



**Crop Protection Research Institute Research Note #1:  
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Review of *World Agriculture and the Environment* by Jason Clay, Island Press, 2004.

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Clay's basic concern with modern agricultural methods is that such methods will not provide the food and fiber needed by populations in the future—they are not sustainable.(p 62) This lack of sustainability is due to the negative impacts of high input conventional agriculture: habitat conversion to agricultural uses, soil erosion, and pollution (from fertilizers and pesticides).(p 6) He argues that modern agricultural methods are an “extreme” and he also refers to low-input systems of the past as “extreme” and suggests that somewhere between the two extremes are systems of production that are more sustainable.(p 7) Thus, the purpose of his book is to identify better practices which exist to reduce the negative impacts of production.(p 8) Clay concludes that if this is not done “in the worst scenario life as we know it will cease to exist.”(p 543)

I have reviewed the relevance of Clay's book for pest management in the United States, which is often cited in the book as an example of high input conventional agriculture.

My conclusions are the opposite of Clay's: modern systems of crop production are sustainable. The “problems” that he identifies are being addressed adequately with current policies; modern agricultural methods have greatly improved the environment in the U.S., greater improvements in food production and environmental conditions are possible in the U.S. with greater use of chemical pesticides and genetically engineered crops, significant agricultural research programs are in place that address many potential approaches to managing pest problems in the future. Clay's book is not a wakeup call. Agricultural interests have been committed all along to researching and implementing sustainable agricultural production practices.

Clay's three negatives do not really apply to the U.S.

Pristine lands are not being converted to agricultural lands; the trend in the U.S. is the conversion of agricultural lands to urban uses (which are far more polluting on a per acre basis than cropland). For certain crops and regions in the U.S. it used to be the case that farmers would farm and abandon the lands that they previously farmed. One of the main reasons was the buildup of pests that could not be controlled. With modern pesticides it is no longer necessary for growers to abandon cropland due to a buildup of weeds, insects, or pathogens, since their populations can be controlled. Modern agricultural chemicals have made crop production more sustainable.

Soil erosion from U.S. cropland has been reduced from an estimated 3.5 billion tons in 1938 to 1.0 billion tons in 1997. Clay refers numerous times to no-till farming as one of the means of reducing erosion. No-till, in production system in which the soil is left undisturbed by tillage and the crop residue is left on the surface, is the most soil conserving system, and can reduce erosion by 90%. However, the elimination of tillage means that growers must rely on herbicides for weed control. Currently, there are 52 million acres of no-till cropland in the U.S. with the average rate of erosion lower by 2.9 tons an acre in comparison to a tilled acre. Thanks to herbicides substituting for tillage, cropland erosion has been reduced by over 300 billion pounds in recent years alone. No till could be expanded to more acres in the U.S. Erosion from cropland could be reduced by 1.8 trillion pounds a year if growers substituted herbicides for tillage.

Clay cites sugarcane production as causing siltation that has clogged coastal ecosystems.(p 165) In Louisiana much of this siltation was the result of cultivating weeds during a fallow year. Sugarcane growers have switched to killing the weeds with an herbicide, which has greatly reduced the erosion. Once again, modern agricultural chemicals have made crop production more sustainable.

With regard to environmental pollution, Clay simply recites the usual litany for pesticides: some cause cancer, some pollute groundwater, some kill fish, and some sicken farmworkers. He doesn't really call for banning any of these. Rather he wants movement away from them. What Clay ignores entirely is the oversight and tight regulation of pesticide use in the U.S. by the Environmental Protection Agency (EPA). The Office of Pesticide Programs at EPA employs 900 people with an annual budget of \$80 million. All of Clay's concerns are regularly and extensively examined by EPA. The conclusion of the Agency is that there is no concern for pesticide uses that are approved on the labels they issue. Risks are managed in such a way as to avoid exposure to amounts of pesticides in the environment that would cause any harm. EPA requires 100 or so risk studies to be done to their satisfaction before issuing new registrations. The simple fact is that the Agency charged with protecting the environment not only permits the continued use of older pesticides, but regularly approves new pesticide uses. Clay refers several times to current regulatory programs as inherently limited because "they provide no incentive for producers to do better than what is required by law."(p. viii) EPA enforces the pesticide laws in a very conservative way with many layers of protection built into their risk management assessments. There is no environmental crisis with regard to pesticide use in the U.S.

