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Using global organic markets to pay for ecologically based agricultural development in China

Paul Thiers
Department of Political Science, Washington State University Vancouver, Vancouver, Washington, USA

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Abstract. The traditional command and control approach and the more recent free market have proven inadequate for promoting ecological agricultural development in China. Organic certification represents a regulated market mechanism with the potential to stimulate ecologically based agricultural research, extension, and investment. Recent linkages between the global organic food industry and local agricultural development in China provide an opportunity to test this potential. The article examines China's two largest organic certification systems for their potential to promote the adoption of integrated pest management (IPM) as a key component of ecological agriculture. Organic certification is providing a format for research, extension, and implementation of IPM principles and practices, and has the potential to do much more. However, possible contradictions between ecological and market rationality, inherent in organic certification and marketing systems, may be exacerbated by the authoritarian political economy of rural China.

Key words: China, Ecological agriculture, Integrated pest management, Market integration, Market mechanism, Organic agriculture, Organic certification, Political economy

Abbreviations: IFOAM – International Federation of Organic Agriculture Movements; IPM – integrated pest management; OFDC – Organic Food Development Center

Paul Thiers *is an assistant professor of Political Science at Washington State University Vancouver where he teaches comparative politics, political economy, and environmental policy in the Program in Public Affairs. His research focuses on the environmental, social, and political dynamics of globalization in rural China, with a particular emphasis on China's integration into global food trade and food standards.*

Introduction

Promoting ecologically based agriculture is not simply a matter of extending a set of technical solutions to problems. It is the perceived appropriateness of certain behaviors and the relative value assigned to inputs and outcomes that will determine whether ecological practices are adopted by agricultural decision-makers. Appropriateness and value are in turn determined by constraints and opportunities afforded by the political and economic environment. Therefore, efforts to develop ecologically based agriculture will only succeed if they are rational within a specific political economy.

This principle is extremely clear in contemporary China. Since the 1949 revolution, centralized political decisions, taken far from the point of contact with specific ecosystems, have impeded the adoption of ecologically appropriate agricultural practices. Since economic reforms began in 1978, an ever-increasing number of these decisions have been turned over to the market. While the transition from a planned to a market economy in agriculture is far from complete, it is relevant to ask if the rise of the market will open up new opportunities for ecological agricultural development.

In this paper, I focus on integrated pest management (IPM) as an alternative to chemically intensive agriculture and a key component of an ecologically based agricultural system. IPM is an information intensive, area-specific, decision-making process by which an agricultural practitioner seeks to keep pest populations below a specific threshold level, through understanding and monitoring field ecology and through a prioritized series of responses including biological, physical, and horticultural techniques. Disruptive chemical controls are typically reserved as a technique of last resort. While the term IPM is often used inconsistently, reflecting various agendas, I use it here specifically in the tradition of Flint and van den Bosch (1981; see also Bottrell, 1979). In this tradition IPM programs are

consistent with the principles of agroecology and should be "based on known economic, social and ecological consequences" (Altieri, 1987:161, 1994). Furthermore, the reduction or avoidance of chemical pest management methods is an explicit goal of IPM in this tradition (Olkowski et al., 1988).[1]

I begin by arguing that both centralized political planning and unregulated markets favor chemically intensive agricultural technology over IPM. Organic certification and marketing are presented as a theoretically effective way of modifying markets to promote and pay for IPM. The rapid increase in global organic food markets and the recent articulation of these markets into rural China are beginning to impact agricultural development decisions in some areas. I examine IPM research and training activities within the context of two Chinese organic certification and marketing programs as a test of the potential use of global organic markets to promote IPM in the Chinese context. I conclude that, even at this early stage of development, organic certification and marketing is providing a format for research, training, and the implementation of some environmentally beneficial practices and has the potential to do much more.

China's growing integration with global organic markets is an extremely complex story with implications for China's political and market reforms and for social and environmental justice at the local level. While I have addressed some of these issues in other publications (Thiers, 2005, 2002a, b), my goal here is limited to an exploration of the potential for this integration to help address failures in China's planned and market economies to promote ecologically appropriate agricultural development.[2]

Political and market bias in pest management technology

The choice between chemically intensive and integrated pest management is heavily influenced by the political and economic context in which this choice is presented. Attention has long been called to the distorting influence of specific development policies such as subsidies for pesticide use (Repetto, 1985; Waibel, 1990; Farah, 1994). By altering market incentives, such subsidies favor the adoption of chemical pesticide technologies at the expense of non-chemical alternatives. The importance of specific policies such as subsidies, bans, and budget allocations for research and extension should not be underestimated. However, the political and economic structures by which pest management technologies are developed and extended are equally as important and often overlooked. In this section, I argue that both centralized political mechanisms and free markets tend to favor chemically intensive pest control technologies over IPM.

Table 1 is a rough representation of general differences between chemically intensive and integrated pest management technologies. These differences are relative and, of course, vary considerably with specific crops, pests, and management procedures. The generalizations in Table 1 represent ideal types in order to illustrate how a particular mechanism for development and extension might favor one type of pest management technology over another.

