ers. Instead, one must first understand existing agroecosystems and identify potential niches within them, then seek new plants that appear suitable for filling these niches. This calls for a different research strategy from the essentially reductionist approach conventionally used by agriculturalists. Interdisciplinary work is needed by natural and social scientists who share a human ecological perspective on agricultural systems.

Unlike the search for new species, either in the wild or genetic engineering laboratories, agroecosystem research does not promise instant solutions for the problems of agricultural development in the tropics. It is labor-intensive and site-specific and cannot be centralized at a few elite international research centers. It is best pursued by scientists working in local institutions having deep knowledge of their own rural areas (*2*). Developing agroecosystem research capability at local institutions in the tropical countries is a slow and expensive process. With rare exceptions, such as the Ford Foundation's support over the past decade for development of SUAN, funding for these activities has been difficult to obtain. Unless much more support is provided for research on local agroecosystems, however, we fear that many of the plant species being identified by Vietmeyer and his colleagues will remain as little more than scientific curiosities rather than realizing their real potential for improving the lives of tropical subsistence farmers.

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Response: I certainly do not look on agriculture as being an "empty slate." Like Rambo and Sajise, I believe that farmers should, and will, be the final judge of what they produce. But farmers—who constantly deal with changing markets, outbreaks of diseases, and hundreds of other variables—deserve to have many options available to them. This is why devoting scientific attention to alternative crops is important.

I do not agree that turning development over to the local institutions in tropical countries to develop "agroecosystem research capability" is the only (or even the best) way to improve the lives of tropical subsistence farmers. Doing that is likely to merely help the researchers and the publishers of scientific papers.

I do not agree, either, that farmers automatically know what is best for themselves. There are innumerable examples where farmers were so conservative that they refused to adopt valuable crops that later proved vital to their well-being. For instance, early this century American farmers vehemently rejected the soybean, and in the 1700's German farmers so opposed the potato that the ruler had to force them to plant the new tuber on pain of death.

Nor are all farmers contented with their existing crops. There is probably not a country in the world right now that doesn't have many farmers who are anxious—even desperate—to try new, and often exotic crops. Collectively, Filipino farmers are among the most entrepreneurial in this regard. Former generations of such pioneers gave the Philippine economy and diet such now beloved mainstays as sinkamas (*Pachyrhizus erosus*; from Mexico), chico (*Manilkara zapota*; from Central America), and sweet potatoes (*Ipomoea batatas*; from the Caribbean).

Actually, Rambo and Sajise and I are pointing up related areas of science that are underappreciated in mainstream agricultural research. I believe our views are more complementary than confrontational.

Finally, I would like to note that my article was written with far more areas than lowland tropical villages in mind. There were sections on crops for arid lands, for highlands, and for temperate zones. Those are regions where "agroecosystem research" of the Rambo-Sajise type is less important because crops there are not all jumbled up together, as they are in the backyard of a Southeast Asian village.

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Insect Resistance

I wholeheartedly endorse the view of L. B. Brattsten *et al.* (14 Mar., p. 1255) that the most promising approach for delaying insecticide resistance is integrated pest management, the judicious use of chemicals in combination with biological and cultural control techniques. However, their statement that "exposing a population with incipient resistance to a low insecticide dose leads to rapid fixation of resistance" is misleading and could have serious negative consequences. Simulations and analytical models showing that high doses can retard resistance (*1–3*) are based on highly restrictive assumptions that include: (i) presence of permanently susceptible pools of individuals in refugia from insecticide treatment, (ii) successful interbreeding between susceptibles from refugia and resistant individuals from treated areas, (iii) complete recessiveness of resistance, and (iv) low initial resistance gene frequency. Although such conditions may apply in certain special cases, they are generally not applicable (*3*). As noted in the simulation study cited by Brattsten *et al.*, "Even a very small deviation from complete recessiveness of resistance has a disastrous effect. . ." and is likely to arise if dose is not rigorously controlled (*1*).

Even if conditions are suitable for using high doses to delay resistance in one pest species, this strategy may greatly accelerate resistance development in other pests present and disrupt biological control by natural enemies, thus causing serious secondary pest outbreaks (*3*). Attempts to suppress resistance with high doses would also exacerbate the public health hazards and pollution problems associated with insecticides. Our best bet for slowing resistance lies in the most obvious strategy—reducing the use of insecticides.

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The article about resistance to chemical control by Brattsten *et al.* does not account for the unique response of the two-spotted spider mite to Pentac or the development of fitness by a resistant strain.

In greenhouses during the 1950's, this mite rapidly escaped chemical control. The introduction of Pentac in the early 1960's resulted in "100%" control, which continues to the present time (*1*). This response was not due to lack of a resistance mechanism.

Selection during the formation of a multiple hybrid swarm, for rapid response to selection (*2*), resulted in a 1000-fold increase of Pentac resistance (*3*). The limited gene pool, the absence of a single resistance factor, and the lack of gene flow maintained susceptible mites in the greenhouses.

Organophosphate selection of a hybrid mite strain rapidly resulted in a high level of stable resistance, whereas as strain devel-