Pesticides are highly effective in reducing pest populations with typical control efficacies of greater than 90%. Numerous pesticides are registered for control of the same pests. New effective chemicals are being brought into the marketplace. What evidence does Clay offer to suggest that this system is not sustainable for controlling pests into the foreseeable future? He cites studies regarding pests becoming resistant to pesticides and concludes “within a decade or two of introduction, agrochemicals lose their effectiveness because of resistance.”(p 29) This assertion is not supportable. There are numerous pesticides that were introduced 40-50 years ago that are still highly effective (2,4-D, carbaryl, mancozeb ). Clay ignores all the work that has been done with regard to managing resistance. Researchers, farmers, regulators, and chemical companies are aware of the potential problem and have devised strategies to manage and prevent it from happening. The claims of resistant populations are exaggerated; often the “resistance” is in the laboratory only and not in the field; resistant populations may exist to a single chemical but not to combinations of chemicals or to the chemical used at a higher rate. The best defense against resistant populations becoming a serious problem is to register more chemicals and keep older chemicals on the market. There is no pest problem in America that is out of control due to the failure of chemical pesticides.

With the exception of cotton, Clay does not advocate the adoption of organic practices. He does wonder why organic cotton acreage has been declining in the U.S. and why organic production seems to be stalled around the world.(p 299) (He cites Denmark, which has subsidized organic growers for several decades and still has only 4% organic acreage--the other 96% of Denmark’s acres are treated with chemicals as always.)(p 33) Nevertheless, Clay repeats the mantra that organic agriculture it is the fastest growing food sector.(p 33) (It is not. Organic acres increased by a factor of three in the U.S. since 1991, all the way up to 1.5 million acres while no till acres grew from 15 to 52 million acres and biotech acres grew from zero to 100 million over the same time period.) Surveys of organic growers regularly reveal what their biggest problem is: controlling weeds without herbicides. There are no effective alternatives except handweeding, which is very effective, but very expensive. Organic cotton acres are on the decline in the U.S. because the practice is not sustainable due to the high cost of handweeding. Companies that buy organic cotton can buy it cheaper from countries where workers get \$0.10/hour for pulling weeds instead of \$7/hour as in the U.S. In the U.S. millions of workers used to spend their summers hoeing weeds out of cotton for 10 cents an hour. That practice was no longer sustainable when the wage rate began to rise in the 1950s and growers switched to using far less expensive herbicides to kill weeds. Organic cotton has no future in the United States. Equivalent weed control can be achieved with \$1,000/acre for handweeding or \$50/acre for herbicides.

Clay’s book offers no coherent blueprint of future pest management strategies that are more sustainable than current practices. He refers numerous times to Integrated Pest Management (IPM) and even refers to IPM as an “important new approach.”(p 420) He does not acknowledge that IPM practices have been researched, promoted, and widely adopted in the U.S. for the past 40 years. He offers no new IPM method for inclusion in the pest management toolbox. IPM methods are adopted by growers when it makes economic sense for them to do so.

Clay says there are “dozens” of research topics discussed in the book.(p. ix) However, he does not lay out a coherent research agenda and completely ignores the numerous research programs being conducted right now by public institutions in the U.S. I recommend that he take a close look at the June/July 2003 issue of *Pest Management Science*, which covers the current pest management research programs at USDA’s Agricultural Research Service, to understand the breadth of current research in biocontrol, IPM, risk reduction, and resistance management. Interestingly, a recommendation for increasing research funding is not one of Clay’s 11 policy recommendations.

With regard to research, Clay suggests that it should be distanced from the “interests of input suppliers.”(p. ix) This is a very shortsighted recommendation. Input suppliers develop the pest resistant seeds, pest scouting equipment, biopesticides, parasitic biocontrol products, and precision monitoring equipment that are used by farmers. Input suppliers also develop the new chemicals that can fit nicely into IPM programs. In fact, many of the advances in IPM programs have come about because chemical companies have come up with a new selective chemical that is nondestructive of beneficial predators. This research should be followed closely by public researchers as they develop programs that could utilize the new chemical and non-chemical pest management technology introductions. Clay would have the public researchers isolated from the private sector.