Centralized, top-down research and extension systems will tend to favor chemically intensive control techniques. In general, chemical control can be classified as a universal technology that seeks to overcome or homogenize ecological variation. The location of research can be highly centralized with knowledge requirements satisfied by specialized technical experts. IPM, on the other hand, seeks to understand and accommodate ecological variation and is therefore locally differentiated. This means that research must be decentralized, with the distinction between the research specialist and the local practitioner minimized.

The inappropriateness of centralized, top-down systems for the development and implementation of IPM

Table 1. Political and market bias in pest management technology.

	Chemically intensive control	Ecologically based IPM
Basic characteristics	Universal, product intensive	Locally differentiated, information intensive
Relationship with ecosystem	Overcome and homogenize ecological variation	Understand and accommodate ecological variation
Primary products	Synthesized chemicals	Living organisms
Return on input investment	Considerable:Annual sales, Ecosystem disruption increases demand	Limited: Organisms reproduce, ecosystem stabilizes
Location of research	Laboratory and field station, can be centralized	On-farm, must be decentralized
Developer knowledge	Chemistry, Insect toxicology, Agricultural economics	Local ecosystem, Traditional practices, Local culture, Economy, and politics, IPM principles

has been confirmed by field research. This has been particularly well documented in the case of rice IPM in Indonesia (Kenmore, 1991; van de Fliert, 1993; Pincus, 1994; Rolling and van de Fliert, 1994; Thiers, 1997). China's centralized system has shown itself capable of creating a sophisticated network of IPM research laboratories dating back to before the 1978 reforms (BIRC, 1991). However, implementation of the results of this research has lagged far behind. As one Chinese researcher told this author in the early 1990s, "as soon as we win national research awards, they put the whole thing in a museum" (*yi de le jiang, jiu fang bowuguan*).

If a centralized, top-down, administrative system is inadequate in promoting IPM, then perhaps the free market holds more promise. Market-based allocation and innovation is often prescribed as an alternative, decentralized mechanism when centralized political systems fail. Some have proposed that a fee-for-service research and extension service would be more responsive to the needs and interests of Chinese farmers (IDRC, 1997; Liu, 1997). Such a market orientation appears to be developing among agricultural technology providers, particularly in southern China. In general, this is an important trend with the potential to promote more locally appropriate agricultural development, leading to greater social and ecological sustainability. However, markets, like politics, support some technologies more readily than others.

Referring again to Table 1, there is reason to doubt the capacity of a free market to support ecologically based IPM. While chemically intensive pest control is based on marketable products, IPM is primarily information intensive. Chinese farmers, accustomed to a system in which information was provided freely by public-interest research units (*shiye danwei*), are hesitant to pay for services that do not include tangible products. When IPM is embodied in biological control products they include living organisms which differ from place to place, must be handled carefully, and often reproduce upon release.[3] As such, they are both difficult to patent and to market, making return on investment problematic. This is particularly true in rural China where the transition to a market economy is recent and incomplete. Shortages of capital and inadequacies of rural infrastructure mean that alternative pest management products are significantly harder to produce and deliver than in the developed market economies of the West.

In addition, by disrupting ecosystems, chemical control creates the conditions for its own market expansion as increased volume and new products are needed to overcome pesticide resistance and new pest outbreaks. Conversely, IPM sows the seeds of its own market saturation by seeking to create stable ecosystems in which pest populations remain below tolerance levels. For these reasons, IPM cannot compete with chemical control for profitability. Investment capital and entrepreneurs will flow towards the higher rate of return offered by chemically intensive control, meaning that IPM services will be under-provided in the market place. In summary, because IPM is both locally differentiated and information intensive, policies using either centralized research and extension or unregulated markets to generate innovation and adoption will prove inadequate. Thus, although the decentralization offered by the market is attractive as an organizational structure, we must also consider who will pay for ecologically based agriculture research, training, and implementation services. The typical solution to the provision of unprofitable services in a market system – state subsidy – is unlikely to be adequate in contemporary China even if it could be done in a way that facilitated decentralized implementation.[4] Although central government leaders frequently call for greater state investment in agricultural science and technology, translating these words into actual investment patterns has proven extremely difficult (Zhang, 1997). Leaders hope that this funding shortage can be overcome through increased investment from local sources including farmers themselves and local organizers of agricultural production (in most cases local governments). Local governments and farmers have shown a willingness to invest in agricultural science and technology as part of a regional or personal development strategy. However, this is only done as an intentional strategy to add economic value to local agricultural production. Long-term ecological benefits are not enough to attract even local capital.[5] A given area of research and development must hold the direct potential of enhancing the profitability of agriculture within a few years. Therefore, Chinese farmers and local agricultural decision-makers will consider ecological agriculture a viable opportunity for investment only to the extent that it adds value to agricultural products.[6] It is within this context that organic certification and marketing schemes hold the potential to promote ecologically based agriculture in China.

