compared to that from solid fertilizers in Georgia. Some data are presented in Table 3. A comparison of treatments 1 and 2, and treatments 3 and 4, shows that liquid fertilizers gave lower yields than solids; this difference being greater at the higher rate of application. The author of that article states that yield difference may be due to plant poisoning by the liquid fertilizer, since foliage on plots that received liquid fertilizer, in any form, was injured. Injurious effects disappear about two weeks after application. The liquid nitrogen used was composed of one-half urea and one-half ammonium nitrate. Concentration of the fertilizer solution was not given, but it appears that the concentration was too high because leaves were burned.

A comparison of treatment 5 with 6 shows a 648-lb. difference in yield in favor of treatment 6. The only difference between these two treatments is that liquid nitrogen in treatment 6 was applied separately, followed by H_3PO_4. The liquid in treatment 8 was mixed with the H_3PO_4 before application, and they were applied together. The author suggests this increased yield is due either to a reduction in loss of nitrogen from urea in the nitrogen solution, a decrease in the phytotoxicity of the materials from mixing, or a combination of these factors. These data emphasize the fact that application of liquid fertilizers in too high concentration can seriously damage grass.

Equal crop response, therefore, has been obtained from the proper application of either liquid or solid forms when the same amount of actual N, P, and K has been applied.

Should You Use Liquid or Solid?

Since liquid and solid fertilizers give the same yield response, which form should be used? In order to answer this question, one must evaluate several factors concerning these two forms of fertilizer. Two of the most important factors are relative cost per unit of plant nutrient and application costs of the two materials. Also considered must be the relative concentrations of nutrients in the final volume of applied material.

Data in Table 4 illustrate some calculations which should be made during the evaluation of the two forms. A liquid nitrogen fertilizer containing 17% N, such as ammonium nitrate (NH_4NO_3), is compared with a solid nitrogen fertilizer containing 21% N, ammonium sulfate ($(NH_4)_2SO_4$). The liquid material weighs about 11.5 lbs. per gallon and is supplied in 30-gal. drums, while the solid material comes in 80- or 100-lb. bags. Manufacturers recommend

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Book Review

Management of Artificial Lakes and Ponds

by George W. Bennett, Reinhold Publishing Corp., 430 Park Ave., N. Y., N. Y. 10022, 1962, 283 pp. $8.00.

Management of Artificial Lakes and Ponds deals with a complex subject. But the author displays an intimate knowledge of limnology, ecology, botany, zoology, ichthyology, conservation, and control, which enables him to sift practical information from a voluminous bibliography of technical material. He includes in his text adequate theory and a maximum of useful advice for those interested in water management.

Contents vary from the history of fish culture, through a discussion of kinds of excavated water bodies as possible habitats for game fish, to a consideration of fish as a productive crop, their reproduction and mortality.

The most important chapter for readers of this magazine is called "Theories and Techniques of Management." Included in this section are subjects of rough fish control and aquatic weed control. Both are dealt with from a management standpoint.

Information on weed and water relationships is invaluable to controllers who seek to make the best possible use of water without nuisance weeds. *Management* is not a handbook for removal of aquatic weeds from standing water, even though it contains a chart of recommended materials and rates to control various weeds. It is designed for the lake manager, whose duty ranges widely, but it is equally useful to the aquatic weed controller seeking new markets for his service. If aquatic weed controllers expect to cultivate business from commercial, municipal, or state recreational establishments, they will have to be familiar with the ideas, and needs of lake, pond, or aquatic game managers. This book helps to supply that familiarity.

Management is easy to read. Author Bennett's style reflects many years of association with people who knew less about limnology and ecology than he, and who wanted to learn. His book conveys concepts in an understandable way: "Prospective homeowners who contemplate purchase of lots for permanent homes on small lakes should insist on a sewage (septic) system which will carry all effluents away from the lake. Effluents from tile fields enter the lake, and because they carry phosphates and nitrates, they act as fertilizers which stimulate aquatic vegetation and create nuisances."

Bennett is a writer with humor: "One type of *Spirogyra* (algae) is notoriously slippery, and once I saw a bather slip and sit down at the top of a steep spirogyra-covered lake spillway and slide entirely to the bottom before he could stop . . . Needless to say, he repeated the act until the algae as well as the seat of his bathing suit was practically gone."

Judging from the scant number of books on this subject, *Management of Artificial Lakes and Ponds* is welcome, and just in time, if not a decade overdue.