

MACROECONOMIC REFORMS AND AGRICULTURE POLICIES IN DEVELOPING COUNTRIES: Impacts on Social Vulnerability in the Argentinean Pampas and Mexican Coffee Sector

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Impacts on Social Vulnerability in the Argentinean Pampas and Mexican Coffee Sector

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Abstract

While climate is a primary determinant of agricultural production, agricultural systems are also highly sensitive to other stressors such as socio-political changes. Not only can the simultaneous impact of environmental and socio-political stress produce new circumstances of livelihood insecurity, but also the responses of farm systems to socio-political stress can alter their sensitivity to future climate impacts.

The 1990s were a decade of radical change in both macroeconomic and sector policy for many Latin American countries. The economic policy agenda epitomized by the Washington Consensus had profound impacts across the continent. Programs of market liberalization, privatization and deregulation were adopted by most of the continent's larger economies in order to facilitate their integration into regional and global markets.

These changes entailed significant restructuring of agricultural production, producing changes in technology, land use and introducing new forms of relationships between farmers and the state. At the farm level, the impacts of these changes have been quite uneven as a function of the existing heterogeneity in the agrarian structure and resource distribution. This paper shows how the transformation of agriculture as a consequence of political and institutional changes has affected the livelihood security and vulnerability of family farmers in two different Latin American socioeconomic and climatic contexts: the center-south of Cordoba, Argentina and central Veracruz, Mexico.

In Córdoba, family grain and livestock farmers have faced a gradual loss of control over land resources and the technology necessary for competitive production. While there have been regional economic gains resulting from these trends, the impact on family farmers has been largely negative, resulting in the expulsion of many rural residents from agricultural activities and rising concerns over the environmental impacts of expansive agriculture.

In Veracruz, after profound domestic and international changes in the structure of the coffee market, the survival of smallholder coffee farmers now depends critically on their capacity to diversify and invest technologically in their production. Past policy interventions in the sector replaced farmers' previous risk coping strategies and generated a strong dependence on the public sector that now is inhibiting adaptation.

The present vulnerability of family farmers is highly tied to these structural changes. In both cases, sector reforms combine with changing patterns of climate variability to increase the sensitivity of smallholder farmers to extreme events and to reduce their capacity to address their livelihood security. Despite important differences in the structure of production in the two case studies, the analysis illustrates how the similar patterns of broad-scale policy change in each country are altering the availability of resources as well as the viability of strategies farm systems formerly employed to address environmental risk. The future vulnerability of the farmers to climatic risk in each case will depend in large part on their capacity to respond to present socio-political stresses.

I. Introduction

The availability or access to productive resources in part determines differential patterns of vulnerability between farmer groups. For those farmers who depend primarily on agricultural activities for their livelihoods, these resources are critical to ensure that farmers have the necessary flexibility to sustain the levels of production necessary to satisfy their development ambitions. Current processes of macroeconomic change in developing countries designed to facilitate their entry into global markets are changing not only the nature of agricultural production but simultaneously imply greater exigencies and new requisites as farmers organize to respond to new consumer markets. Together with new production technologies and commercial channels, this transformation implies a need for better information management, an increased role for private sector and civil society organizations and a process of learning as farmers face increasingly complex production systems.

We argue that such change is necessary not only to adapt to new markets but also to reduce farmers' vulnerability to other external shocks that affect the sustainability of their livelihoods, such as those related to climatic variability and change. Unequal access to credit, input and producer markets and, particularly in the case of Argentina, to insurance markets, is increasing the gap between those with capacity to manage climatic extremes and those without. This gap in capacity is particularly worrisome in face of the possibility that extreme events may increase in frequency or magnitude with global climate change.

This paper argues that the series of policy reforms that have occurred in relation to agricultural production and trade throughout Latin America have direct and indirect implications for farmers' capacity to respond to stress. We posit specifically that farmers' adaptive capacities are affected by changes in resource availability and access, as well as by the rapidly changing requisites for participation in the agricultural economies of Latin America.