Organic certification: Regulating markets to promote ecologically based agriculture

Before looking specifically at organic certification programs in China, I turn briefly to the theoretical potential of organic marketing and certification programs to promote ecologically based agriculture. Such programs rely on an independent certification regime to differentiate agricultural products produced using certain practices, thus providing a market incentive for the

adoption of those practices. In order to function, organic certification must generate a market premium (i.e., a price differential) high enough to convince the producer to adopt the desired practices. An independent certification authority, which may be governmental or non-governmental, is necessary to guard against farmers claiming organic status while using prohibited chemical fertilizers and pesticides to increase yields and lower costs. Such free rider problems would erode the credibility of the organic label in the market, leading to reduced market premiums. Theoretically, all costs associated with organic production, including the high costs of locally appropriate innovation and training, could be internalized into the price of the product. Chemical products and other centrally developed production packages would no longer be cost-effective because they would fail to capture this premium. An information intensive, locally differentiated research and extension service would develop in response to market demand from organic producers.

Organic certification and marketing developed gradually in North America and Western Europe from the initial articulation of organic farming principles in the 1920s, to an increased interest in organic practices in the 1970s, to the rise of governmental certification and subsequent rapid expansion of the organic market in the 1980s and 1990s (Tate, 1994; Kirschenmann, 1996). By the close of the 20th century, the global organic market had reached an estimated total value of US$10 billion (Roberts and Clifford, 2001). While organic production in developed nations is increasing, much of the growing demand by first world consumers is being met through international trade. Of the £600 million sterling of organic food consumed in Great Britain from April 1999 to 2000, 75% was imported (Brown, 2001).[7] China has the inexpensive rural labor force and relatively well-organized agricultural sector to exploit this market. The Japanese convenience store chain, Lawson Inc., recently announced that all of its vegetables for prepared meals and a significant portion of its fresh vegetables will be imported from certified organic farms in China in the spring of 2002, thereby ensuring that the US$80 million in certified organic food Japan imported from China in 1999 will grow rapidly (Anon, 2001). Chinese certifiers claim that the value of Chinese organic products sold internationally continues to increase (see below).

To what extent is organic certification and marketing as a regulated market system compatible with ecologically based agricultural practices such as IPM? First, it is useful to distinguish between two categories associated with the organic movement and the organic industry, which I will call respectively *organic farming* and *organic food*. Organic farming, which dates by name from the 1920s, is a holistic ecosystem management approach to agriculture that stresses regenerative soil fertility, ecosystem balance, biodiversity, and an overall orientation towards the conservation of resources. Pest management on organic farms includes such practices as the selection of appropriate varieties, crop rotation, the provision of habitat to conserve biological control agents, and physical controls such as hand weeding. The holistic and integrated management approach of organic farming is clearly consistent with the ecologically based, least-toxic tradition in IPM to which I referred in the introduction.

Organic food is a marketable commodity and thus must have a straightforward definition acceptable to consumers. The most common such definition is food produced without the use of synthetic chemical fertilizers or pesticides. Compliance with this definition is certified by an external body through inspection of input records and production practices. Pest management in organic food production typically employs some of the practices associated with organic farming but can also rely on external inputs such as biological pesticides. Where conversion to organic status is driven solely by a desire to capture higher prices offered by the organic food industry, a simple input substitution process may be followed and the holistic, integrated, and ecological qualities of organic farming may be less fully realized. As I have documented elsewhere (Thiers, 2002a), many organic conversion projects in China are organized by local government elites out of a desire to capture the higher economic values offered by organic food with little or no interest in organic farming principles. Such sites tend to focus on single, marketable crops and seek specific replacements for conventional pesticides. In China, as elsewhere, the pursuit of organic food does not guarantee the full ecological benefits of organic farming.[8] While the organic food paradigm does not directly guarantee an ecological and holistic approach to pest management, it could facilitate some aspects of IPM through a conversion to information intensive management. Organic certification requires extensive record keeping of what inputs are used, for what purpose, and to what effect. Monitoring and evaluation components of IPM decision-making could be integrated with these record-keeping procedures. Organic certification can also reinforce IPM concepts such as the calculation of and adherence to tolerance thresholds. Once farmers have gone through the lengthy, and sometimes costly, conversion process, they have a strong incentive to stick with non-chemical pest management programs rather than abandoning organic certification at the first sign of pest problems. Finally, as implied in the title of this paper, the market premium associated with organic sales provides capital investment targeted at achieving and maintaining organic production standards. Where IPM is perceived as a viable alternative technology to chemically intensive pest

control, some of this capital will be invested in non-chemical IPM research and extension.

Organic certification and marketing programs in China

While several foreign organizations are actively certifying organic production in China for specific foreign buyers, two Chinese government sponsored organizations, Green Food and the Organic Food Development Center have emerged as the most significant certification organizations in the country. Because these two programs operate differently and are enjoying different degrees of success, I will briefly describe each of them here.

Green Food

The Chinese Ministry of Agriculture's Green Food program began in 1990 as an effort to guarantee the safety of food produced in China's extensive system of state-owned farms. Since then, Green Food has outgrown both the state farm system and the limited food safety mandate. The Green Food program now certifies more than 500 producers (including processors) producing more than 1000 products on just over one million hectares of cultivated land. Certified producers now include: state farms; county, township, and village-led cooperatives; and Chinese and foreign funded private ventures. The certification program is administered by the China Green Food Development Center in Beijing and by provincial and county government Green Food offices throughout China.

