Exchange and the Environment: a study of agricultural practice and information transmission in the Gildardo Magaña Ejido, Los Angeles, Michoacán

Aaron Sharratt
University of Minnesota-Morris

Abstract

Environmental degradation in the Mexican countryside is partly caused by the current agricultural practices utilized by the ejidatario on the land. Many believe that the ejidatario is unaware of the ecological devastation and of farming practices that are environmentally friendly. This study examines ejidatario awareness of environmental destruction caused by farming practices in the Ejido Gildardo Magaña, Los Angeles, Michoacán, Mexico through an investigation of information transmission, individual knowledge, and agricultural practice. Twenty three of fifty six ejidatarios (representing half the possible sample) were selected to interview based upon time constraints and willingness to participate. The study took advantage of structured and unstructured interviews with ejidatarios and experts, a focus group, and participant observation. Expert advice consisting of sugar cane union representatives, agronomists, a representative from Hurst’s Berry farm, and a doctor at the local clinic was also obtained.

With the influx of foreign produce companies has come growing environmental concern as far as practices conflict with foreign food standards. The increasing quantity and frequency of pesticide application required by fruit cultivation is harming an already fragile environment and wreaking havoc on human well-being. A lack of information and education is resulting in uncontrolled use of agrochemicals and to severe destruction of the soil and the water supplies. Agricultural practices promoting conservation, reforestation, and sustainable management are rarely discussed. The national neglect of the land is obvious in the lack of a consciousness concerned for ecological and human safety. The uninhibited application of chemicals such as Parathion, Endulysulfan, Marathion, and Furudan, which are heavily regulated or banned in “modernized” countries but readily available in Mexico, is reason for great concern. For the ejidatario, all decisions are economic endeavors. These endeavors include which crops to cultivate, the amount of agrochemicals to apply to the land, and whether or not to invest in the correct protective equipment for chemical application. With the desire to stretch the land to its limits for the accumulation of profit, any ecological and safety concerns are forgotten.

The future of farming in the Ejido Gildardo Magaña is very uncertain as the dialectics between issues, directives, and competing ideas are causing shifts in supply and demand of sugar cane. In the midst of this uncertainty, the fate of the environment is unknown due to the lack of any coordinated effort to find or develop sustainable farming practices.
Introduction:

Environmental degradation in the Mexican agricultural sector is blamed in part for the agricultural woes facing the small holding agricultural sector, particularly the ejido (Barkin 1990, Cross and Sandos 1981, Simon 1997). In addition, there are numerous studies highlighting the deterioration of the environment in Mexico and the agricultural basis for this destruction. There are few studies, however, that systematically seek to understand the problem as the ejidatario (who has been blamed for his/her share of the problems), understands it, and to seek answers that would help the ejidatario. The focus of these studies has always been on changes needed within the national governmental. Discussion on institutional changes is urgently necessary, but the issue cannot be examined without assessing the process from the bottom up, from the ejidatario to government agencies. The importance of doing so becomes evident when one considers that to spur change it must include the layman and to be effective it must consider the ejidatario. More so, global changes (expansion of markets, policy, ideas, etc.) of late have exacerbated transitions from traditional practice to new techniques.

The ecological neglect and general lack of foresight permeate both the national government and local conscious. Whether it is simply collective indifference or ignorance continues to be debated, though a pervasive neglect of environmentally related debate again pervades all decision making. Barkin (1990:40) claimed that, “Even within the country, commercial and citizen participation in garbage disposal and recycling are virtually forbidden topics”. While progress has been made since this staunch conclusion, reform efforts in these areas continue to confront vested political and economic interests controlling these processes.

There has been a seeming systematic neglect of the countryside in Los Angeles. While the environment has been mentioned as both a reason for their success or failure, there is a lack of knowledge regarding the integration of ecological issues into the campesinos’ farming practices. In addition, little is known about their awareness of these issues and their view concerning the environment and the causes and solutions to its degradation. There have been no analyses made of the land regarding its fertility, agrochemicals best suited for each different soil type, water quality, and erosion. More so, in a zone dominated by sugar cane, the sugar mill dictates the varieties of cane to be grown, limits the range of agrochemicals available for use, and dictates the date when the crop is harvested. Solely demanding the use of distinct varieties of cane and types of agrochemicals to be used in production may pay off in the short term, but it is not suitable to sustain the long term productivity of the land.

The privatization of the sugar mills (1988-1992) and an economy that is driven by export provides an opportunity to capitalize on the diversity of reactions and approaches among ejidatarios (some are changing cropping strategies and some are renting their land). I attempt to furnish a sense of the cultural conservation understanding in a Mexican ejido utilizing a qualitative approach. This approach ensures an overview of the diversity of environmental attitudes among ejidatarios that has traditionally essentialized them into a “typical” ejidatario.

Ejidatarios have the same needs as all farmers regarding advice on sustainable practices, new products, available markets for the sale of their harvest, and on reliable sources of credit and inputs. However, they are limited in the information encountered while seeking to implement new technology (be it varieties of seeds, agrochemicals, or farming practices) and by the constraints and desires of each separate interests (e.g. agrochemical engineers or wholesalers, sugar mill agronomists or field technicians, foreign fruit companies). If the national structure does not support an ejidatario’s efforts to solicit information, the ejidatario is left with nothing. The time is ripe for an analysis of the cause of this degradation, the actual degree of destruction, and strides undertaken to improve conservation practices. The ejidatarios’ knowledge and perception provides the basis upon which to construct the analysis. The degradation has been exacerbated by the constant desire to produce more at all costs, to combat resistant plagues with more frequent application of stronger chemicals, and by the privatization of the sugar mills.
Once the main source of income for the ejidatario, they are now turning to export-driven production in an attempt to maximize profit, unknowingly squeezing the land to its limit, as privatized mills\(^1\) offer less economic support.

The function of agricultural technology and consideration of environmental factors is of utter importance as the global economy is consolidating and basic grain production is replaced by higher-profit, luxury produce. Though capitalist-inspired enterprise has been existent in the countryside since the time of Porfiriato Diaz it has been stimulated in the last ten years with the introduction of liberal free-trade agreements. The result has been agriculture in transition, where the dilemmas between agriculture, technology, and the environment run rampant.

Recently the San Sebastián zone\(^2\) has experienced an influx of foreign fruit companies. The temperate climate in this zone is suitable for the growth of virtually any crop, though because of the incentive offered by these companies this has been defined by international consumption standards rather than national market trends. The zone has always been a major producer of avocado for the national market, but with the opening of the foreign market under NAFTA, it has become the prime export from this region. Within the last few years other crop alternatives such as blackberries, raspberries, strawberries, and peaches have also been introduced, as has the option for one to rent or even sell their land. With the introduction of multinationals and new cultivation options, foreign influence and ideas are soon to follow.

Research Purposes and Rationale

The expansion of information pathways is producing an environment in transition dependent upon the availability of and access to such information. Ecological concerns play a more fundamental role in agriculture and are often shaped by both history and immediacy. It is the ecosystem which is the final determinate of practice because everything agricultural - from which crops can be planted, when they can be planted and harvested, to providing the crops with nutrients - is affected by ecology. Thus, the interaction between the campesinos’ access to information, development of knowledge, and actual implementation of particular approaches is essential in fomenting change, to building a more environmentally conscious atmosphere allowing for sustainable agricultural management practices.

Inputs in the form of agrochemicals make up the focus of this study. Fertilizers, herbicides, and pesticides provide the opportunity to explore availability, access, and environmental damage. The introduction of organic fertilizers and biological pest management control are now providing alternatives to dependence on chemicals. Changing varieties of seed and farming strategies (e.g. rotation of plots and crops, diversification of cultivation, and renting of the parcel) are also new forms of technology with a direct impact on the environment. The traditional practice of working the land with livestock has gradually been replaced by mechanization. However, the degree to which each farmer is able to utilize equipment including trucks, tractors, cargadores (for picking up cut sugarcane), and cosechadores (harvesters) depends on access, credit, and desire. It is these technologies that benefit or exhaust the environment. Observations on changing air and water quality and quantity, nutrient loss from the soil, vegetation alterations, climatic transformations, and a brief historical sketch provide the basis from which to evaluate awareness.

History

A vast knowledge and deep tie to the land was developed during the time of the ancient Mesoamerican cultures. The land was given the utmost respect because of its importance for survival. Culture’s very survival depended upon the land. The Aztecs engineered the world’s

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1 In its implementation of neoliberal policies, the government privatized sugar mills from 1988-92.
2 Los Ángeles lies in the heart of the San Sebastián sugar cane zone, encompassing the municipalities of Periban and Los Reyes in western Michoacan.
most productive form of farming during their time, creating floating gardens (*chinampas*) using drudged mud from the bottom of Lake Texcoco. These artificial fields were astonishingly productive as water steadily seeped up through the bed, allowing plants to germinate year-round and producing nearly 100 million pounds of *maíz* annually. Soon after the city of Tenochtitlán began to expand, an aqueduct was built to transport fresh water down the mountains. In addition, fecal matter from outhouses placed on each block was drained into canoes and hauled to both the *chinampas* and to irrigated fields along the shores of the lake for use as fertilizer (Simon 1997). Unfortunately, the conquest destroyed much of the ancient tie to the land and their ecologically sustainable practices. The introduction of European techniques (monocrop production, introduction of draft animals, the hacienda system, etc.) began the long process of agricultural change and environmental destruction which has led to many of the agrarian problems of the last century.