The paper focuses on four policy-processes that have become polemical in the reforms of agricultural sector in Latin America: 1) the privatization of agricultural services; 2) the liberalization of agricultural input and product markets; 3) the decline in public sector support for agricultural research, development and extension and finally 4) the entry of new actors into the process of policy and agricultural development. In the following section, we briefly discuss each of these four policy-processes in turn, outlining how, in theory, these processes could be hypothesized to enhance or diminish the adaptive capacities of particular farmer groups in face of climate change. In section III, we explore these hypotheses with evidence from recent research carried out in the Center-south of Córdoba, Argentina and Veracruz, Mexico. We illustrate the role

played by the political and institutional context of production in determining current and future capacity of family farmers to adapt to climate variability and change in both countries.

II. Hypotheses

The 1990s were a decade of radical change in both macroeconomic and sector policy for many Latin American countries. As a consequence of the debt crisis, countries like Mexico and Argentina were induced to follow a number of policy reforms as to get new financing. At the same time, as globalization started to be the panacea for economic convergence (Fritzche, et al 2004), the economic policy agenda epitomized by the Washington Consensus had profound impacts across the continent as market liberalization; privatization and deregulation reforms were adopted (Bulmer-Thomas 1996).

These changes entailed significant restructuring of agricultural production, producing changes in technology, land use and introducing new forms of relationships between farmers and the state. Prior to these recent reforms, agriculture in Latin America tended to be heavily regulated, subsidized and protected in the interest of national food security, political stability and urban and industrial growth (Thorpe 1997). Although in different forms and at different paces, in general Latin American countries in the 1990s (the late 1970's in the case of Argentina) pursued similar policy programs in agriculture involving the opening of agricultural markets and transformation of state involvement in the sector in response to the perceived stagnation of agricultural production in the middle 1980s (de Janvry and Sadoulet 1993; Spoor 2000; Reca and Parellada, 2001) . At the farm level, the impacts of these changes have been quite uneven as a function of the existing heterogeneity in the agrarian structure and resource distribution. The history, process and consequences of these changes have been discussed at length elsewhere (e.g. de Janvry and Sadoulet 1993; de Janvry, Chiriboga et al. 1995; Thorpe 1997; Murmis 1998; and Ghezan et al. 2001.). In this section we focus on four processes related to these policy changes that had particular implications for agriculture production and producers in both countries. Adjusting to these policy and institutional framework changes determined new circumstances in relation to the sensitivity and the process of adaptation to climatic shocks and change: privatization of agricultural services, liberalization of agricultural markets, restructuring of agricultural research and the entry of “new actors” into the agricultural sector.

Privatization of agricultural inputs providers and services

During the “Import Substitution Industrialization”(ISI) phase of development in Latin America, agricultural production in many countries were characterized by heavy-handed involvement of the public sector in the provision of agricultural services and technology (Thorpe 1997). This was particularly the case in countries such as Mexico, where the public sector was involved in everything from the provision of crop insurance, seeds and fertilizer and credit to the transport and commercialization of agricultural products

(Appendini 2002). Import restrictions designed to protect the agricultural input industry from external competition tended to limit the range and quality of inputs available to farmers, while marketing parastatals tended to control the distribution agricultural products and the participation of producers in the global agricultural economy. In Argentina, agriculture policy was highly linked to the results of the ISI. The agricultural sector was a provider of foreign exchange during periods of shortages, and a provider of cheap food and labor, as well as a source of price stability, during periods of expansion in the economic cycle. The only sector programs with a vision towards the long-term viability of the sector that were articulated during this period were the creation of the National Institute of Agriculture Technology in 1948 together with a tax and credit policy that created a demand for agricultural technology (Cuccia, 1983; Sábato, 1980).

According to standard neoclassical theory, the privatization or closure of many inefficient parastatals, particularly those that served as market and input intermediaries, in theory should improve the availability and quality of services, lower service costs and improve the efficiency of product and service distribution in the sector (Obschatko, 1994). The expected improvements in agricultural efficiency and increased choice in technology and services should thus improve farmers' opportunities for adaptation. However, in the context of the highly heterogeneous agricultural sectors of Latin America, in which a substantial portion of farmers operate on the economic margin, the productive needs of some producers may be neglected by the private sector in favor of those farmers who can better articulate their demand through the market. In these cases, those who may be particularly vulnerable to climatic impacts may be the most excluded from opportunities to directly address their vulnerability.

