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Discussion

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Science is challenged from time-to-time by claims that are completely outside the usual boundaries of observation and experience. Reports of flying saucers (unidentified flying objects) and creationism's counter to evolution are two examples that fall into this category. Credentialed scientists can themselves become the victims of such phenomena when their research results are not evaluated through anonymous peer review as part of publication. The cold fusion debacle of a few years ago is an example of such a bypass of peer evaluation.

Unfortunately, agronomic science is not immune to such problems, particularly as they relate to claims of miraculously high crop yield. Reports of unconfirmed field observations (UFOs) must not be accepted as bases for agronomic understanding. Without critical evaluation, the UFO yields reported for the system of rice intensification (SRI) (Fernandes and Uphoff, 2002; Stoop et al., 2002) and grower's yield contests (Evans, 1993; Waggoner, 1994) have both been taken by some as legitimate standards for assessing crop yield potential. The large yield increases claimed by Nonomura and Benson (1992) for spraying small amounts of methanol on plants is another UFO that is widely cited despite the fact that it was published in an unrefereed journal.

A sound scientific approach and critical evaluation is required to affirm the validity of yield increases from new or modified crop and soil management practices. Sheehy et al. (2004) examined the putative yield increases obtained using the SRI system, providing a classical example of the research required for such a validation. This paper offers a detailed theoretical analysis of crop growth and yield potential based on documented assumptions about the resource limitations that govern crop yield. They show that the claimed SRI yields were approximately twice what was possible based on the energy available to support crop growth. This paper also includes a careful and fully documented experimental program that attempted to duplicate SRI under a range of conditions similar to those under which most rice production occurs. Sheehy et al. have found no evidence for the yield advantage claims of the SRI system, but rather, their results were consistent with past experiences and theoretical expectations. The study undertaken by Sheehy et al. was published in a peer-reviewed journal that insists on full documentation of their research using accepted standards for both theoretical analysis and experimental protocols. This research offers a convincing analysis of the SRI system and shows that the yields reported for the SRI system should not be accepted. At the same time it details methodologies that would allow others to test these conclusions, were they so inclined.

The scientific system has had to spend considerable time and resources in rebutting the claims of SRI yields (Sheehy et al., 2004), yield contests (Yang et al., 2004), and methanol spray (Albrecht et al.,

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1995). Such time and resources could be better utilized in research with direct benefits. While scientists need to consider ideas from all sources to meet the challenge of increasing crop productivity, these ideas need to be subjected early to critical evaluation for their consistency with known principles governing plant development, growth and yield. Reminders are needed to bring skepticism and critical evaluation to all initial reports of UFOs. It is human nature to hope for major advances that will improve the welfare of so many using technologies that are easily accessible to resource-poor farmers, but this innate desire must be balanced in the scientific arena with critical analysis and carefully designed experimental evaluation. Funding agencies must also insist on sound scientific approaches and validation in the conduct of research to increase crop yields, which has not been the case with funding support for research on the SRI system. Sheehy et al. have proven again the value of the scientific approach, and their work emphasizes the magnitude of the challenge to sustained increases in crop yields.

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