The first years of this century saw a reformist movement seek changes to the agrarian structure of the society. The national government, however, staunchly opposed these efforts and was unwilling to break interests with the elite. It was in this atmosphere that Emilio Zapata and Pancho Villa set about to arouse the peasants' ambition. Though Zapata was not alive to see his dream of constitutionalizing agrarian reform, President Carranza nonetheless signed the liberal constitution in 1917. Article 27 of this constitution declared:

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Ownership of the lands and water within the boundaries of the national territory is vested originally in the Nation, which has had, and has, the right to transmit thereof to private persons, thereby constituting private property … The nation shall at all times have the right to impose on private property such limitation as the public interest may demand, as well as the right to regulate the utilization of natural resources which are susceptible to appropriation, in order to conserve them and to ensure a more equitable distribution of wealth.
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Under this designation, land titles were granted directly to communities in collective holdings known as ejidos. Individuals receiving a plot had the right to farm the land and leave it as inheritance, but they could not mortgage, sell, or rent the land. Because of political and bureaucratic structures opposing the plight of the peasant, the process of actual land distribution did not begin in earnest until the mid-1930s with the presidency of Lázaro Cárdenas. While the reform sought redistribution of prime hacienda lands, Joel Simon contends that “the vast majority of the land distributed was not pieces of haciendas, but small plots of marginal land not even suitable for farming” (Simon 1997:41). Judith Adler Hellman, however, claims that the distributed land was some of the best in the country (Hellman 1994). In any case, the haciendas generally found loopholes to avoid redistribution of their lands. They were allowed by law to retain 200 hectares of farmland in addition to 500 hectares of grazing land. Cárdenas set up institutions designed to support the land reform program and aid the new land recipients in their struggle to break the old patterns of dependency on large land owners. He organized the ejidatarios into the National Confederation of Peasants (CNC) through which they could turn to him with problems. However, it soon became evident that the institutions themselves were no more than a device for subduing the masses; the solution was to distribute land with little attention given to infrastructure or technology.

The agrarian reform was intended only as a means of fomenting the country’s industrial development. By the 1950s, one of the world’s great rural to urban movements was under way. The major impetus for this migration was not industrial, but rather the inability to obtain land and

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3 The excerpt from Article 27 of the 1917 Constitution is taken from Joel Simon’s *Endangered Mexico* (1997) which offers an insightful synopsis of the present environmental problems facing Mexico through reconstructing the practices of the past.
the rapid deterioration of distributed lands. This deterioration was caused by intensive
cultivation, a growing dependence on fertilizers, and a lack of sustainable practices (Simon
1997).

While the movement to the city had begun, the nation was hoping to thwart this migration
through technological advances intended to raise production levels. This would be achieved by
providing depleted soil with artificial nutrients. This Green Revolution was considered a time of
hope and seeming prosperity, when Mexico’s future of self-sufficiency seemed a foregone
conclusion. Government expenditures on irrigation, research, and extension multiplied.

The spawning of the Green Revolution has its roots in the development of agrochemicals.
In Switzerland, Ciba-Geigy developed a chemical, DDT, which practically exterminated insect
pests. Parathion, another powerful insecticide helping spur the Revolution, was developed as a
nerve gas during World War II (Simon 1997, Wright 1990). However, it was the initiation of a
joint United States-Mexico technical program, funded by the Rockefeller Foundation, which
specifically impelled the Revolution. This came about after a visit to Mexico by the United States
Vice-President Henry C. Wallace where he observed that Mexico’s salvation lay in improving its
agriculture. Cross and Sandos (1981:17) mention “The stated purpose of the cooperative effort
was to increase crop yields by developing new seed strains, improving soil by using fertilizers,
and controlling insects and disease. The Mexican government was to back the joint endeavor
by providing the necessary rural infrastructure; irrigation projects, transportation improvements,
and capital”. Officials began touting chemical fertilizers as the means to end rural poverty,
though they did not have knowledge concerning the impact of these new chemicals on the
environment or on people. Nobel Peace Prize winner Norman Borlaug spurred the use of the
high-yielding varieties of maize and wheat with his research in Chapingo, Mexico – this was
perhaps the single most important development spurring the revolution. These high-yield,
disease-resistant “miracle seeds” provided many Mexican farmers with the means to increase
production. However, this increased production also necessitated the use of fertilizers and
sufficient irrigation4. It has now become evident that the agrochemicals introduced during this
time are perhaps the single greatest contributor to contamination of the land and water in
Mexico.

Many other advances came forth during the revolution including improved farm
management, increased education, and mechanization. Not coincidentally, those receiving the
education, expertise, seeds, and support were primarily the large land owners whom the
government believed were capable of producing the nation’s food. The Mexican government
even complemented these developments by supplying large amounts of agricultural credit,
initiating massive irrigation projects, and improving the transportation infrastructure – providing
inaccessible areas with links to the national market (Cross and Sandos 1981, Wright 1990).
Again, all measures taken were to increase production at all costs – without an ecological plan to
deal with destruction and contamination.

The years following the Green Revolution saw another revolution of sorts brought about by the
discovery of oil deposits off the coast of Tabasco and Chiapas. These deposits were said to be
larger than those along the North Slope in Alaska. However, while the Mexican Miracle (as it
has been termed) led to a drastic improvement of living for some it had little effect on the lives of
the peasantry. Again, it failed to lead to broad-based, evenly-distributed improvements.

The economic crisis of 1982, spurred by the fall of oil prices after Mexico refused to join
OPEC, left Mexico to its own impetus. The overnight crash in oil prices hit Mexico especially
hard as the government had been making expensive improvements and investments in the
country with money loaned by foreign banks. The devastating impact of the ensuing debt crisis

4 Additionally, the seed varieties have in fact decreased the genetic pool of the seed, making the crop more susceptible to
plagues and extinction, while some seed varieties, because of their modification, do not themselves reproduce – thus requiring
purchase of new seed yearly
and the structural adjustment policies proposed by the International Monetary Fund (IMF) and the World Bank to ‘rescue’ Mexico were a drastic change from the luxuries of the “Miracle” just years before – terming the 1980s ‘the lost decade’.

The structural adjustment package, with its emphasis on opening up the domestic economy to international competition, began to squeeze even tighter the small-sized and medium-sized farm sector in Mexico. This consolidation occurred as a result of the Mexican government opting for strong trade liberalization and reduced protection for national producers – an adoption of the neoliberalist policy. It involved a shift from inward-oriented development strategies promoting national self-sufficiency to outward-oriented free trade aimed at integration into the world market. Phillips explains the appeal and failure of neoliberalism as: “its emphasis on individual autonomy, flexibility, and choice within the general context of protecting law and order, private property, and family life…. To treat neoliberalism only as capitalist ideology would discount the extent to which much of the population is concerned about these issues…. However, when there remains a gap between the rhetoric about such concerns and the programs in place to do something about them, the hegemonic potential of the project is clearly compromised” (Phillips 1998:xvii). For many reasons the experiment with neoliberalism, just as with other policies, benefited the large land owners and failed the peasantry.

The demise of the ejido continued as private interests again took center-stage during the López Portillo administration. Portillo removed virtually all remaining restrictions on the concentration of agricultural land in the hands of the large-landowner with the introduction of the Law for Agricultural and Livestock Production. The presidency of López Portillo emphasized “incentives to private investors, particularly foreign capital … transnational corporations already active in Mexico (Anderson-Clayton, Birds Eye, Campbell’s, Carnation, Del Monte, Nestle, Ralston-Purina, and United Brands) were urged to expand their operations, so that eventually every stage of food production from cultivation to processing, distribution, and marketing came increasingly under the control of these giants” (Hellman 1994:124).

In 1992, President Salinas de Gortari introduced a proposal to amend Article 27, legalizing the privatization of ejidal land (and thus the sale or rental), thus ending the constitutional obligation to distribute land to qualified peasants – ending agrarian reform. The liberal amendment permits both foreigners and corporations to buy land in Mexico. The passing of NAFTA in 1994 and subsequent free-trade arrangements, for better or worse, have continued to open Mexico to the world market. No longer is there talk of self-sufficiency, but of export production and raising luxury produce bound for sale overseas (Cruz García 2003, Rodriguez 2004, Ulterras 2004). The difference in technological and governmental aid to the large and small owners has driven many to find other strategies for survival, including becoming laborers on their own land (Hellman 1994) and selling petty merchandise. Prior to the changes, the ejidatarios did not have to pay taxes on their land. Now, they too must pay the IVA tax.

The ejido dotación of Gildardo Magaña was solicited in 1930 and granted in 1934. This region was formed from old hacienda lands. The general consensus is that there was no fighting and that the land was handed over peacefully. Some of the ejidatarios even claim that the hacienda owner willingly gave the land, stating that the land is for those who work it. The actual community of Los Angeles has a different history. Prior to the eruption of Volcán Paracutín in 1943, the pueblo of Los Angeles viejo had formed in a location one kilometer from the present Los Angeles. No one could work the land, however, due to the Cristero Revolt (a bloody struggle between the conservative Church and agrarian-oriented interests) lingering on. People were brought in from outside of the region to fill the ejido’s parcels. Then, as earthquakes became strong with the eruption of Volcan Paracutin, water from a nearby river flooded the village. Thus, the people were displaced and relocated to the present day community of Los Angeles where the ejidal land had already been parceled. Originally the ejido consisted of 106 members, though after obtaining another sum of land (the ampliacin) in 1987,
it now consists of 138 ejidatarios. The association was run communally until 1948, and had been run throughout its existence (until recently) by a cacique controlling the affairs of the ejido. The ejido negotiated in cohorts with the sugar mill to their benefit and allegedly did away with those who opposed them. The ejido had seen divisions form as a result of this undermining, though they are now attempting to reconcile and unite.