Market liberalization

The liberalization of agricultural markets – entailing the removal of barriers to the import and export of agricultural inputs and commodities, as well as the opening of agriculture to foreign investment – has been a controversial feature of recent policy reforms in Latin America. Market liberalization in Latin America has been particularly important in the context of the proliferation of multinational and regional free trade agreements (according to one source, 40 such agreements were signed by Latin American countries between 1990 and June 2003 (IICA 2004)). Trade quotas and tariffs have historically been effectively used in the continent to protect producers of food staples such as maize and rice, as well as to ensure “living wages” for farmers, as it was the case of Mexico, or for the development of the industrial sector, as it was the case of Argentina.

However, restrictions on the import and export of particular agricultural technologies or inputs can limit the flexibility of farmers in responding to environmental, economic or other stresses and lead to input and crop choices different from those which would result in free market conditions. In much of the literature, market liberalization is expected to facilitate farmers' autonomous adaptation to climate risk by increasing the

competitiveness and efficiency of production and enabling farmers to invest in risk-reducing technologies for profitable crops. By specializing in crops in which particular geographic regions have a comparative advantage, the overall efficiency of production is expected to increase, not only internally but also globally.

Public Agricultural Research and Extension Services

It has long been recognized that state institutions play important roles in distributing and regulating public goods. While most agricultural inputs may be regarded as “private goods”, agricultural research, information and technological development have traditionally been considered to be public goods, given that the benefits of research are generally diffuse and non-exclusionary, and that the private sector is unlikely to invest in research that may produce social benefits but not generate specific profits (Schultz 1990). Nevertheless, over the 1990s, public funding for agricultural research institutes stagnated in Latin America, while private sector investment in research and development has moderately increased (Echeverría 1998). A reduction in state expenditure for science, technology and research is of particular concern because of the geographic and economic concentration of knowledge production in agriculture in industrialized countries and within private sector companies protected by patents and intellectual property rights (CEPAL 2002). In order to compete economically and adapt to the rapid changes occurring not only in international markets but also in climate and environmental conditions, farmers will increasingly need access to information, new and appropriate technologies and innovations (IICA 2004). A reduced participation of the public sector in agricultural research and extension could have negative implications for those farm sub-sectors with limited resources, poor capacity for organization and highly sensitive to economic and environmental stress.

Entry of New Actors

Partly as a result of the privatization of many agricultural services and resources (not only of credit and input suppliers, but also of land and water), the rural landscape in Latin America has undergone a transformation in recent decades, characterized by the presence of many new economic agents. Input providers and output processors national and multinational corporations (e.g., Monsanto, Cargill, Nabisco, Bunge); national and international non-governmental agencies (such as Conservation International and World Wildlife Fund in Mexico; and AAPRESID in Argentina); and, new actors directly related with agriculture production (owning land or not like “Agriculture Investment Funds” in Argentina), are now players in the evolution of national agricultural policies and rural development outcomes (Chalmers, Martin et al. 1997). At the local scale, the combination of increasingly flexible land markets and new opportunities in export markets can enable easy entry and exit of agricultural production for those actors with sufficient resources for speculative investment (e.g. Soros). The short-term investment of such speculative actors could contribute to process of environmental degradation and thus increase the susceptibility of localities to climatic risk.

III. Evidence from case studies

1) Argentina

The policy reforms that began in Argentina in the 1970's and intensified in the 1990's affected all aspects of the agriculture sector, including the organization of the production process, agricultural productivity and the agrarian structure. Family farmers, who were the basis for of agriculture sector development policy in the past, started to find it increasingly difficult to incorporate themselves into the process of productive restructuring required by the new policy and institutional environment. In these conditions, their previous tools for managing market or climate risks became increasingly economically inefficient, and the economic impact of climate variability and its extremes were thus exacerbated. This was , principally the case for those farmers who were unable to meet the capitalization requirements of the reformed sector. In the Southern *pampas* region, the distribution of normal, mean and extreme precipitation values, seasonal climatic variability, and the interaction of climate factors with other physical variables of the environment are extremely important in determining the potential production of the region, crop yields, the quality of the natural resources and the strength of the regional economy. Common extremes events are droughts, wind and hail storms and flooding.

