Aldrich points critically to the bias introduced by differences in land use and land quality between the two groups in our first study. We fully discussed this bias in favor of the organic farmers in our report of this study (*8*). We estimated the bias to be between 3 and 9 percent. (It is curious that Aldrich calls the reader's attention only to the 3 percent polar case and then proceeds to "correct" our stated 3 to 9 percent estimated range to his own estimate of 6 percent!) Nor does Aldrich note that in the second, larger study (*7*) no such bias existed; yet the results of the comparisons were similar.

Aldrich notes that the organic farmers wouldn't have done so well if crop prices hadn't been so high in 1974 and 1975. True. But he does not note that, because conventional farmers have a higher output, they benefited even more from the high prices.

But when all is said and done, arguing over whether or not Aldrich is right each time he tries to find a few percentage points here or there for the conventional farmer misses the main point of our conclusions: the amount by which the organic farmers fell below the conventional farmers in yield and productivity was *much less* than had been commonly supposed and certainly gives no support at all to the frequently expressed view that adoption of organic farming—or even of certain features of organic farming—would consign an enormous number of people to starvation and famine. Organic farmers have achieved the results we reported largely without benefit of assistance from agronomic researchers. (Surely agronomic researchers must believe that such assistance is worth at least a few bushels an acre.) Further, from the point of view of the organic farmer, the relatively small deficit in crop production is almost entirely offset by the lower cost of producing crops and the additional advantage of being insulated from shortages and future price increases of energy-intensive inputs. Thus there is good reason to give serious consideration to intermediate systems between the two that we studied, since such systems might offer many of the resource advantages of organic farming with little or no loss of the high productivity of conventional farming. To Aldrich, "intermediate" means no more than eliminating wasteful use of fertilizers or pesticides, which would correspond to an economically optimal version of conventional practice, as currently recommended by extension advisers. But organic and conventional practices differ in many more ways than simply in the quantity of fertilizers and pesticides used. Thus there is quite a difference between Aldrich's suggestion of reducing somewhat the use of these materials in the context of conventional practice and starting with organic farmers' rotations, tillage practices, and so forth, and then adding a modest amount of certain agricultural chemicals to the extent that it is advantageous to do so. (We conjectured, for example, that the small yield difference in corn between the two groups might be largely eliminated if organic farmers applied a small fraction of the amount of nitrogen fertilizer typically used with conventional practices. This rate would be much lower than the "economically optimal" rate under conventional practice.)

Jukes' characterization of mail surveys and interviews disposes of a lot of agricultural research. Actually, besides using these methods, we also did the things he regards as better: side-by-side yield comparisons; chemical analyses of soils; and chemical analyses of crops. (Jukes is right that we didn't analyze pesticide residues in crops, a topic about which our article says absolutely nothing.) Moreover, where the field measurements and the interviews covered the same topic (that is, crop yields), we checked the two for consistency and found good agreement, as noted above. Neither Jukes nor Aldrich, who, respectively, criticized our use of farmers' reported yields as "anecdotal" and "highly unreliable," mention this corroboration. (For that matter, they do not mention the field measurements at all.)

Jukes' implication that protein composition depends only on the nucleotide sequence of DNA does not entitle him to label this the "customary belief." The literature on protein synthesis is full of examples of environmental control of gene expression. In particular, it is well established that the amino acid composition of grain grown from seeds with homogeneous genomes varies with nitrogen fertilization (*9*).

Jukes' criticism of the term "organic farming" is a quibble. The point of words is to communicate ideas. We are confident that every reader knows what "organic" means when it modifies "farming" as opposed to its meaning when it modifies "chemistry" (especially since we set down explicitly the criteria for being included in the sample of organic farms). In addition, a quick check of any dictionary will show that before the word "organic" was applied to chemistry, it had—and still has—other senses that make the term "organic farming" a reasonable one that hardly illustrates the "unreality" of "organic farming" ideas.

Jukes' obvious (but irrelevant) point that urea in manure is identical to synthetic urea says nothing about organic farmers' knowledge of fertilizers. They value manure because it contains many things (which give it a characteristic non-urea-like color, texture, and smell) besides urea, including several that are beneficial to crops and soils. Organic farmers are not alone in recognizing the agricultural value of manure. The conventional farmers in our study applied not only conventional fertilizers (including urea) but also manure to their fields at approximately the same rates as did organic farmers (*6*). Whatever Jukes' view of this issue, the reader may be assured that organic farmers, at least, do know the difference between manure and urea. For instance, were an organic farmer sufficiently incensed by the tone of Jukes' instruction and decided to respond heatedly, he would certainly not make the mistake of asserting that Jukes' ideas on organic farming were full of urea.

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References and Notes

1. W. Lockeretz, G. Shearer, S. Sweeney, G. Kuepper, D. Wanner, D. H. Kohl, *Agron. J.* **72**, 65 (1980).
2. W. Lockeretz, R. Klepper, B. Commoner, M. Gertler, S. Fast, D. O'Leary, R. Blobaum, *A Comparison of the Production, Economic Returns, and Energy Intensiveness of Corn Belt Fertilizers and Pesticides* (Publication CBNS-AE 4, Washington University, St. Louis, Mo., 1975).
3. S. R. Aldrich, *Science* **190**, 96 (1975).
4. *Organic and Conventional Farming Compared* (Report No. 84, Council for Agricultural Science and Technology, Ames, Iowa, 1980), p. 23. This report was prepared under the chairmanship of S. R. Aldrich.
5. S. R. Aldrich, *Ill. Issues* (Sept. 1977), p. 19.
6. R. Klepper, W. Lockeretz, B. Commoner, M. Gertler, S. Fast, D. O'Leary, R. Blobaum, *Am. J. Agric. Econ.* **59**, 1 (1977).
7. G. Shearer, D. H. Kohl, D. Wanner, G. Kuepper, S. Sweeney, W. Lockeretz, *ibid.* **63**, 264 (1981).
8. W. Lockeretz G. Shearer, R. Klepper, S. Sweeney, *J. Soil Water Conserv.* **33**, 130 (1978).
9. S. Dubetz, E. E. Gardiner, D. Flynn, A. I. DeLaRoche, *Can. J. Plant Sci.* **59**, 299 (1979); M. Byers and J. Bolton, *J. Sci. Food Agric.* **30**, 251 (1979); V. V. Rendig and F. E. Broadbent, *Agron. J.* **71**, 509 (1979).

Erratum: In the report "Size of the chloroplast genome in *Codium fragile*" by M. F. Hedberg *et al.* (24 July, p. 445), measurements in the legend to Fig. 1a are mistakenly reported. The correct value of the contour length of the chloroplast DNA is 26.1 micrometers (54×10^6 daltons) and that of the scale is 5 μm.