Initially, the area primarily cultivated rice and maíz. Sugar cane has been prevalent in the area since the 1600s. For the first years of its existence, the ejido of Gildardo Magaña was primarily concerned with raising livestock and rice. Then in about 1950, the ejidatarios began to switch to sugar cane cultivation. The region has had trapiches producing sugar (in the form of piloncillo) since the time of the introduction of cane to the region. The first sugar mill was established in 1937 when the San Sebastián trapiche was converted to an ingenio (sugar mill). After a rough start, including near bankruptcy and closing after the ash fall from Paracutín, the sugar cane became the main crop cultivated in the ejido in 1947.

Cane production was one of the largest employers in the campo up until the late 1980s. In 1980 President Miguel de la Madrid initiated the food system SAM (Sistema Alimentarla Mexicana) obligating the sugar cane mills to produce at any cost. This led to the production of poor quality sugar as the ingenios struggled to fulfill the demands of SAM. However, with the oil crisis and economic downfall soon thereafter, Mexico was left with little option but to follow the sanctions set forth by the World Bank and IMF. At that time, President Salinas de Gortari decided to privatize the sugar mills, selling them to entrepreneurs seeking quick profits, with little knowledge of the sugar industry. This changed the relationship of cañeros to sugar mills. Cañeros were accustomed to government support, credit, and decent profits. In the early 1990s, however, Mexico was importing so much sugar that it devastated the Mexican sugar industry because the importation of fructose under NAFTA was a cheap alternative to the sucrose produced by sugar cane. With declining earnings, cañeros have begun to abandon cane, shifting to new productive technologies (avocado, blackberry, agave, etc.) or resorting to renting and selling their land. The decline in the sugar cane industry and the introduction of export produce to the region resulted in the closing of the San Sebastián sugar mill in 2002. Sugar production is now centered in the Santa Clara sugar mill, eight kilometers away by road. However, the continual decline of profits earned from the production of sugar cane continue to bring changes as more and more land is converted to the production of alternative crops. The new crops provide options to those fed up with insufficient credit, rising costs, and declining profits from cane production. Between 1991 and 2001 alone, 900 hectares of cane was redirected toward the production of alternative crops in the San Sebastian region (Ricardo Salazar García interview, Confederación Nacional de Productores Rurales, Feb 12, 2004).

Theoretical Framework

Cross and Sandos (1981) claim that because the ejidatarios are frequently indebted to credit institutions or those companies (export companies, sugar mills, etc).buying their harvest, they become caught up in a dependency cycle which continually depletes the land and their earnings, eventually forcing a change back to basic grain production. However, they fail to recognize that the ejidatarios cannot return to basic food production because of the loss of soil fertility caused by synthetic fertilizers; thus, the ejidatario is destined to the continued use of agrochemicals and a cycle of indebtedness. The dependency continues as the ejidatario must look for alternative production strategies or work in order to make money. In Los Angeles the production alternatives, while all requiring heavier agrochemical application, provide the possibility of turning a greater profit.

The theory of comparative advantage, once the prominent theory for expressing Latin America’s situation, predicted that farmers would convert their resources to the production of
more profitable crops for which their geographical region was particularly well-suited, or use more productive technologies to produce traditional foods. Many studies (Schultz 1964; DeWalt 1979; Eicher and Staatz 1984) have documented the rapidity and creativity with which rural communities adopt new crops and technologies when the evaluation of the risks and benefits is economically favorable. Again, environmental risks and benefits are negated to a subordinate, if not non-existent role. Stavenhagen (1970) asserts that the majority of Mexico’s small producers cannot even participate in this process of productive transformation due to a lack of access to machinery and agrochemicals and to inadequate prices for their products. Now that these changes are coming about – a necessary reliance on agrochemicals (in the face of deteriorating land), an influx of technology riding the influx of foreign produce companies, and the ability to turn a greater profit – it is possible that a better understanding and care for the land will also accompany these changes. The conditions of the past, exacerbated by the lack of local environmental conservation knowledge are now undergoing a period of rapid change.

An economic explanation for this basis must be explored to understand the market conditions creating the situation today. Agricultural development itself proceeds through a complex interaction of market pressures and government policy. Through the pricing system, the market guides producers toward the most profitable crops. National economic policy rearranges market priorities by modifying prices and profit rates in different activities; historically, governments have accorded priority to industrialization and export. In this environment, basic foods producers are at a decided disadvantage as technology and politics combine with market forces to privilege commercial farmers (Barkin 1990:12). The introduction of NAFTA in 1994 opened the Mexican market to an even greater extent, providing easier access to export markets. Historically, the poor farmers have been left to their own creative ability, though the free-trade agreements are now providing access to these markets. According to Martin (1993), the situation prior to the trade agreements saw the horticultural exporters importing a substantial portion of their inputs such as fertilizer, boxes, seeds, transplants, equipment, plastic and chemicals, and paying Mexican import duties of from 10 to 20 percent. Now that the deterrent of tariffs is no longer an obstacle the expansion of the market continues, though it is yet to be seen whether these companies will help solve some of Mexico’s rural agricultural and environmental woes or whether they will add to them, taking their profit and running as the land gives out.

The political economy provides a platform from which to evaluate the plight of the ejidatario. While these profit-driven enterprises (multinational corporations) are partly to blame, it is apparent that there is a general lack of organization and a collective indifference that has historical roots. The national organization, or lack thereof, has contributed significantly to the deterioration of the environment through years of corruption by those wishing to pad their own pockets and the lack of an infrastructure able and willing to support the concerns of the masses. This continual negligence - the failure to follow through with promises (by leaders on all levels) – has led to a collective faithlessness and indifference. A vision of a better future is impossible when the masses have had to rely on the government for their very survival, and time and again they have been abandoned.

In order to initiate change, a consciousness must form and the flow of information through communication must occur. Cross and Sandos (1981) contend that the limited use of new seed strains was directly related to greater problems in the general circulation of information. This is exacerbated by the government’s lack of concern for extension programs to promote new techniques and give advice. While the lack of extension has caused the ejidatario to suffer accordingly, an investigation into the network of exchange need be undertaken. The movement of information can take many pathways. One way change has been brought about without institutional assistance is exemplified by the adaptation of sorghum from the United States as studied by Barkin (1990). The dissemination of information from foreign to large-scale and on down to small-scale farmers describes one possible route. Through exchange such as this,
information circulates throughout the nation. Through the cane unions, ejido meetings, export companies, agronomists, field technicians from the sugar mills and the like, new ideas and practices are continually being communicated. The expansion of mass media is transmitting outside ideas and consumption patterns to the rural populous on a grand scale. The immersion into strict capitalism has brought drastic changes to the life of rural Mexico. The rural population is becoming more dependent on consumer goods and even foods supplied through the national market rather than on local produce. The desire for material goods (those prevalent on television, in the metropolitan areas, and across the border) are becoming necessities as the influx of foreign ideas increases. More so, migration – prevalent in rural Michoacán\textsuperscript{5} – is another source for the transmission of ideas and of new behavior patterns (Economic Commission for Latin America 1970). Sadly, the development of institutions promoting ecological use of the land have been slow to develop in Mexico, and the distribution of conservation oriented information has been neglected.

Literature Review

Esteva (1983) claims that the struggle for the ejidatario to simply subsist is the reason they cannot be worried about the environment. Barkin (1990:50) alleges there exists, “a pervasive attitude that the area outside one’s own home is the responsibility of the government. Willingness to deal with littering and public cleanliness in general …is stymied not so much by ignorance as by a lack of resources and by collective indifference”. While a pervasive collective indifference is apparent, it is the result of ignorance spread through lack of ecological education issues. Other researchers (Simon 1997, Weir 1987) also view the reason for environmental and safety neglect as the fault of education as chronicled in Wright’s \textit{The Death of Ramón González: The Modern Agricultural Dilemma} (1990)\textsuperscript{6}.

In the early 1980s the struggle in the Lacandon Jungle area of Tabasco brought together both realities of the current situation (Harvey 1993, Simon 1997). Communities petitioning the government for the formation of 26 ejidos for subsistence grain production were ignored to the benefit of wealthy ranch owners who owned vast stretches of this land. After some time, the campesinos took action and began destroying the forest and taking land to create plots for themselves. Even the state governor, Absalon Castellanos Domínguez, staunchly fought against their tenure as he too had personal interest in the timber industry. The destruction led to ecological damage and outcry for government intervention to protect the forest resources. Finally in 1989, with pressure from environmental and development groups, President Salinas de Gortari gave land title to these ejidos, supposedly saving future destruction of the forest – though irreversible devastation had already been done. Unfortunately this is not a unique case of deforestation but a practice fairly common in many parts of Mexico where depleted land is driving many to destroy forest resources to obtain land. In Michoacán alone, deforestation during the past 30 years has resulted in the lost of over 50 percent of the forest resources. This loss includes the disappearance of hundreds plant and animal species; interestingly 80\% of the forest land is owned communally or by ejidos (Elorriaga 2002).