History

Prior to the “technological revolution” in the 1960's (Green Revolution), farmers in the pampas region managed climatic and market risk through highly diversified agricultural strategies with relatively little incorporation of newly developed technology (Sabato,1980). The income of family farmers was sustained through managing land use, thus reducing the high opportunity cost of capital. Cash crop and commercial livestock production was complemented in this region with a variety of subsistence activities, however in general farmers had poor access to educational and health services. By the 1960s, this situation began to change, driven by increased land and labor scarcity resulting from the Import Substitution Industrialization model pursued by the national government.

During the technological revolution of the 1960s, public sector support of farm credit, public financing of the national farm machinery industry, and the availability of seed varieties developed through the National Institute of Agriculture Technology, INTA, facilitated successive waves of technology incorporation by farmers (Obschatko, 1988). With the availability of low cost technologies from the public sector and an explicit tax and credit policy that favored technology use, even small-scale family farmers were able to sustain both their livelihoods and participate in the broader economy. Throughout this period, however, a culture of rural life prevailed, with rural incomes complemented with diversification in on-farm activities such as small-scale meat and dairy production (Cloquel et al, 2003). Mechanization and expansion of agrochemical utilization contributed to the spread of the practice of multiple tillages in one year resulting in the loss of more sustainable agriculture practices (Barsky y Gelman, 2001). However, in general, the increased availability of a

diversity of state-subsidized technologies within this institutional framework proved to favor rural households' resilience to climate and market variability (Sabato, 1980).

From 1976 through the 1980s, the agricultural sector was in a period of transition. The liberal economic policies pursued by the military government further facilitated the process of adoption of capital-intensive technologies and increased the participation of farmers in international markets. In the 1980s, declining grain prices coupled with a decline in the foreign demand for beef (mainly due to increased self-sufficiency and export policies in Europe) and a drop in the real exchange rate, resulted in the decline of cattle production in the Pampas and an increased specialization in cash crops as farmers aimed to maximize income per hectare. In general, the economic sustainability of the family farm depended on their capacity to incorporate new technologies and practices aimed to increase productivity, a process facilitated by INTA. Nevertheless, the trend towards greater specialization on cash crops also made the sector more sensitive to climatic variability and other external shocks, thus intensifying the demand for financial mechanisms of risk reduction (insurance and farmers' financial reserves).

During this period there were also concerns over the environmental consequences of the structural changes in the sector. For example, the diffusion of soybean production allowed for double cropping and the abandonment of mixed (livestock and crop) production, coinciding with increasing concerns over soil deterioration and degradation (Barsky y Gelman 2001; Moscatelli and Pazos 2000). The use of more capital intensive technologies also led to increased rates of rural-urban migration. Family farm households dealt with their reduced labor force by diversify their incomes through different activities in provincial towns (Cloquel, et al. 2003).

The reforms of the 1990's

A series of macro-economic reforms were initiated in the beginning of the 1990's, principally as a result of negotiations with international financial institutions associated with the debt crisis. At the same time the failure of the ISI supported an argument for economic recovery through export oriented production, increased competition, greater international integration to increase foreign trade (specially among MERCOSUR countries) and a reduction in direct support for agriculture in the public sector.

Although the search for higher farm-level productivity has been a constant since the 1960s, the policy framework established in the 1990s has made increasing productivity particularly challenging for some sectors of the farm population. Through the deregulation of sector activities, the liberalization of input and output markets and the withdrawal of state intervention, the government aimed to improve the efficiency and competitiveness of agriculture production. One of the results of this policy was the decline in prices of agriculture relative to non-agriculture products and in livestock relative to agriculture. This process combined

with an increase in the use of input technologies and commercial input packages (e.g., “genetically modified soy seeds”), facilitated by the growing participation of multinational agribusiness in the sector and the reduced role of INTA and the public sector as production intermediaries.

