers understand clearly the meaning of analysis, grade or ratio. Labeling on an elemental basis should improve the understanding of what actually is "in the bag."

Changing to an elemental basis has some temporary disadvantages. The most prominent of which are:

1. *Dual labeling* will be necessary where: both N-P-K and N -  $P_2O_5$  -  $K_2O$  values are shown.

2. The new labeling will make it appear that there has been a lowering of analysis. Phosphorus expressed as  $P_2O_5$  is 2.3 times as large as P (on an elemental basis) and  $K_2O$  is 1.2 times as large as K actually is.

### Change Costs Money

3. Additional cost to industry for changing labels.

4. Additional cost to industry and educational institutions for the extra effort and money to explain the change to the fertilizer and agricultural chemical buyer.

5. The literature now contains the nutritive elements on an oxide basis

(except for N). The reader must recognize this difference and take it into account in his thinking and calculations.

Despite these temporary disadvantages, the change will serve to emphasize and enlighten the growers and the public in general regarding the importance of knowing what they are actually buying. The long-time effect should lead to a greater and more efficient use of fertilizers.

A conversion scale which relates the present  $P_2O_5$  -  $K_2O$  oxide expression with the proposed new P - K expression, with mathematical conversion factors, is given on Page 19.