The introduction of fertilizers is viewed by some as yet another testament of the failure of the system, leading to increased destruction of the soil, flora, fauna, and climate. Joel Simon presents an example from San Juan Mixtepec, Morelos where, “sometime between 1975 and 1978 the Green Revolution arrived …Government officials triumphantly donated several bags of chemical fertilizers to each farmer in town. Then people began to notice something strange. Three years after they first began to use fertilizers, corn yields had dropped to their original levels. Not only that, if farmers did not add fertilizers, the corn would not grow at all. By the

\textsuperscript{5} Michoacan is consistently one of the largest providers by state of migrant workers to the US.

\textsuperscript{6} See \textit{The Death of Ramon Gonzalez: The Modern Agricultural Dilemma} (Wright, Angus. 1990. Austin: University of Texas Press) for health and environmental devastation caused by a lack of education and training in the use of agrochemicals.
early 1980s with their debt continuing to grow the people of San Juan Mixtepec were caught up in a cycle of dependence" (Simon 1997:37).

Initially, the Green Revolution brought to some modern technology that resulted in higher yields. Production yields, however, eventually leveled off toward the end of the Green Revolution despite a continued increase in population. The increasing availability of government agricultural credit for wealthy farmers lowered the cost of new technologies and other inputs and facilitated the expansion of the physical productivity of the land, allowing the commercial farmers to abandon traditional use of the land to capital-intensive exploitation; “in fact, the credit to the rich probably came at the expense of financing poorer farmers” (Barkin 1990:19). In fact, it left virtually no financing for the campesinos as distribution of machinery directly reflected the distribution of credit, and ejidatarios tended to pay higher unit costs for vehicles and machines.

Toward the end of the Green Revolution, there emerged a necessity to use fertilizer that was promoted by agro industry and government alike. This led to reliance on and overuse of fertilizers and led many to abandon their parcels and migrate, plunder forest resources to clear new farm land, or continue to build debt while yields dwindled. Now, Joel Simon (1997) argues that the productivity continues to decrease even with the use of more chemicals. It “has spawned more intensive uses of the land, from logging to over farming … Michoacán, Hidalgo, and Jalisco are some of the country’s most eroded regions and the source of the bulk of migrants to the United States” (Simon 1997:36).

Most technical observers acknowledge that a great many of these farmers could substantially raise output by modifying present cultural practices, using measured amounts of fertilizer, and incorporating more conservation friendly practices to ensure sustainable production. Redclift (1983) and Felstehausen and Diaz-Cisneros (1985) argue that such changes are unlikely, however, without changes in macroeconomic policies to improve the relative profitability of these crops, and provide sufficient credit and living costs during the growing season, as is done in commercial agriculture.

With regard to the environmental consciousness that has for so long been nonexistent in Mexico, changes are now occurring slowly and without much assistance from the government. While the government has funded some restoration projects, these too have suffered setbacks of the kinds associated with poorly designed and rushed projects. In the Lake Patzcuaro region of Michoacán, concern about the dumping of raw sewage and the erosion of vast volumes of topsoil into the nearby lake has led to the search for corrective programs. One program undertaken in 1983 involved the planting of peach trees in a large terraced area. As the trees matured however, it became evident that they were inappropriate for the wind patterns coming off of the lake causing the fruit to mature incorrectly. Of even greater concern was the magnitude of the failed erosion control problem. All of this led to greater disillusionment toward government-sponsored projects from environmental groups involved in the project (Barkin 1990). The lack of governmental support, education, and effort has resulted in hastily put together programs. The climate, soil, water, flora, and fauna are all affected by farming practices and also determine the success of farming practices. Thus, just as the Aztecs worked with the land to ensure their longevity and success by building around an environmentally friendly agricultural system, it is becoming more and more evident that the environment cannot be forsaken.

The creation of irrigation systems to distribute water has too been a source of political and social strife throughout recent history. The deterioration of these systems, negligence, contamination and overuse, is leading to water loss and costly repairs. This illustrates an important dimension of responsibility which is often overlooked, one which the campesinos welcome and heartily accept government aid and support, but once received the aid is often abused, not considering the long-term effects, costs, or upkeep of the canals. Another common occurrence, especially in the sugar sector, is the burning of cane fields in the local rural community. Hazardous fumes are sent into the atmosphere, likely wreaking havoc on air quality.
and health of the people in an attempt to reduce waste from the cane plants. In addition, the distribution of vast amounts of soot into the air by sugar mills during the daily operation of extracting sugar occurs with little air quality regulation.

Research Methods

The ejidatarios offer an interesting medium from which to view the struggles of a small-holding farmer to change production strategies in the face of the sugar mill closing. A census (A17) of the Gildardo Magana ejido7, conducted as part of the Field School project, provided a sample from which to draw participants. Due to time constraints, work schedules, willingness, and convenience, the selection of twenty three ejidatarios represented half the possible sample. Expert advice was obtained from three agronomists working for agrochemical stores8, an agronomist and former Sanidad Vegetal employee9, a fruit company representative10, representatives from the CNPR (Confederación Nacional de Productores Rurales) and the CNC (Confederación Nacional de Cañeros) sugar cane unions11, and a doctor at the rural clinic in Los Angeles12. The information gathered from these experts was analyzed to understand the knowledge pool each group possesses regarding safety and environmental issues, the resources available, and how or if this information is transmitted between groups.

The structured interview (A18) consisted of three groupings of questions, targeting knowledge and availability of technological resources, environmental awareness, and the source of their information. At the same time, participant13 and simple observation14 provided a basis from which to evaluate the solicited information. Working alongside the ejidatarios in the field proved an invaluable source of information. The field is the setting in which they are most comfortable and where they openly shared their knowledge and demonstrated their actual practice. While particular parallels and disparities between ejidatarios’ understanding became apparent as analytical conclusions were drawn, integrity was maintained by examining each individual’s answers. To ensure validity, the outcome was presented for scrutiny before an assembly of ejidatarios and community members15, also allowing the ejidatarios an understanding of how their own knowledge and practices are shaped.

Findings

Gildardo Magaña is an aging ejido with an average age of 65.4 years and whose extensive farming experience is 52 years (A2). From the survey sample, it was found that the ejidatarios are in possession of an average of 6.5 hectares even though seven ejidatarios owned four hectares or less (A2). In addition, the survey revealed that the ejidatarios have had about

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7 provided by a list of ejidarios obtained from the Secretary of Ejido Gildardo Magaña, Abdón Cartagena Alvarado
9 Ing. Ernesto Castaneda formerly an employee of Sanidad Vegetal (the sanitation body of the Agricultural Secretary in charge of controlling agrochemical use on export produce) was interviewed on April 25, 2004.
10 Aldo Mares, an administrator at Hurst’s Berry Farm – a California-based transnational exporting blackberries, raspberries, strawberries, and blueberries – was interviewed April 16, 2004.
11 Ricardo Salazar Garcia, Acesor Tecnico, of the CNPR was interviewed on three separate occasions – February 12, 2004; March 17, 2004 by Donna Chollett; and April 1, 2004. Adán Valentín Velázquez, a representative for the CNC, was interviewed March 21, 2004; and April 19, 2004 by Donna Chollett.
12 Dr. Edith Campos Cerdova of the Los Angeles health clinic was interviewed April 22, 2004.
13 Participant observation consisted of picking blackberries three different occasions for two different ejidatarios.
14 Simple observation occurred throughout the course of the field school through short visits to the campo to watch the harvesting of sugar cane, burning of the fields, planting of the fields, harvesting of export produce, and the like.
15 A presentation was given at the Casa Agraria (ejido building) in Los Angeles, Michoacan on 5/1/04 followed by a discussion of the outcome and opinions from the community members attending.
three years of formal schooling though aging members tend to have many fewer years while younger members account for the vast majority of education due to the recent rise in educational opportunities in rural Mexico. Forty percent of the ejidatarios lacked any education (A1). While other regions are geographically isolated from international market routes, the proximity to Guadalajara (2.5 hours by truck) has encouraged expansion in this region. These markets, however, have promoted expansion and increased use of agrochemicals which proves contradictory to efforts required to preserve the environment. The uncontrolled use of agrochemicals\textsuperscript{16} has led to visible ecological destruction and health-related illnesses due to lack of information concerning procedures for their safe application.

The overuse and incorrect application of chemicals has been a persistent problem since their introduction. It is partly for this reason that plagues have built up resistance with great speed. Plagues typically build up resistances with greater concentrations in the environment thus inducing the need for either greater application or for more potent chemicals. Ricardo Salazar (Interview: 4/1/04) believes that the rancher generally chooses to apply increasing amount of chemicals; this opinion was also shared by the agronomists surveyed in this study. These higher applications have led to greater resistance of pests and the creation of a vicious and costly cycle. The higher application rates of fertilizer are also ‘tiring’ the earth as the fertilizer becomes ineffective because of the ‘burning’ from over use. Thus, the application of fertilizer becomes tied up in the same vicious cycle where more is required, in turn burning the soil, creating the need for the use of even more fertilizer. The majority of ejidatarios have a mentality that insufficient fertilizer is one reason for their production woes, that having monetary resources to access fertilizer would solve many of their problems. Joel Simon suggests this will only continue the cycle, feeding the need for increasing quantities until the land finally gives out (1997). The ejidatario then, is not able to grow without fertilizer and as the need increases from the nutrient loss in the soil the costs increase and the ejidatario is tied to paying rising costs for fertilizer.

