The Profitability of Sustainable Agriculture on a Representative Grain Farm in the Mid-Atlantic Region, 1981–89: Comment

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A long term whole farm analysis comparing conventional and low-input farming systems is reviewed. A computational error led to the mistaken conclusion that conventional farming with government programs is less preferred by risk-averse farmers than the low input alternative. The greater income variance of conventional agriculture need not make it less preferred provided a higher mean income sufficiently offsets the higher variance.

In their October 1990 article, Hanson, Johnson, Peters, and Janke (hereafter, HJPJ) explored the comparative profitability and riskiness of low input farming systems with more conventional systems. Their analysis concluded that conventional systems with government programs were more profitable while low input systems offered a higher lower limit of risk. Their findings have begun to be cited elsewhere as supporting the argument that lower input systems may be preferable for more risk adverse farmers (Lee). In this comment, we show that an incorrect application of their methodology resulted in a wrong conclusion, and our correction provides results more in line with other findings.

Using partial budgeting and whole farm analysis HJPJ analyzed profitability, liquidity, solvency, and risk for a representative Mid-Atlantic commercial grain farm under conventional and low-input scenarios. A strength of the study was the dynamic component incorporating the transitional costs of changing cropping systems using nine years of data from the Rodale Research Farm. These results were extended to look at risk as well as profitability both with and without government programs. HJPJ's results (Table 1) show the conventional system with government programs to have the highest average annual profit, while the low-input approach would be preferred by risk averse farmers using a safety first criterion. According to HJPJ, "a farmer with risk averse preferences would choose the low-input scenario over the conventional alternatives . . . [because] in three of four years profit would exceed $16,166" (p. 96).

HJPJ estimated risk tolerance using a safety-first criterion developed by Musser, Ohannesian, and Benson where, according to HJPJ:

> "the lower confidence limit of profits is equal to: $(L_i) = E_i\text{-}KS_i$, where L_i is the lower confidence limit of profits for activity i; E_i is the average mean of profits for activity i; S_i is the standard deviation of profits for activity i; and K is the number of standard deviations required to satisfy the farmer that average profit in a given year will exceed L_i (given a level of probability). If a farmer desires that average profit exceed L_i in three of four years (75% lower confidence limit), then $K = 0.674$ if a normal distribution is assumed" (p. 96).

Using this formula, however, produces a different result from that reported by HJPJ for the conventional system with government programs. Applying this formula to the data in Table 1 results in a lower limit of $22,747 for the conventional alternative with government programs (Table 2) which greatly exceeds the $12,777 amount HJPJ reported[1]. This correction changes the conclusions

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[1] Another anomaly in HJPJ is that the average annual profit for the conventional, government program alternative in 1981–1989 is higher than either of the 1981–1984 or 1985–1989 component periods (see HJPJ Table 3, p. 94).

Table 1. Average Annual Profits, Standard Deviations of Profits and 75% Lower Confidence Limit of Profits for Three Scenarios, 1981–89 (Dollars) HJPJ Table 4, p. 96

Scenarios	Average Annual Profit	Standard Deviation	Lower Limit
Low Input, base scenario	27,614	16,985	16,166
Conventional, base scenario	29,891	37,811	4,406
Conventional, government programs	39,193	24,416	12,777

of the study, in that the conventional system using government programs is advantageous for both the profit maximizer and the risk averse farmer.

This result is consistent with other financial risk studies showing that government program participation is preferred by risk averse farmers (Olson and Eidman, Saline and Dobbins, Scott and Baker). Government programs cushion price risk. The higher variance of income from conventional agriculture need not make it less preferred by risk averse farmers. Using Musser, Ohannesian, and Benson's safety first criterion, a system with higher income variance is inferior only if its mean fails to be high enough to offset the higher variance. In HJPJ's data on conventional agriculture with government programs, this appears not to be the case.

Table 2. Values of the Safety First Criterion for Conventional Alternative with Government Programs

Coeff.	Description of Coeff.	($)
E_i	Average mean of profits	39,163
K	Standard deviations required	0.674
S_i	Standard deviation of profits	24,416
L_i	Lower Confidence Limit	22,747

In his Presidential Address at the 1994 Agricultural Economics Annual Meetings in San Diego, Larry Libby addressed the need to make publications more relevant and improve public support and confidence in our research. Rectifying errors that result in incorrect conclusions is a key part of accomplishing this (Robison and Colyer, Tomek).

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