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ESTIMATING THE RISK OF ALTERNATE TECHNIQUES: NITROGENOUS FERTILIZATION OF RICE IN THE PHILIPPINES—REPLY

James Roumasset*

Menz has chosen to focus his attention on a small part of my article and left the misleading impression that my purpose was to estimate the effect of risk aversion on adoption of modern techniques. Specifically, he seems to contend that I erroneously claimed to have rejected the hypothesis that farmers are risk averse.

As stated in the opening paragraph of the article, my main purpose, in fact, was "to develop and illustrate a methodology which was found to be useful for estimating frequency distributions of yields corresponding to different levels of nitrogenous fertilizer". Likewise, the first line of the abstract reads, "The problem investigated is how to estimate expected profits and the risk of using nitrogenous fertilizer . . ." Finally, the main title itself, "Estimating the Risk of Alternate Techniques",[1] suggests that the paper is concerned with a problem in statistics, not with making inferences about farmers' attitudes towards risk and their effect on choices. Unfortunately, none of Menz's remarks pertain to the methodology which was developed to estimate risk.

Aside from the discussion of various statistical procedures, the results and implications of applying the most promising procedure to Philippine data are summarized in the abstract as follows: "For the Philippine situation analysed, it appears that using the amount of nitrogen fertilizer which maximizes expected profits does not substantially increase the risk above low nitrogen levels. This finding casts doubt on the hypothesis that farmers' reluctance to use modern techniques is due to their aversion to risk".

In his second paragraph Menz argues that the hypothesis just stated is overly succinct. His objections indicate that he would prefer restating the doubted hypothesis as follows: "Farmers' reluctance to use modern inputs is due to their aversion to risk (*since farmers view modern inputs as being risky*)". But this amendment does not change anything. If our estimates are correct, risk is not generally greater for modern (cash)

* University of California, Davis.

[1] While the production techniques examined differed only by their amounts of nitrogenous fertilizer, the use of the term "techniques," which Menz also objected to, was intended to emphasize the potential generality of the methodology developed for other types of production inputs.

inputs such as fertilizer and insecticide. This result was derived from the damage-matrix approach applied to three Philippine barrios and from a completely different method applied to experimental data from IRRI (section 5.3). Thus, the generality of the conclusion that risk does not increase monotonically with fertilization appears to be more general than indicated by Menz. (*See also* Anderson [1],) Furthermore, since our estimates of risk were based on farmer perceptions, it seems likely that farmers do not *view* the use of cash inputs as increasing risk.[2] The implication is that farmers' reluctance to use modern inputs is due to something other than risk aversion (for example, the use of inputs at recommended levels may decrease expected profits).

This conclusion in no way suggests that farmers are not risk averse, and at no point in the article did I attempt to draw that inference, a point misunderstood by Menz (*see* his third paragraph). Thus, I am in complete agreement with Menz that "It is not possible to reject this conclusion ('that *increased* risk should and does inhibit the use of chemical inputs') with results which show no significant change in the level of risk". However, that particular conclusion is irrelevant to the article in question.

I have shown elsewhere that a risk neutral model predicts as well or better than models incorporating risk aversion for the same farm areas discussed in the article of present concern[3]. The purpose of "Estimating the Risk of Alternate Techniques . . .", however, was only to discuss the methodology of measuring risk and to discourage researchers from *assuming* that modern or cash intensive techniques are either more risky or are viewed as being more risky.

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[2] Nevertheless, it might be argued that farmers view new techniques as being more risky, not because they are in fact more risky, but because farmers' subjective probability distributions (over yields) give more weight to unfavourable outcomes of new techniques than is warranted by available evidence. This is equivalent to Fellner's [3] "slanting down" hypothesis. As Dillon [2, p. 21] notes, however, there are "strong arguments against the rationality of such a theory."

[3] Roumasset [4, 5, 6].

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