Herbicide use in the sugar cane is a common practice (A6), though it is often combined with cutting the zacate (weeds) by hand (A8). All zacate was cut by hand until twenty-five years ago when herbicides were introduced in the region. One cañero stated that he would like to go back to cutting zacate by hand because of the danger posed by herbicides but cannot afford to hire the peones (workers). The application of herbicides is exceedingly prevalent in sugar cane, while use of insecticides is much greater in fruit production due to vulnerability (A6). Insecticides used in the blackberry, which was grown by three of the twenty six ejidatarios surveyed, includes an assortment of products: Gusation, Gesapax, Marathon, Captan 50, Benlate, Chanuro, Faena, Bermilique, Karmex, Gramazon, and Gramocil –many of them double as an herbicide and an insecticide. The same fertilizers are commonly used in both fruit and cane production, though avocado and peach producers (there were six avocado and two peach producers in the sample) are using organic fertilizer. Gallinata (a mix of fish parts, excrement, and mulch) is becoming a more commonly used product due to its low cost noted three ejidatarios. Agronomists noted that it is becoming more accepted because of the desire of the European food market for organically grown produce, and the need for more sustainable practices. Evidence is vague concerning the number of growers turning to organic fertilizers. One agronomist claimed that 10-15 percent of avocado producers use organic fertilizers (Interview: José Angel Bentancort, Fertimiculo, 2004)

\textsuperscript{16} The application of chemicals (A6) represents a portion of the usage by the ejidatarios because not all could recall the names of all the products used, nor were all willing to disclose all the chemicals applied. Nevertheless, the sample provided sufficient data from which to draw conclusions, to discover similarities and differences between the applications by individual ejidatarios. Firstly, something must be said of the state of information transmission when ejidatarios cannot so much as name the chemicals they are applying.
while another agronomist concluded that less than one percent use these same fertilizers (Interview: José Rosario Caballero Arroyo, Agroquimicos Chapingo, 2004).

In pursuing questions of agrochemical safety it became evident that a neglect of safety information exists as many ejidatarios were not aware of the dangers posed by use (A6). A gross negligence on behalf of the government is at least partially to blame as safety education has been brushed aside in favor of international profit-driven directives. A lack of institutional organization stymies any reform efforts. An elder ejidatario, experience showing in every wrinkle on his worn face, believes that “campesinos no nos usamos productos muy fuertes porque son peligrosos” (“campesinos don't use strong products because they are dangerous’); emphasizing that they (the mill) wouldn’t allow campesinos to use strong/unsafe products. This sentiment was even expressed by two of the four agronomists, José Angel Bentancort (Interview: 2004) of Fertimiculo Agrochemicals and Javier Guerrero (Interview: 2004) of Chapingo Agrochemicals. Interestingly, 25 percent of ejidararios believed all pesticides pose a danger while 17 percent claimed that none of the pesticides, including Parathion, pose a danger while 17 percent claimed that none of the pesticides, including Parathion, pose a danger to humans.

The liberal use of Parathion (originally developed as a nerve gas) by a percentage of avocado producers is cause for concern. Interestingly, Parathion is among the more than half a dozen pesticides that have been banned in the US but continue to be used in Mexico (Wright 1990). Angus Wright notes that there are two classes of pesticides, the persistent and nonpersistents. The persistents remain in the ground for years, if not generations, and were once the chemicals of choice. The nonpersistents have half-lives of hours, days, or weeks and include products such as parathion, guthion, methamidophos, malathion, aldicarb, paraquat, and endosulfan. Half of these are commonly used in the San Sebastián zone without discretion or any enforcement of safety measures. The use of persistents has been banned due to their long-term effects and chronic disease syndromes. They, however, only contain 2 to 5 percent the acute toxicity of nonpersistents such as parathion. In fact, parathion has been the main cause of agricultural poisonings in Central America. Parathion is thought to account for some 80 percent of pesticide poisonings even though it has not been restricted because of its rapid decay. Its rapid decomposition should result in little harm to the environment, although it is more acutely toxic to animals and humans (Wright 1990). Endulsulfan, another no persistent, has replaced the use of DDT according to José Rosario Caballero Arroyo, an agronomist for Chapingo Agrochemicals (Interview: 2004).

Researchers have noticed that pesticides restricted or banned in the United States have been found in surface and ground water systems in countries such as Mexico. These countries are aggressively marketed by the multinational companies as a means to recover lost profit in wealthier countries (Weir and Shapiro 1981, Bull 1982). Pesticides, which are often produced in the United States, are exported to countries like Mexico because these chemicals were no longer allowed in the United States (Weir and Shapiro 1981).

The lack of safety precautions and protection necessary for the application of many chemicals has been a source of tension between countries lax in enforcing safety standards and human rights organizations seeking to protect the people. The ejidatarios in Los Angeles are no different and are caught in the middle of this gustapox (A6). Multiple ejidatarios animated for my understanding the way in which they simply mix and apply the chemicals. For some, a bandana was placed over their mouths prior to applying the harmful chemicals with a backpack sprayer. It is doubtful that the bandana filtered the harmful aerosol as the ejidatario inhaled during the application process. One of the formally schooled ejidatario commented how one must take “mucho cuidado” (much care) when applying chemicals as it has made other campesinos sick. Another ejidatario claimed that the government had sent people to demonstrate the safe use of agrochemicals. This claim, however, could not be validated by any other ejidatarios. The doctor at Los Angeles’ clinic believes that agrochemical intoxication is a problem, but she could not validate the actual cause and effect as she doesn’t generally receive these patients as they go to
the larger clinics in Los Reyes or Periban. Nonetheless, she does receive about one case per month with ejidatarios experiencing allergic reactions or skin irritations from chemical applications (Interview: Dr. Edith Campos Cerdova, 2004).

A pattern of contradiction and lack of safety concern becomes evident when speaking to agronomists. These agronomists claimed to provide information on the safe application of pesticides to their clientele. Heeding this advice, however, is up to each ejidatario they claimed. From observations at three separate stores, however, no one I observed gave advice on the safe use and application of chemicals. One agronomist claimed that it is not the avocado and blackberry producers that are getting sick from agrochemical intoxication, only the cañeros. These people get sick because the mills agronomists do not instruct the ejidatarios on how to apply (Interview: Javier Guerrero, Agroquimicos Guerrero 2004). However, another agronomist claimed that many do get sick from the application of chemicals to avocado and blackberry. In fact, seven people had become intoxicated during a single fumigation of the blackberry the week before the interview (Interview: José Rosario Caballero Arroyo 2004). Edith Campo stated that agrochemical-related illnesses are not as prevalent in Los Angeles as in Periban because of the increased pesticide use in the avocado orchards (Interview: 2004). The lack of instruction reflects a gross negligence for safety education and general organization by industry and government. There are no regulations regarding safe chemical application on a national level. A few ejidatarios even mentioned that DDT was still available, a claim supported by an agronomist who mentioned that it isn’t difficult to obtain on the black market.

The general consensus is that the export produce requires far more chemical applications than sugar cane (though one agronomist adamantly insisted that the more harmful pesticides are used on sugar cane). Ejidatarios stated that sugar cane is a crop for “flojos” (lazies) because it requires less maintenance. Despite the fact that European food standards are forcing an increased awareness with regard to the application of chemicals, but the increased resistance of plagues is forcing heavier and more frequent applications of pesticides (every 15-20 days in the blackberry and avocado). This increased application using a diversity of products to treat the numerous plagues (in the avocado alone there are some 20, as compared with 3 plagues that regularly affect sugar cane) is of concern for both the environment and humans.

The impact of agrochemical use on the environment is leading to the deterioration of fragile land, increased ecological and economic costs, and the dependence on greater agrochemical application. Initially, I did not expect the ejidatario to comprehend the harmful impact of pesticides on the environment beyond their observed domain due to the lack of government assisted education programs. While I found this to be true for many ejidatarios, the ejidatarios linked this destruction to many factors both heard from experts and from their own experience (A16). Though many can see the damage caused by destructive practices, they continue these same practices due to economic constraints. About one-quarter of those surveyed insisted that the chemicals are having no impact on the environment. Three of those surveyed linked the contamination of water to the urban district as a result of sewage draining into the campo “estamos contaminando nosotros. Todas las aguas negras del drenaje al campo” (“we are contaminating ourselves. All the black water from the drainage to the campo”). Another ejidatario claimed that chemicals are no longer used which have contaminated irrigation canals. The overwhelming consensus from the sample (those both aware of agrochemical impact and those claiming not to be) suggests that the ejidatarios cannot determine the impact of the chemicals on the environment, but are able to identify the impact on crop production (A16 and A15). This has been exacerbated by the capitalist world (i.e. United States) where one desires to maximize profits and increase one’s wealth. This philosophy of single-minded money earning is reflected in the private enterprises selling agrochemicals and multinational companies solely concerned with profit. The deterioration of the environment is further exacerbated by the lack of organization and care on behalf of the national government. The lack of assistance, regulation,
and education are to blame for many of the woes facing the land as the interest of the
government is turned from assisting the people to assisting wealthier nations in their desire for
luxury produce.

One ejidatario, with seemingly closer ties than others to the land - noting his love of the
land throughout the interview as “the land is like my mother - it feeds me,” made a keen
observation that the chemicals have taken out the natural process of the earth which is why one
can’t grow crops anymore without chemicals. In doing so, they are contaminating both the water
and the soil. Another ejidatario mentioned that all of the animals in the water have died and that
the soil is ‘burned’. Yet, with a growing awareness of the dangers posed by agrochemical use,
there has been little effort made to introduce alternative methods or to educate people on the
safe and proper application of these dangerous chemicals. This is the result of the
government’s decision to promote agrochemical use at all costs during the Green Revolution
and their continuing belief in agrochemicals at the cost of the well-being of both humans and the
environment.