Green Food uses a two-tier certification system that reflects the program's transition from a food safety guarantee to a participant in the international organic industry. The original certification label, now called A-Grade Green Food, is a quasi-organic designation similar to ''no detectable residue'' labels occasionally seen in the West. This label and the standards it represents were developed in response to concerns by domestic consumers and non-organic foreign buyers about chemical contamination in Chinese food products.

When A-Grade Green Food standards proved unacceptable to international organic buyers, Green Food leaders developed a second tier called AA-Grade Green Food. While the definition of AA-Grade continues to evolve, it is converging on internationally accepted organic standards in important areas such as the certification of production process rather than products. Some AA-Grade products such as peanuts, tea, and dried beans have begun to enter international organic markets. While Green Food claims to have had some success in getting its certification label accepted in Japan, entry into the European market has been accomplished only through double-certification by both Green Food and by internationally recognized organic certifiers. Green Food has still been unable to secure independent, international recognition of its AA-Grade label as organic.

In 2000, Green Food claimed total domestic sales of US$4.8 billion and international sales of US$200 million (Liang, 2002). The great majority of this bears the A-Grade Green Food label and, therefore, fails to capture the high market premium or follow the process-oriented standards of greatest interest to this study. However, A-Grade product certification can be a platform for conversion to full AA-Grade status as intended in the Green Food training programs described below.

The Organic Food Development Center

If Green Food represents a typical enterprise of a large, centralized Chinese ministry, the Organic Food Development Center (OFDC) is more similar to a western, non-governmental certification organization. While OFDC was not officially established as a sub-unit of the State Environmental Protection Agency until 1994, it had been developing contacts with the international organic community since the late 1980s. OFDC joined the International Federation of Organic Agriculture Movements (IFOAM) in 1989 and received IFOAM accreditation in 2003.[9] An OFDC staff member serves on the important IFOAM standards board. OFDC began assisting foreign non-governmental certifiers in China in 1990 and formally entered into a joint certification relationship with an American certifier (The Organic Crop Improvement Association) in 1995.

Without the bureaucratic access to production offered by Green Food's connections through the Ministry of Agriculture and the State Farm system, OFDC has grown more slowly, certifying only 4000 hectares in 1997. Yet OFDC's stronger connections with the international organic community have paid off in terms of market access. While Green Food certified production volume in 1997 outpaced that of OFDC by about 150:1, both organizations reported export values of US$2–3 million that year. By 2000, OFDC certified growers were exporting US$30 million worth of products, probably surpassing the AA-Grade Green Food total (Du, 2001; Smith, 2002). Thus, while OFDC is likely to remain smaller in absolute terms for some time, the global market incentive it provides to Chinese producers to adopt organic practices is probably already greater than that provided by Green Food.[10]

The organization of organic production in China

While Green Food and OFDC differ in their histories and orientation to the international organic community,

organizational patterns at the level of production converge, reflecting the political realities of local political economy in rural China. The original western image of individual small farmers taking the initiative to convert to organic production appears rare in the OFDC system and non-existent in Green Food. Rather, production is organized by political or economic entities such as local governments, state farm managers, foreign buyers, or export-oriented trading companies. Most organic production has some close relationship with local governments, often county or township agricultural bureaus.[11] These government offices decide which lands will be converted to organic production, provide investment capital, and organize marketing. Local governments also play a role in organizing research and training, material inputs, and production practice decisions. This is especially true in villages that have officially recollectivized. But even in villages where use-rights to land are still divided among farmers, local governments are able to exert significant pressure to ensure farmer participation.[12] Local organizers often have a contract or market order with a foreign buyer or Chinese export company, a practice that significantly reduces risk to the producer by guaranteeing a market channel.

The dominant role of companies and local governments in Chinese organic production systems links organic agriculture to what Liu (1997) calls the "company-led extension approach" (p. 6). Under this system, an agricultural company such as a food processor or broker often linked to a local government, makes contracts with extensionists to provide products and services needed to ensure an acceptable yield and quality of crop. Such services typically include acquisition, development, and application of seed varieties, fertilizers, and pesticides. In the case of Chinese organic production, contracting companies or local governments specifically seek agricultural services that facilitate local organic production, an important improvement over both the centralized command and control model and the chemical product orientation of conventional market-based extension services.

Chinese organics and IPM promotion

A number of activities associated with Chinese organics have the potential to support IPM as a component of ecologically based agriculture. Some of these, particularly training and on-farm research, are already becoming common characteristics of organic food production. Others, such as record keeping, are recent developments in the evolving definition of OFDC and Green Food certified production.

Market incentive

To be successful, an organic certification and marketing system must offer a significant market premium as a financial incentive for producers. At this early stage in organic market development, it is not clear if domestic consumer demand will be sufficient. As the major domestic player, Green Food provides the best test of demand among China's growing urban middle class. A survey of targeted Beijing consumers (Liu, 1994) found that only 20% of respondents would pay premiums of 50% or more for Green Food certified products. However, the survey indicated that problems with the integrity of Green Food itself were more significant than a lack of consumer interest and purchasing power.[13] A full 45% of the respondents said that they would not buy Green Food because they did not believe the claims of the label. Because it lacks a self-interested, bureaucratic connection to agricultural production units, OFDC may have more success in gaining consumer trust as evidenced by a large, Green Food, certified vegetable broker recently switching to OFDC certification even for domestic sales. However, most Chinese consumers are not yet familiar with the term organic and their general lack of trust in the claims of any producer or government certifier will take time to overcome (Smith, 2002).