Farmers adopt new technology when it improves their bottom line. Thus, when Clay says that sugarcane growers “should plant pest resistant varieties,” the news is that they currently do.(p169) All U.S. sugarcane growers plant disease resistant varieties and do not use fungicides because it makes economic sense to do so. Not all alternative practices make economic sense. For example, Clay suggests numerous times that farmers should practice more extensive crop rotations—perhaps even fallowing the land for a time. This strategy would mean that growers literally give up income by planting a crop worth less money. Clay likes the idea of banding herbicides down the row of corn plants as a way of reducing herbicide use.(p.424) What he fails to mention is that farmers who band herbicides have to cultivate between the rows of corn plants. Numerous farmers have tried banding and stopped the practice as being too time consuming and not as effective as broadcast spraying of herbicides.

Clay chides U.S. soybean growers for wholeheartedly embracing the use of biotech soybeans that are genetically-engineered to tolerate glyphosate. He says they have not exercised caution.(p. 181) Clay says that the biotech soybeans have been planted on 50% of U.S. acres.(p. 180) The percentage has actually increased even higher to 80%. It is estimated that the biotech soybeans improve soybean growers bottom line by \$20/acre in comparison to other comparable effective herbicide systems. It makes economic sense to use the biotech strategy just as it makes sense for sugarcane growers to plant disease resistant seed.

Clay wrings his hands wondering what is holding up adoption of alternative practices.(p. 41) He concludes that it is due to “the boundaries to existing ways of thinking.”(p. 41) No. It is due to alternatives not being cost-effective. Growers use many non-chemical means of pest control-when it makes economic sense. They use chemicals when they make sense.

Wheat illustrates another set of economic forces that affect pest management decisions. Clay points out numerous times that U.S. wheat yields are low and not increasing like other crops. This could be due to a lack of investment in conventional plant breeding. It is also due to the lack of pesticide use on the crop. U.S. growers do not apply fungicides or insecticides to wheat and only 50% of the winter wheat acres are treated with herbicides (a fact that Clay notes [p. 372]). U.S. wheat yields are one-third those in France where growers make multiple treatments with insecticides, fungicides, and herbicides. As a result, the U.S. loses twice the wheat to insects, diseases, and weeds as France does. In France, wheat is worth more due to much higher subsidies than in the U.S. U.S. wheat yields could be dramatically increased with more chemical use. Right now, U.S. farmers are switching from planting wheat to planting biotech corn, canola, and soybeans because of the genetic improvements in those crops--with the promise of more biotech improvements to come.

Five of the Clay’s policy recommendations have to do with the promotion of “Better Management Practices” through regulation, permitting programs, investment/insurance/purchase screens, and certification/labeling of products. Clay argues “the adoption of better management practices cannot be left to the market alone.”(p. 548) Thus, Clay’s position is that farmers must be coerced or given financial incentives to adopt practices that are economically not competitive. At one point, he states “requirements could include prohibiting the use of certain chemicals or insistence on the use of conservation tillage or no-till production.”(p. 193) Clay represents the view that farmers must be told what to do in the interests of the long term survival of the human race.

Clay provides no examples of how this scheme would actually work. Let’s assume then that a certain percentage of farmers are instructed to use less profitable rotations, a certain percentage will be told to band herbicides, a certain percentage of farmers will be instructed to use a more costly insecticide, while a certain percentage will be told to not plant biotech seeds. All of these practices result in financial losses for the farmers. Thus, Clay recommends that current agricultural support payments such as subsidies could be “usefully shifted to environmental service payments.”(p 547) How much will it cost? Who makes the decision? How much closer will this policy move us toward a more sustainable future in comparison to current regulatory and research programs? Clay has no estimates of costs or effectiveness and no blueprint of what will be required for each crop.

Farmers have numerous choices for managing pests. There are hundreds of chemicals and hundreds of seed varieties. There are numerous biocontrols and IPM scouting techniques for sale. Many companies have all sorts of biological controls for sale to the

farmer. Right now, the marketplace sorts these decisions out with the grower selecting the most cost effective method of control. Clay wants to change this procedure because, in his view, the market-based decisions are leading the planet to ruin. He has not made a case for the problem being a real one. He has nothing new to offer in the way of technology. His frustration with the continued use of practices that he does not approve of has led him to make policy recommendations that are not warranted.