The introduction of organic fertilizer and pesticides is a phenomenon which is gaining
momentum in the San Sebastian zone. The use of more ecologically-friendly practices, while
more sustainable, have begun to be incorporated into the campesinos’ farming practices only as
far as they do not impinge on the ability to maximize profits. While the roots of an environmental
awareness have been sown, and a few ejidatarios are able to speak openly about the impact of
practices on the environment, their actual practices are limited by the use of the most cost-
effective profit-maximization strategies. The monetary cost of implementing more sustainable
(e.g. organic) practices, combined with a lower productive capacity, hinders the desire to
implement such strategies (Interview: José Rosario Caballero Arroyo, Agroquimicos Chapingo,
2004).

An interesting contradiction arises as greater profits can be gained by using alternative crops,
but more money is expended at incorrectly applying agrochemicals to these crops. More so,
usage of a greater volume of pesticide results in greater environmental damage and a vicious
cycle of chemical dependence. Not only are incorrect chemicals applied in more than
recommended dosages, but a lack of desire to find better practices seems to pervade all
decision making. This is a problem manifest at all levels of agricultural production.

Agricultural decision making is primarily an economic endeavor. From the sample survey,
the decision to or not to plant cane is strictly economic – the debate between profitability, access
to credit, and new alternatives (A19 and A5). Some of the ejidatarios have already changed
production strategies. They have selected export produce production because cane has become
unprofitable and there is no longer credit assistance. Others would like to change strategies, but
have no financial resource to make the switch to alternative crops. Yet others have chosen to
grow cane because it is profitable for them or it offers security. In fact, those with pensions and
switching to alternative production strategies have continued to maintain at least a part of the
parcel in cane as a means to receive social security (which includes medical insurance) and
their monthly pension.

While pensions at one time offered security, this is changing for those who were not
fortunate enough to obtain it before 1997. Pensions were originally given to 60-year old farmers
who had produced sugar cane for 500 weeks (10 years). Now one must be 65-year old and
have produced cane for 24 years to obtain a pension (Ricardo Salazar 2/12/04). This change
must be factored into decisions regarding the profitability and security of sugar cane. The
decision is more difficult when one considers that export companies will pay $1200/hectare per
year to rent land while the average earnings from cane are $703/hectare per year (Interview:
Ricardo Salazar 2/12/04). A continued decline in credit has led to inadequate access to fertilizer
and thus declining profits. In fact, far more ejidatarios are receiving insufficient credit (76% of
the sample) commenting that they have declining profits and increasing costs as a result of lack
of support. The sugar cane unions are trying to remedy this crisis with the help of the government and sugar mill under a fideocomiso program. Through this program, the CNC (Confederación Nacional Campesina) union is hoping to obtain credit and inputs on time. The cañeros will provide the union with four tons of cane per hectare from their harvest, valued at $135. The government and the mill will then add matching funds as a guarantee (Interview: Adán Valentin, Unión Local, CNC, 4/19/04). While the cane unions seek out assistance for the dwindling credit, the cañeros continue to feel the brunt of the sugar cane sector’s problems.

The introduction of cane varieties suited to the sugar mill’s intentions that are not necessarily suited to the land spans the debate whether cane production should be continued in the region. Ejidatarios find that the new cane varieties have a tendency to give out (decline in yield) after a few years and do not produce as well or last as long as the older varieties that are now discouraged by the mill. Yet, Ricardo Salazar (Interview: 2/12/04) of the CNPR cane union has insisted cañeros can expect yields close to 200 tons/hectare if they tend to their land, receive good advice, and apply adequate fertilizer. In a utopian world maybe, but this is inconceivable given the current circumstances and lack of consensus in attainable information. In fact, the average current yield from the sample was 93.7 tons/hectare. Adán Valentin (Interview: 4/19/04) of the CNC cane union stated that the average yield for the zone is 80 tons/hectare, though it was 125 tons/hectare before Grupo Porres took over control of the sugar mills 13 years ago (1991). An agro industry cannot work effectively if one part is neglected to hastily improve another. Money was thrown into improving the mills instead of investing in sustainable management practices that would have ensured increased production and longevity. The state of the industry is even more tenuous when one considers that the costs to produce sugar in Mexico are much higher than in other cane-producing countries. For example, the cost of production in Mexico is $30 per ton while in Brazil the cost is $15 per ton due to more advanced field technology and fewer field laborers in Brazil (Interview: Ricardo Salazar 2/12/04).

Two of the sampled ejidatarios were forced to rent their land because the costs of production exceeded revenues. Another three ejidatarios in the survey are also considering quitting the farming and renting their land. They claim to not be able to live on cane production, but they likewise cannot cultivate export produce as they are without money to invest. There is no definitive answer concerning their fate in farming. Increasing costs outside of the agricultural realm have led two ejidatarios to sell their land – one for medical expenses and another to pay for his children’s education. As the private mill owner seeks to maximize profit, the cañeros must begin to seek out alternatives or creative measures to stay in business. This will be a challenge without adequate government support, an infrastructure that lacks organization to distribute information, and a mentality that they can rely on experience for their decisions.

The dissemination of information provides a pivotal point from which to view the organization of the institutions contained within the nation. The cane growers claim there is not enough information available to make good decisions, but they are also reluctant to try new technologies (some claimed that technology has stopped changing). Their ability to make decisions concerning management practices is also hampered by the dictates of the sugar mill. This is an interesting perspective considering the plethora of changes in both living conditions and agricultural practice that have been introduced into the region within the last thirty years. For example, the community of Los Ángeles received portable water and sewage in 1974, electricity in 1978, and the first paved road was put in one year ago. In addition, pesticides, herbicides, and fertilizers were introduced during the Revolution and many now mechanically produce cane.

Half of the sampled ejidatarios are using farming practices that have been proven through trial and error over years of experience. One stated that he had never attended school, but that
the campo “fue me vida, fue mi escuela, es la escuela que tuvimos nosotros” (was my life, was my school, is the school that we have). This sentiment was expressed by a majority of the elder ejidatarios. This one ejidatario then avowed “you went to the University, but you won’t read about the experience in your textbook”. Likewise, I can never be a campesino without having grown up to be one. It is essential that the ejidatario continues to seek out options and advice to remain in business. A few of the ejidatarios claimed that the agronomist whom they sought for advice gave poor advice. This one encounter prejudiced the minds of these ejidatarios against all agronomists, believing that none know their circumstances or profession. Upon being asked why fellow ejidatarios lament this advise, one who had sought help from an agronomist stated that “dentro de la tecnologia, que no le de verguenza de acercarse al ingenio…Unos, por el machismo, eso es una gran mentira…Debemos recibir accesorias para no matar al campo” (“Within the technology, one should not be afraid to approach the sugar mill…Some [don’t], due to machismo, and that is a great lie…We should receive advice so we don’t kill the land”) – noting that the machismo mentality thwarts efforts to distribute information. The agronomists also expressed the sentiment that the campesinos do not trust their advice and would rather rely on their knowledge gained through experience. The ejidatarios are stubborn people and will not change practices unless they can actually see the benefits. As Ricardo Salazar (Interview: 4/1/04) said, there needs to be economic and effective alternatives. An interchange of ideas and sharing of effective management strategies must occur to change the mindset of the ejidatarios, but this will be a gradual process. A fellow agronomist agreed that the sharing of ideas must occur, though for whatever reason this sharing of ideas is happening at a slow pace (Interview: Ernesto Castañeda 2004).

The ability of an ejidatario to mechanize has been a battle waged since the distant past. Some regions like the San Sebastián region have chosen the path of mechanization at the expense of manual labor while other regions such as Puruarán continue with more traditional practices. San Sebastián moved from the use of oxen and cart to picking the cane with cargadores and hauling it in semi-trucks. One of the ejidatarios used the latter method during the last harvest, but others have been reluctant to use more modern methods because of rocky soil or simply having no interest. A few communities in the Santa Clara zone have harvesters (cosechadores) that cut the cane into pieces before loading. The investment in these newer technologies has cut labor costs (though in turn sending indigenous laborers in search of opportunities further north) for the ejidatarios. Now, with increasing transportation costs, they are once again facing a financial dilemma.

All the ejidatarios sampled said that the technology available is sufficient and they have adequate access to it (tractors, cargadores, and trucks) - some have even been able to invest in equipment (A7). Nine of twenty-two shared that they own at least one piece of agricultural equipment with five owning trucks or tractors, and three owning multiple pieces. While the purchase of equipment is a grand investment, two ejidatarios noted that they would like to buy equipment but can’t because of economical considerations.

This is one of many technological changes the region has seen. The future of change in the region is a source of speculation. Surprisingly, with all the technological change the elder ejidatarios have seen over the course of their lives, it is interesting that nearly half of the ejidatarios from the sample believed that there will be no technological change in the future. While one stated “estamos perfectamente bien” (“we are perfectly fine”), others argued that “el campo es muy atrasado” (“the land is very behind”). Two ejidatarios contributed this lag in adapting technology to a lack of government organization.