In the near term, the international market is more promising and Chinese organic producers have begun to obtain lucrative contracts through either OFDC or Green Food certification, often with co-certification by a foreign organization. The total value of organic food exported from China (using certification through OFDC, AA-Grade Green Food, and a number of foreign certification organizations) was estimated at US$140 million in 1999 and US$200 million in 2000 (Anon., 2001; Gilley, 2001). There is room for concern, however, that premiums may not be transferred all the way back to farmers. Cases investigated in the course of this study indicate that many farmers are receiving only a 5%–10% premium for participating in organic production while some are receiving no premium at all. Still, given the frequent problems of over-production and lack of demand in Chinese agricultural markets, the guaranteed market offered by production contracts themselves represents a significant incentive to participate at this stage.

Many farmers may participate simply in response to dependency and administrative pressure from local governments or other organizers of agricultural production. The balance between markets and politics as a mechanism for organizing organic production appears to vary tremendously at the local level. Some local officials claimed that their provision of organic fertilizer and technical training was a significant factor in eliciting

farmer participation, although at one such site farmers denied receiving these inputs and said they sold to the county-owned factory because "the government" was the only buyer. Local officials at several production sites said that they rely on "administrative measures" (*xingzhen zuofa*) to ensure farmer compliance. If farmers in a designated production site are resistant to adopt required techniques, their land is simply swapped (*liuzhuan*) with land outside the site and more willing farmers are brought in. Where organic production can be organized through this kind of political control rather than through market incentives, premiums will fail to reach farmers and many of the benefits of the system may be lost.[14] In particular, coerced participation may limit the potential for participatory approaches to IPM such as farmer field schools.[15]

Moving from the level of farmer incentive to that of production organizers such as local governments and companies, the existing and potential profits offered by organic certification represents an important opportunity for IPM. A major problem in Chinese agricultural development during the era of market reform has been the tendency for investment capital to flow out of agriculture towards more profitable enterprises. Organic food premiums represent a return on investment that may change this equation. Township and county officials consistently identified potential market premium and foreign contracts as significant factors influencing the decision to organize organic production. These officials are showing some willingness to invest in research and training, labor, and land. For example, Green Food training workshops are paid for by a combination of production enterprises, provincial Green Food offices, and the central Green Food office in Beijing.[16] Local organic production organizers hire additional workers to accomplish labor intensive tasks associated with organic agriculture such as the production and application of organic fertilizer. Land investment shows itself most directly in the allocation of land for organic research and demonstration fields (discussed in more detail below). In Ji County, Tianjin, twelve Green Food demonstration districts have been established on collectively-farmed land comprising the bulk of the county's 20,000 hectares of Green Food production. In addition to providing the land itself, the county's Green Food office organizes and funds research and farmer training within these districts.[17]

Pesticide use reduction

The potential to actually reduce pesticide use is a second category of benefits which organic agriculture offers IPM advocates. While the initial reason for this pesticide use reduction may be purely to obtain organic certification, the effect in restoring damaged ecosystems could be significant. The degree of restoration will depend on the extent to which this simple reduction in pesticide use is combined with the introduction of ecologically rational practices such as crop rotations and harborage for natural enemies. If IPM and other agroecological practices can be introduced in tandem with pesticide reduction, Chinese organic producers may find that they can increase profitability not only by gaining higher market premiums, but also by reducing input costs through ecologically rational alternatives. Some observed sites are sterile monocultures where pesticide reduction is accompanied only by a conversion toward equally expensive, if less destructive, substitutes such as the intensive use of the insecticidal bacteria *Bacillus thuringiensis* (Bt).[18] In other sites diverse field ecologies have become well established. This study did not allow for definitive conclusions about what factors push sites toward one outcome or the other.[19] But it is clear that, while the potential for initial pesticide reduction to translate into a more ecologically based management system exists, it cannot be assumed.

Information intensive pest management

The record-keeping requirement for organic producers provides another opportunity for IPM. Such record keeping is consistent with a transition from product-intensive to information-intensive pest management. If used creatively, record-keeping requirements can facilitate a systematic comparison of input costs, monitoring of pest populations, and the evaluation of the effectiveness of practices. Here again, there appears to be some difference of opinion among Chinese administrators about the purpose of record keeping. Some see it as simply a method for controlling producers and enforcing standards. Others see it as an opportunity for increasing farmers' knowledge about the interaction between pest management practices and field ecology. At the level of implementation, these different perspectives result in different formats for record keeping forms. For example, a form used in Jiangsu Province Green Food rice production requires only that farmers record the type, amount, and timing of inputs, while forms used for Beijing Green Food and OFDC vegetable production also include application procedures, effect on target pest, and effect on plant condition as well as summations of pest and disease experiences encountered during the growing season. This is still somewhat distant from IPM's systematic monitoring of pest and natural enemy populations, but the potential is obvious.

