AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

REPLY: ENERGY ACCOUNTING: THE CASE OF FARM MACHINERY IN MARYLAND

Phillips Foster and Dennis Wichelns

The most important issue raised in the comment by Bradford involves the problem of how to handle the fact that, although the logical period for accounting for energy use on the farm is one year, farm machinery is typically used over a period of several years. No solution to this problem will be entirely satisfactory, and the alternative offered by Bradford has its own difficulties. Nevertheless, the Bradford alternative is worth trying, and this response to the comment will consider briefly his proposal.

Several questions were raised in Bradford's comment, and for ease of comparison they will be considered in order, using his numbering system.

1. The method used in obtaining the embodied energy estimates for the 20 most important farm machines (Table 1—Foster, et al. 1980a) is described in detail in the publication by Foster et al. 1980b, *Fossil Fuel Energy Use in Agriculture—A Data Base of Maryland, 1974,* Dept. of Ag. Econ., U. of MD., December, 1980, available on request from the University of Maryland. Briefly, census data were the basis for most farm machinery numbers used. Energy value added at the various stages of production and in repair and maintenance was the basis for the embodied energy estimates per machine.

2. There are two methods of handling the problem regarding the use of farm machinery in more than one year. One way, which Bradford calls the "depreciation approach," is to estimate useful life, then divide the machine's embodied energy *plus* energy emobidied in replacement parts *by* the useful life. As Bradford implies, there are at least two hazards in the depreciation approach. First, one might guess incorrectly on the useful life of the machine. Second, farm machinery is often used more intensively during the first few years of its life than in later years. This is the case when, for example, a tractor is replaced by a newer, more powerful, or more versatile model. The old tractor is not usually junked, but rather is retained for specialized roles. Despite these problems, this approach has the advantage of accounting for all the equipment presently on a farm—not only recently purchased equipment.

Similarly, the "flow approach" advocated by Bradford is not without its hazards. Farmers tend to buy heavily in machinery after financially successful years and to postpone purchases after financially unsuccessful years. If one were to record purchases during a year that was affected by some such abnormality, the resulting analysis would be misleading. This problem could be reduced by taking a three-year average of farm machinery sales and using that for the analysis year.[1]

Both of the above methods are valid. It would be interesting to compare the results of the Bradford "flow approach" with the results of the "depreciation approach" obtained in the Foster et al. article.

3. Some of the pioneering work on the energy cost of farm machinery attributed all of the embodied energy in a particular piece of machinery to the production of one crop, even though the machinery was used in producing a variety of crops (Pimentel et al.).

This method resulted in a higher energy allocation to the production of that crop than was realistic. To overcome this type of problem, the authors undertook to allocate energy embodied in machinery among the crop and livestock activities on which it was used. The most reasonable method was to distribute embodied energy in the same ratio that direct energy was expended. It still seems appropriate to distribute embodied energy among the various crops and livestock operations on which it is used.

4, 5. These comments were related to comments 2 and 3 above, and this response so far would cover the reaction to comments 4 and 5 also.

At the close of the Bradford comment, a remark is made about the energy theory of value.

Phillips Foster is Professor and Dennis Wichelns is a graduate research assistant, Agricultural and Resource Economics Department, University of Maryland, College Park.

[1] A user of the "flow approach" would want to look at data supplied by the Farm and Industrial Equipment Institute, Chicago, Ill., and published in *Implement and Tractor*, P.O. Box 12901, Overland Park, Kansas, 66212. The Annual Market Statistics Edition furnished yearly sales data by states on a number of farm implements. A user of the flow approach would also need sales data on spare parts and replacement tires sold, plus some means of assigning these to the type of farm equipment on which they were used.

At the time of writing of the Foster et al. article, price data to associate with the physical energy account data had not yet been assembled. The development of physical energy accounting data was a necessary preliminary to making good estimates of the dollar cost of energy involved in agricultural production. Price data have now been assembled, and work is under way on a report that will show the dollar costs of energy involved in agricultural production in Maryland.

SUMMARY

Both the "depreciation approach" and the "flow approach" are valid methods of handling the problem of farm machinery's being used over a period of years, yet the logical accounting period for energy use on the farm is only one year. The results of using the two approaches should be compared.

If an item of machinery (such as a tractor) is used in more than one productive activity on the farm, it is important, when energy accounting is done, to refrain from allocating all of the energy embodied in that item of machinery to only one productive activity, as that would result in a distortion of the energy costs of that activity.

Physical energy accounting is a necessary predecessor to estimating the dollar costs of energy used in agriculture, but physical energy accounting is not a substitute for economic analysis.

REFERENCES

Bradford, Garnett L. "Comment: Energy Accounting: The Case of Farm Machinery in Maryland." *S. J. Agri. Econ.* 13 (1981) No. 1.

Foster, P., J. Flemming, and D. Wichelns. "Energy Accounting: The Case of Farm Machinery in Maryland." *S. J. Agri. Econ.* 12(1980a):189–92.

Foster, P., J. Flemming, D. Wichelns, and L. Roberts. "Fossil Fuel Energy Used In Agriculture, A Data Base For Maryland—1974." Research Bulletin, Md. Agr. Exp. St., December, 1980b.

Pimentel, D. L., L. E. Hurd, A. C. Bellotti, M. J. Foster, I. M. Oka, O. D. Sholes, and R. J. Whitman. "Food Production And The Energy Crisis." *Science* 182(1973):443–49.