Not all ejidatarios are opposed to new technology or ideas. In fact, many do seek advice. One ejidatario, for example, has several engineers whom he talks with about avocado growth. Agronomists working for the blackberry companies also provide useful information to growers. One blackberry grower noted that he has learned how to apply the products from reading the
product labels. Companies that export produce have done a much better job with respect to
distributing information than their domestic counterparts, largely due to stricter foreign
regulations and enforcement governing the export of fruit.

Private companies play a fundamental role in distributing this information, as it is these
institutions which dictate the practices utilized by the ejidatario. These institutions, however, are
motivated to distribute information that will bolster production and therefore financial rewards.
Interestingly, while half of the cane growers claimed to use practices based upon experience,
the other half asserted that they will consider practices recommended by the agronomists at the
mill (A13). The mill has pasatiempos who claim to visit the ejidatario monthly, informing the
cañero of new cane varieties, inputs, and practices. Sadly, half of this group claimed that the
sugar mill is only interested in production, not in implementing sustainable management
practices. They claim that the mill neglects the ejidatarios and the land at the expense of the
environment. However, one ejidatario, with close ties to the mill, stated that the mill has
experimental plots where new cane varieties and agrochemicals are tested. More so, he
claimed that the campesinos are invited to see the plots. However, I was never able to view the
plots and could not corroborate their existence with any other ejidatario. If the campesinos are
unaware of these efforts, the mill has faulted in inviting all campesinos to view their experimental
plots. It may be that the pasatiempos of the mill give advice based upon the results obtained
from research plots, but such advice is not heeded by the ejidatarios. The sugar mill’s
agronomists must be persistent and effective in communicating technological information and
find alternative means to bring about change. Perhaps the agronomists should personally invite
each cane grower to observe the experimental plots as well as ensure that each grower receives
information that highlighting the results from the experimental trials. The ejidatario who claimed
the mill has research plots also said that there are sufficient agronomists working on all aspects
of cane production. However, in speaking with cañeros, private agronomists, and cane union
representatives, I found that the mill does not have sufficient agronomists to serve all cañeros.
For example, many times the agronomist did not have sufficient quantities of fertilizer at the
warehouse to meet the demand of the cañeros.

Cane growing ejidatarios often complained about the lack of soil analyses and a limited
selection of varieties and quantities of fertilizer. Chemical applications depend upon soil
chemistry. Yet, complaints have been expressed that the mill uses the same types of fertilizer
regardless of soil fertility. Many ejidatarios expressed similar views as Ricardo Salazar
(Interview: 4/1/04) of the CNPR in claiming that fertilizer availability is the main problem causing
the diminishing sugar cane yields. Fertilizer is often not available when needed in the field
because the sugar mill’s bodega (warehouse) had an insufficient supply. The ejidatarios will
suffer because of the industries neglect as poor yields will result from improper timing of the
fertilizer application. The application of fertilizer consists of a combination of three or more types
applied at different times throughout the year. Triple, Urea, and Sulfato fertilizer, used by 10 of
18 cane growers surveyed (two ejidatarios did not know the name of the product used), is most
commonly applied in combination. The elder ejidatarios lament that “el fertilizante no está
complejo como antes” (“the fertilizer is not complete like before”) as three applications of
fertilizer are now required annually instead of one application in the not-so-distant past (A8).
The greater fertilizer requirement is due to continual overuse and ‘burning’ of the soil, depriving
the soil of sufficient recovery time. Several ejidatarios stated that fertilizer is necessary for plant
growth whereas in the recent past plants would grow without the use of fertilizer. Thus, with the
introduction of fertilizer, the ejidatarios have become dependent upon their use.

The use of certain fertilizer types provides an interesting examination of motivation and
accessibility to information. While the majority of ejidatarios use fertilizers recommended by the
mill, there seems to be no consensus for the use of certain types; each individual ejidatario has
their own preference (A12). Two ejidatario use Urea more often than Triple or Sulfato because
“me da mejor resultado” (“it gives better results”). Other ejidatarios said they are limited to the types carried by the mill. One ejidatario began experimenting with Barco Biquingo three years ago after talking to a friend who had been using it with some success. This fertilizer purportedly gives the fruit more flavor, though it is more expensive. Triple is favored by the mill because the cane matures faster, though one ejidatario claimed that it dissolves slower and does not hasten growth. Interestingly, the ejidatarios who have had their soil tested stated that they are using fertilizers recommended by the agronomist (the recommendation is based upon the soil test). Yet, types are the same for these ejidatarios as for the majority of ejidatarios who do not have their soil tested and use fertilizers commonly available at the mill. This begs the question of whether soil chemical analyses were actually carried out and if there is an added incentive for the agronomists to sell certain types of fertilizer. However, this may be due to the ejidatarios not heeding the advice of the agronomist as well.

In the avocado industry, property owners have soil chemical analyses performed every two years to determine those nutrients needed for the soil. These analyses cost on average $80 per hectare (Interview: Jose Rosario Caballero Arroyo, Agroquimicos Chapingo, 2004). Very few cañeros (cane growers) have had these analyses performed on their land, noting that the mill does not provide this service. However, upon inquiring of the ejidatarios as to the possibility of private industry performing these analyses, many exclaim that they are too expensive. However, the cost of such an analysis of an ejidal parcel is likely equivalent to the cost of incorrectly applying fertilizers every year. Ricardo Salazar (Interview: 4/1/04) agreed that it would be cheaper in the long run to apply fertilizers in accordance to a soil test but noted that the money would come out of earnings. The elder cañeros likely cannot see the benefit of spending money for a soil test.

The export produce companies appear to better support and assist their producers. While complaints were common regarding the lack of advice in cane production, these same complaints were not heard from avocado and blackberry producers. This is likely because of the greater number of agronomists available to assist these producers. While the cañeros are restricted by the assistance provided by the sugar mill, unless they have money to pay a private agronomist, export producers have an array of personnel to assist them. Because of the greater profit turned by the export produce and the increased vulnerability of export crops to plagues, this sector has agronomists working for each specific company who oversee all phases of production. More so, Sanidad Vegetal, a government agency charged with oversight of agricultural export regulation, also assists in advising these producers.

The blackberry and avocado exported are much more susceptible to plagues and to the dictates of foreign food regulations than sugar cane. While the sugar mill dictates the types of chemicals used in cane production there is no forced compliance upon the export producers – it is voluntary compliance. Theoretically, the producer must work with an agronomist to ensure that the application of chemicals falls within the regulations for exporting and thus has more incentive to do so. Otherwise, they could lose their entire crop if the produce is affected by a plague.

Information is nearly nonexistent concerning the effect of management practices (e.g. fertilizer application) on the environment. The only information that the ejidatarios have access to is in regard to the diminished quality of water as a result of chemical use. This concern has led to a national campaign to introduce bottled water and safe procedures in applying agrochemicals (A10). This lack of information reflects disorganization at the national level where continual changes and foreign dictates create an uncertain atmosphere regarding policies and procedures. One agronomist told me that it is frustrating when one authority says one thing and another authority says something else. Likewise, he said that the lack of organization manifested at the national level penetrates through all levels of society. No plans exist that will steer the future of agriculture. This disorganization results in contradictory advice as some
agronomists promote ecological friendly sustainable practice while others continue to support
the Green Revolution mentality. In fact, one agronomist mentioned that the Green Revolution
was “bueno, trajo beneficios” - that the use of agrochemicals has only been advantageous
(Interview: Jose Rosario Caballero Arroyo, 4/21/04). Two other agronomists, however, more
attuned to the environment, emphasized their desire to introduce organic practices and their
optimism that environmental degradation can be reversed. They, however, lamented that
contamination is so rampant that it will be a futile effort to reverse the trend. They argued that
the cost of organics must decline significantly for the campesinos to buy into them. The
ejidatarios cannot afford to change practices without realizing a profit.

The lack of organization and a national environmental conscious became evident when
inquiring of agronomists, the secretary at the municipal government building, and local
ejidatarios about organizations that published or distributed information concerning the
environment and agricultural management practices. The response from these people
suggested there was no such group. I was lucky, though, to interview an ex-employee of
Sanidad Vegetal, the closest organization to promoting sustainable practice as one can find
around Los Reyes, Michoacán. This organization’s priorities, however, lie in sanitation and
agrochemical regulation (specifically in the avocado), not with sustainable agricultural practice or
the environment.

Monocropping has been criticized as an ineffective strategy and environmentally
hazardous practice because of the ease with which disease spreads. This practice also fosters
the development of resistant pests since the same chemicals are used year after year. This is a
dangerous practice not only from an environmental perspective, but also from an economic one.
In the San Sebastián zone, a single profit-driven entity has dictated the lives of 1500
campesinos. Under the dictates of nationalistic policy, the sugar cane growers were entitled to
government subsidies only if their farming practices complied with mandated requirements.
However, with the adoption of neoliberal policy and privatization, profit-driven enterprise has
rolled back nearly all subsidies. The private company does not have the same resources or
political incentive as the government; its motivation is purely economic – the maximization of
profit at all costs. Unfortunately, the campesinos of the San Sebastian region (like their
counterparts in many other parts of Mexico) were left to their own vices as the dictates of the
private owner cared not for the welfare of the campesino, yet the campesino had no option but to
continue cane production. With declining profits in the sugar cane industry as a whole, the mill
owner has tried to squeeze all economic revenue out of his mill, thus leaving the campesinos to
take the brunt of these reforms.