Training

Organic production trainings are an important opportunity for the extension of IPM principles and practices

to production managers and farmers. Training workshops conducted in the context of Green Food and OFDC certification were observed in March 1998 and September 2001, respectively. Because of the similarity in their content and format, they are summarized jointly before important differences are highlighted. Together, they illustrate the advantages and challenges of such workshops for IPM.

Both workshops made use of academic researchers with IPM expertise. These professors maintained a formal Chinese classroom lecture format although their "students" were enterprise production managers, county and township level officials and, in the OFDC case, several farmers. Lecturers spoke on the environmental impacts of chemical agriculture with content ranging from a description of Carson's (1962) arguments in *Silent Spring* to recent evidence linking pesticides to cancer. Agroecological practices were presented simultaneously as a goal in and of themselves, and as a means to achieving certification in order to enter the international organic market. Large-scale production was endorsed (and, in the case of Green Food, required), not for ecological reasons, but in order to create the necessary level of production to satisfy foreign buyers.

Both workshops featured the same IPM expert from China Agricultural University. In 1998, he was working as a technical consultant for Green Food in addition to his job as a professor teaching IPM to entomology students. By 2001, he had stopped working for Green Food and was providing OFDC trainings based on his belief that OFDC, as part of the international organic movement, provided a better opportunity for dissemination of ecological agriculture principles. At both workshops he stressed the importance of prioritized and integrated control techniques with an initial reliance on cultural and physical controls, biological control as the most important tool in responding to pest outbreaks, and biochemical control as a last resort. The speaker used diagrams to show how crop rotations and other production practices created complex changes in the field environment such as the relationship between chemical use and natural enemy populations, and the impact of water management on plant diseases. His discussion of biological control introduced and prioritized the conservation of natural enemies, the release of beneficial insects, and the use of microbial pesticide sprays. The discussion of biochemical control emphasized the importance of careful calculation of the economic costs of inputs to determine their appropriateness, and the avoidance of routine application. The speaker completed this detailed exposition of IPM principles and practices by stating that, while IPM may seem more troublesome than chemical control, it does work and is necessary in order to capture the market premium associated with organic certification.

Both training workshops clearly included the provision of technical information on IPM and other components of ecological agriculture to managers and practitioners. While this is a significant accomplishment, it is also clear that the top-down, command and control tradition in Chinese agricultural research and extension will not simply disappear. This is most evident in the Green Food training, which took place as a component of a hierarchical extension format. Central and Provincial Green Food offices pay for such trainings for county level officials and enterprise managers with the expectation that the counties will pass information, intact, to the next level through local trainings for township and village technicians. These technicians are then expected to train peasant farmers. Thus, there is no assumed need or format for farmers and researchers to exchange information directly. The Green Food trainers also stressed the need for centralized and hierarchical control of production to ensure enforcement of standards.

The OFDC training was organized and paid for by a for-profit trading and retail company, hoping to increase the supply of organic certified products for its international and domestic business. In keeping with the desires of the company, the audience included county-level production managers side by side with some village technicians and farmers.[20] On-site inspections by the independent certification organization were stressed as the primary means of enforcement of standards.

It is not surprising that the Green Food system would stress internal hierarchy and central control in both training and enforcement while OFDC would conduct more inclusive trainings and rely on independent inspection. This reflects Green Food's origins in the hierarchical state farm system and OFDC's close association with the international organic community and market. However, it should be noted that neither of the trainings provided an interactive environment in which farmers could discover IPM principles or provide researchers with feedback.

On-farm research and demonstration

One area where organic certification and marketing may help to breakdown hierarchical traditions in agricultural research and extension is in the facilitation of on-farm research and demonstration. As mentioned earlier, many local governments have allocated land and resources to set up Green Food or OFDC demonstration districts where research and demonstration projects are carried out in connection with organic production.[21] In the Green Food system, these districts often receive additional support through Ministry of Agriculture programs while some OFDC districts are supported through donations from international organizations.[22] While the provision of external resources may make direct adoption of

demonstration district practices by neighboring producers difficult, these districts represent a significant improvement over field-station approaches to IPM extension. The districts are actually engaged in market-oriented production and are expected to turn a profit. Just as importantly, they cover the range of organizational formats found in Chinese agriculture from state farm, to local government-controlled collective farm, to individual farm families. In other words, they reflect the reality of political organization and market accountability found in rural China today.

Important questions remain about the nature of on-farm, organic research. In particular, there is only limited evidence that farmers themselves have any influence on the research agenda. IPM is most effectively developed and adopted through a process of farmer participation and farmer discovery. Such participatory methodologies are rare in the culture of Chinese agricultural development where the top-down approach is deeply ingrained and local governments exercise considerable authority. This issue is further complicated by the emphasis on quality control and enforcement of standards inherent in organic food certification and marketing. The strict requirements of international organic food buyers tend to reinforce the top-down approach.