The introduction of alternative crops and markets can only be economically
advantageous, as no longer are the cañeros subjected to the dictates of one single mill. The
influx of these national and foreign produce markets has spawned competition and alternatives.
This competition is forcing the mill to re-examine its objectives and work with the cañeros.
Avocado, which has been grown in the hills overlooking the sugar cane fields for the past fifty
years, is now the main export and continues to expand. The North American Free Trade
Agreement policy has led to the expansion of foreign markets in the region (there are some
twenty avocado packaging facilities and nine export companies running operations out of the
region). Of the 5500 hectares of cultivatable land in the zone, only 3058 are now in sugar cane
production (in 2002-03 there were 3396 hectares). Between San Sebastian and the neighboring
region, Santa Clara, blackberries are now produced on 2500 hectares whereas they were grown
on 500 hectares six years ago. Land in cane production is diminishing as this land is being
converted to other crops, zoned for urban districts (e.g. Los Reyes), and rented. Of the Gildardo
Magaña ejido members, few are not seriously considering an alternative crop or renting their
land (A2 and A19). The influx of the export companies to this particular region is due in part to
the temperate climate and abundant water provided by the geographic splendor the region offers.

Destruction of the environment from agricultural practices has become the focus of attention for much of the world as the need for sustainable practice is becoming more evident. While the wealthier nations have been able to adopt more sustainable practices because of their economic situation, the lack of infrastructure and status quo have curtailed adoption of these practices in poorer nations. As these strategies have historically degraded the environment, the recognition of a global community may lead to increased environmental consciousness throughout the world. For example, the introduction of foreign standards combined with the degraded state of the environment has begun to force the adoption of more sustainable and controlled practice in Mexico.

The awareness of the ejidatario concerning the degree of environmental degradation varied widely throughout the sample. A third of the ejidatarios claim there has been no change in the environment while the rest of the sample indicated there has been change. Most commonly noted among the ejidatarios was a change in water quality. This is likely a result of chemical runoff, erosion, and parasite build-up from animal excrement contaminating the canal water (as mentioned on multiple occasions). A few ejidatarios were told not to drink the water by medical authorities due to the presence of contaminants form of livestock excrement and agrochemical residues. Four ejidatarios noted a decline in the volume of water as more water is used for the production of blackberry than cane. Other ejidatarios, however, refute this claim saying that there is sufficient water. A diminishing volume of water could be due to changes in micro-climate in this region as a result of deforestation of the hills. Six ejidatarios noted that rains are less frequent; three of these people described the changes in the weather as becoming contradictory. These ejidatarios wisely associated this change in weather to the vegetation changes in the hills, noting that cutting down the forests has reduced total rainfall and shifted the rainy season – “porque cuando más selva, hay mas lluvias” ("because when there are more forests, there is more rain."). According to a few ejidatarios, the climate is becoming more temperate, with hotter and colder extremes. They, however, did not know the cause of this climate shift. These patterns are indicators that an undesired climatic change is underway.Perhaps such a change will result in a more arid climate. Extremes in temperature, decreasing rainfall, and changing weather patterns should serve as a warning that land will soon be part of tierra caliente, a much hotter and humid zone just to the South of the San Sebastián zone.

Reforestation efforts have begun in some parts of the region— one ejidatario planted 10,000 pine trees and 12,000 cedars on his property in the hills nine years ago. Another claimed that all the pine trees were cut from the hills 10 years ago, a program spawned by the governor of the state. A recent newspaper article too stated that the continued deforestation is cause for major concern as it is a resource that influences the climate, wildlife habitat, soil fertility, etc. (Cambio De Michoacán 3/30/02). Harvesting the forest does not simply reduce the number of trees, but wreaks havoc on the local ecology.

Changes in land use and management continue to destroy the environment and create conditions for sustained production that once was enjoyed by this region. It is evident that the ejidatarios are not preoccupied with the environment. Perhaps their economic desire does not allow them to look into the future, and at the same time, their economic past dictates they use more agrochemicals or conventional practices for a sustainable future. However, as the region undergoes these aforementioned ecological changes, it becomes evident that the environment will not sustain abuse for the sole purpose of short-term economic gain. Diminishing production and increasing chemical usage are evidence of the short term economic plight of the ejidatarios.

One ejidatario described the environmental situation as hopeless because ejidatarios lack knowledge and advice – “todo eso se hace falta uno, se necesita técnicos” (one lacks all of this, there is a need for technicians). Another ejidatario said that although there is an awareness of
how practices affect the environment, one must do certain things to make a profit. This type of mentality, therefore, contributes to environmental degradation. While some ejidatarios are concerned about how their practices impact the environment, they too rationalize their choice of practices based upon economics. Others ejidatarios are not concerned about the environment, only about financial gain. The real financial and environmental benefit will only be realized when ejidatarios choose more cost effective and ecologically conservative practices. However, while change is slow, it is necessary for the ejidatario to adopt alternative practices to preserve the environment for long term economic gain. This includes the safe and appropriate application of agrochemicals, erosion control, reforestation, discarding of waste in proper places, and controlled use of water. As one ejidatario who had been to New Mexico noted, ranchers in New Mexico collect and store water for irrigating while water runs off our land and is wasted. The future of environmental degradation in this region is likely to continue according to the consensus of the ejidatarios (A14). One ejidatario noted that “nosotros tenemos la responsabilidad pero llegan los políticos y no mas ponen papeles a nosotros, no llega el apoyo” (we have the responsibility but the politicians arrive and they only give us papers, and the support does not arrive), emphasizing that it is the responsibility of the individual and government to induce change. Five of the ejidatarios blamed the government for providing little advise and incentives to create change in agricultural practices. If change does not occur, the disintegration of the land will be inevitable. Climatic change is already underway, and sadly, before too long, this paradisic region will become part of the hot land, la tierra caliente under the current political and economic situation.

With the mentality that more agrochemical use will result in more production, the ejidatarios’ opinion of the land (A11) is valuable being the stewards of the land. The majority of ejidatarios sampled emphasized the beauty of the land, the advantages in abundant water, perfect climate, and good soil. “Estamos en un paraíso aquí” (“we are in a paradise here”) lamented one ejidatario, while another called this zone “oro verde” (green gold). Any crop can be grown in such a paradise. It is interesting that while four ejidatarios noted that soils differed across the ejido (with the soil in the lower part of the ejido richer than in the ampliación17), one of the ejidatarios stated that the good soil was derived from the ash of Volcan Paracutin18. While this is true, the ash would have fallen uniformly over the region. The bad land in the ampliación “barrita, con barro, tierra negra” (“hard, with clay, black land”) is likely due to the rapidity of erosion. The most productive part of the soil, the top soil, has washed away with time. One ejidatario noted that Michoacán is flatter than other places, so the cane can be harvested with machines. More cane is produced in Michoacán than in any other region. Not one person could think of any disadvantage to living in this region, all expressing their luck for being in such a location.

It was sad to hear the ejidatarios express their gratefulness for living in such a location, while at the same time discussing the pollution and environmental degradation. The basis for such awareness has been sown with the ejidatarios’ knowledge of the paradisic nature of the land around Los Angeles. Broadening this awareness of the state of the environment can only happen with the distribution and dissemination of information concerning sustainable practices. The foundation for change is present and the ejidatario must realize that to sustain production — their way of living - they must take measures to adopt new or alternative practices. The mentality that one knows all from experience will not serve future generations. The future of the environment is not in the hands of the government as some of the ejidatarios contend. Agreed, the government should be an initiator of change, but relying solely upon the government is

17 The ampliación is an addition to the ejido lands that was given to sons of ejidatarios and those without land in 1987.
18 Volcan Paracutin benefiting soil
dangerous. The government often shift priorities and policy (as happened with the San Sebastián sugar mill), which does not bode well for any long term programs.

Conclusions
I expected that the degree of environmental consciousness possessed by the ejidatarios would be directly related to the availability of expert advice. While this is true, there are several other factors which play fundamental roles: lack of organization and communication, lack of government support, the inability to plan ahead, and the mentality of the ejidatario. These factors have caused a decline in the environment’s ability to produce, leading to a system of higher inputs. This rise in inputs occurs due to the lack of organization, education, and assistance within the government.

I did not expect much of an environmental consciousness among the ejidatarios, though was pleasantly surprised by their awareness of changes in the environment. The majority of ejidatarios do not perceive the link between agricultural practice and degradation. The lack of an environmental conscious stems from the lack of monetary resources and education available. In stating this, I am not claiming that it takes monetary resources to initiate awareness. For example, ecologically sustainable practices have been applied by people with no economic recourses. But, for lack of monetary resources, Mexico has been subjected to the demands of the world’s richer nations at the expense of its own people.

This continued neglect of the land is due in part to the government’s lack of assistance and education combined with the profit-driven farming practices. With the influx of foreign produce companies, ecologically friendly practices are being introduced to meet the demand of the foreign market. European food regulations, for example, are limiting chemical use and market conditions are spawning the production of new produce. However, this change is limited by the produce companies, governmental constraints, and the implementation by each individual producer.

The elder ejidatarios are more likely to ignore advice concerning more sustainable alternatives, claiming the knowledge gained through experience is sufficient. As the culture of machismo is less prevalent and formal education is more prevalent in the younger generation, they are more inclined to illicit assistance in the implementation of farming practices. The future is very uncertain as the dialectics between issues, directives, and competing ideas are taking production in different directions as Michoacán moves from being a major sugar cane producer to export production – “El futuro económico de los michoacanos” (La Opinion de Michoacán 2003).
References Cited