One Green Food technical advisor, inspired by accounts of IPM success in Indonesia (Kenmore, 1991), attempted to experiment with a farmer field school model for AA-Grade Green Food development on several sites in northern China in 1997, but the approach proved problematic. The researcher later explained that the Farmer Field School paradigm would need to be modified to incorporate the strong leadership role of local governments in China. One foreign-funded development project in Anhui province established through OFDC has resulted in the establishment of a farmers' association designed to conduct farmer-led, organic research and marketing. The farmers' association has shown itself capable of generating and contracting for technical information, but has had difficulty establishing market connections, a task often dominated by local political elites. Presently, it is unclear how the independent farmers association will even pay their certification fee once international donor funding ceases. While these initiatives may prove successful over time, their near-term limitations indicate that the combined authoritarian traditions of local Chinese agricultural development and the demands of international market forces present a challenge to any participatory approach to ecological agriculture.

Conclusion

Organic food production offers a diverse and complicated set of opportunities for the promotion of IPM in China. The market premium associated with organic certification may generate investment of capital, land, and labor to facilitate IPM research and adoption. Reductions in agrochemical use may open the door for a more ecological and regenerative approach to input management. Training programs may facilitate farmer and farm manager learning about IPM principles and techniques. On-farm research and demonstration projects may make IPM research more responsive to economic and political realities of agricultural production in China and may eventually facilitate a more farmer-directed, participatory approach to the generation of agricultural technology.

However, these opportunities are potentialities, not foregone conclusions. There are forces within the local political economy in China and the global organic market which tend to lead away from ecological agriculture, away from farmer empowerment, and away from the comprehensive development of IPM. The strict demands of the organic food industry may eclipse the ecological principles of organic farming, particularly where the need for "quality control" can be used as a justification for local authoritarianism. The cultural and political tradition of top-down agricultural development and government intervention may preclude local innovation and flexibility.

The training workshops described above provide the clearest illustration of the compatibilities and contradictions between Chinese organics and IPM. It should be stressed that the attendees would not have been at the workshop without the market incentive (current or potential) offered by organic certification. They, or their bosses, have decided to participate in organic certification as an investment in local economic development. While the dry, lecture style format of the presentation was less than ideal, the fact that such presentations are taking place at all is significant. Chinese agricultural scientists have shown themselves capable of important technical research in IPM, but extension and adoption of these technologies have lagged behind. Organic agriculture is paying these specialists to present their results directly within a context of economic benefit to practitioners. However, in addition to principles of ecology and IPM, the workshops also stressed the need for large-scale production and strict adherence to market-based standards ensured by centralized administrative control or external monitoring. This stress on large-scale, externally controlled production comes not from the principles of organic farming, but rather from the demands of the organic food industry in conjunction with Chinese developmental assumptions about the need to control rather than empower peasant farmers.

The global organic food market clearly holds some promise for the promotion of ecologically based agriculture practices in China. But in China, as elsewhere,

organic certification and marketing programs face contradictions between market and ecology as well as between control and empowerment. These contradictions are exacerbated by the hybrid character of China's rural political economy in the reform era, which I have called the fragmented entrepreneurial state (Thiers, 2002a). Politics and markets are not a zero sum game in Chinese "market socialism" and the synergistic overlap between authoritarian administration and profit-minded global capitalism exacts a heavy toll on farmers and ecosystems alike.

The challenge for all who would use the organic market to promote ecologically based agriculture is to find a balance between the market rationality that gives organic agriculture its power and the ecological rationality which gives it meaning. The administrative oversight and certification of production, so necessary for consumer confidence, must somehow coexist with local innovation and responsiveness to local ecosystems.

Advocates of ecological agriculture in China, as in the rest of the developing world, can play an important role by becoming actively involved in organic agriculture research, training, and the development of standards. In China, it is essential that such efforts recognize the power and interests of local government elites. This is consistent with Lieberthal's (1997) recommendation that all environmental policies should be linked to short-term economic returns at the local level in order to ensure crucial local government support. A particular area of mutual interest might be the promotion of low (external) input approaches to pest management. Most organic enterprise managers in China, including local government officials, are motivated primarily by economic incentives and only secondarily by environmental benefits. They will be most impressed by demonstrations of IPM's capacity to lower production costs, thus reducing risk and increasing profitability in the face of market fluctuation. If both market and ecological criteria can be satisfied within individual projects, the demonstration effect could be substantial. In this way, the organic market's full potential to promote ecologically based agriculture in China might be realized.

Notes

1. This ecological and least-toxic tradition is also reflected in the use of the term IPM (*bingchonghai zonghe fangzhi*) in the Chinese ecological agriculture (*zhongguo shengtai nongye*) paradigm (Sun, 1993) and in biological control laboratories in China (BIRC, 1991). It is also consistent with the use of the term IPM by those conducting organic training workshops described later in this paper (Du, 2001). In all of these circles, the term IPM implies ecologically appropriate design and pesticide use reduction as inherent goals.
2. This study is based on 20 field visits to organic or quasi-organic production sites in five Chinese provinces in 1997, 1998, and 2001. One hundred and sixty officials, entrepreneurs, researchers, and practitioners were interviewed and extensive secondary sources were reviewed.
3. Biological pest control is a key component of an IPM system. Populations of living natural enemies of pests are increased, through habitat enhancement, rearing and release, and other techniques to bring pest populations below an acceptable threshold.
4. Cuba's regional insectary program represents one intriguing example of central financing for a decentralized implementation of biological control services within a very different context of late-socialist reform (Rosset and Benjamin, 1994).
5. The lack of long-term investment capital for agricultural development is exacerbated by continuing ambiguity of land tenure in some parts of China (see Posterman et al., 2000).
6. This argument holds not only for investment of financial capital, but also for other investments required for ecological agriculture in China such as land, labor, and political (organizational) energy.
7. The percentage imported is likely to keep pace with future growth in the British market, projected to reach three billion pounds by 2005 (Snoddy, 2001).
8. Guthman (1998) and Buck et al. (1997) argue that the displacement of the organic farming movement by the organic food industry is already taking place in the most developed organic market systems.
9. IFOAM is a coalition of more than 500 organizations in 80 countries, many of them non-governmental certifiers. While the international organic community is decentralized, IFOAM and its various boards provide a degree of continuity, particularly by accrediting certifiers as meeting IFOAM basic standards. While Green Food is also a member of IFOAM, it has not received the more significant IFOAM accreditation.
10. By 2001, several former Green Food producers had switched to OFDC certification and at least one former Green Food government official had set up a private trading firm using OFDC certified growers. OFDC's new status as China's only

domestic certifier with IFOAM accreditation is likely to accelerate this process. Meanwhile Green Food's domestic advantage (bureaucratic connection to agricultural producers) has proven to be a liability internationally as the organization has been unable to satisfy the international standard that certification is completely independent from production. However, Green Food's extensive institutional infrastructure and ties to the Ministry of Agriculture mean that its potential to influence agricultural practices cannot be ignored. For more on the political and administrative battle between Green Food and OFDC (see Thiers, 2002a, b).

11. In what I have elsewhere described as China's *fragmented entrepreneurial state*, local governments and other bureaucratic entities use their political authority to pursue market advantage (see Thiers, 2005). Local governments organizing large-scale conversion to organic food production as a regional economic development strategy are consistent with this pattern.
12. Use-rights to land in most of China were officially given to individual farm families in the early 1980s. However, some areas have officially or functionally recollectivized in order to pursue value-added agricultural production and marketing. Such collectives are dominated by local political leaders.
13. More general surveys indicate that Chinese urban consumers are very concerned about pesticide contamination and would be willing to pay more if they could be sure that food is safer (Jassaume and Lin, 1996; Veeck, 1997).
14. For a more detailed elaboration of the problems associated with the use of political authority in Chinese organic production (see Thiers, 2002a).
15. For descriptions of the farmer field school approach to IPM (see Kenmore, 1991; van de Fliert, 1993).
16. All of these entities profit from Green Food as provincial offices and the central Green Food office are also involved in exporting Green Food products and in selling Green Food production inputs to producers. Thus, the very conflict of interest that has hurt Green Food's international acceptance does provide additional internal incentive for organic food promotion.
17. The potential for organic food profits to help overcome the opportunity costs of land in semi-urban areas can also be seen in the professed willingness of local leaders to forego the development of non-agricultural, polluting industries to protect organic production. While such claims have yet to be tested, given the seriousness of the loss of semi-urban agricultural land in China, this potentiality should be explored further. Perhaps the most encouraging example is in Yanqing County, Beijing where local leaders claim to have incorporated Green Food into the county's long-term regional development planning as part of an integrated effort to promote "environmental and agricultural tourism."
18. Bt is the only biological pesticide available throughout China. As such, it is used extensively on organic and non-organic farms, sometimes with a chemical pesticide added to the product. Some researchers report that pest resistance to Bt is already becoming a problem.
19. What were striking were the polarized assumptions of site managers about the role of external resources in organic production. This issue can be seen as an extension of the debate between high external input sustainable agriculture (HEISA) and low input sustainable agriculture (LISA) familiar in agricultural development circles around the world. HEISA is the dominant paradigm among Green Food administrators with the assumption that Green Food, as a form of value-added production, requires greater investment in inputs than conventional agriculture. The LISA paradigm is well entrenched among OFDC staff, many of whom have backgrounds in systems ecology. Among producers, there seems to be considerable variation in both Green Food and OFDC certified sites.
20. Interestingly, the company CEO even required that clerks from Beijing retail outlets attend so that they could provide consumers with information about organic techniques and principles.
21. I use the intentionally vague term "districts" because the size and structure of these sites vary greatly. While some are called "demonstration farms," it should be understood that they almost always involve the participation of many farm families or contract workers.
22. Green Food districts have been linked to MOA initiatives such as the "Three Highs" agricultural modernization program, designed to transfer technology for high yield, high quality, and high efficiency agriculture. At various times in OFDC history, districts have been funded by the Rockefeller Brothers Fund and by the German development agency GTZ.

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Address for correspondence: Paul Thiers, Department of Political Science, Washington State University–Vancouver, 14204 Salmon Creek Avenue, Vancouver, WA 98686-9036, USA
Phone: +1-360-546-9466; Fax: +1-360-546-9036;
E-mail: thiers@vancouver.wsu.edu