Agriculture land allotted to GM soy notably increased during the 1990s, replacing other crops and constituting the foundation of the agrarian change in the region, although for some researchers, soybean production has allowed for the survival of some small family farmers. No-tillage farming has increased in coverage and is now being used in almost a 90% of main crops (wheat and soybeans). However, the use of agro chemicals has also increased considerably as part of the “technological package” including pesticides, fungicides, fertilizers and mainly, herbicides.

The technological change required for increasing competitiveness together with a 50% decline in agriculture income purchasing power during the first four years of the reforms (as measured by the cost of living index) has not only pushed farmers towards more specialized production but also resulted in land concentration. Between the 1988 and 2002 National Agricultural Censuses, 35% of small and medium size farmers abandoned agriculture activities in Córdoba (INDEC, 2004). These farmers either have rented or sold their land. The costs of renting also began to increase as a consequence of competition with new forms of production organizations (food processors, foreign agents and agents from outside agriculture). And, on the whole process more marginal land has been incorporated into cash crop production.

In general, restructuring of agriculture production implied an increasing debt burden for small and medium size farmers, given the high cost of credit in real terms (the farmers’ lack of collateral). In many cases these farmers had no access to private credit (e.g., through input suppliers or banks). Integration within MERCOSUR countries also implied greater competition in poultry, pork and dairy production and decreasing prices for these products, leading to the abandonment of more diversified agricultural strategies and contributing to the further specialization in cash crop production.

Despite the strong tendency towards soybean mono-cropping, most of smallholders, especially in marginal areas, continue to plant a diversity of crops and to keep cattle, although under more intensive practices. According to interviews with farmers in the region, they continue these strategies to maintain soil conditions and to diminish climate risk. However, despite observable diversification, most specialists consider that the proportion of land under soybean cultivation is so significant that it is not possible to consider the small scale livestock and agricultural strategies of these farmers as diversification as such.

Independent of the degree of diversification in the region, the prevalence of new technologies favoring intensive production imply increasing rates of nutrients extraction, leading over time to increased fertilization requirements thus rising production costs and the consequent fall in producers’ economic margins. Recent

research carried in the region by de Prada et al. (2004) concluded that even relatively low rates of erosion are having high immediate on-site impacts, even without the consideration of future land productivity and the consequent loss in social welfare.

Finally, the changes in the agrarian structure resulted in important changes in labor and demographic aspects of the sector. Over the course of the 1990s, the permanent labor force within farms has diminished by 39%. Family labor in agriculture decreased 40% in the same period. Less than half of farms are now not employing a permanent labor force and main production activities are now contracted through service suppliers. For example, 50% of harvesting activities, 25% of planting activities and 20% of crop maintenance is now contracted through service providers. This has contributed to increasing rates of migration from rural to urban areas.

As a conclusion, the structural reforms have yielded positive results in terms of production and productivity; however have increased the exposure of farmers to volatile domestic policies and international markets. The reforms have also resulted in a strong dependence on external marketed inputs and technology and an uneven distribution of best practices and technologies. Socially, there has been a strong process of concentration in land tenure through renting or selling and an increased risk that farmers who have rented will not re-enter the sector as producers. This process has also increased the dependence of farm families on income outside agriculture. Finally, the technological changes that have taken place has produced a worrisome process of soil deterioration caused by mono-cropping and cultivation on marginal land and increased levels of pollution due to agrochemicals use.

Adaptation to environmental and economic change

A recent vulnerability assessment conducted in the region (Eakin, Wehbe et al. 2005), illustrates how the processes of change in the 1990s has contributed to highly differential vulnerability levels among agriculture producers. In all the cases, the differences derive from a combination of climate sensitivity and adaptive capacity. Climate sensitivity - specifically attached to droughts, hail and wind storms and floods - is highly associated with geographical location and type of activities performed in the farm, while adaptive capacity results from a combination of farm attributes that determines particular situations in terms of access to resources and the concomitant strategies. The principle means by which the recent reforms have affected the vulnerability of small-scale producers has been through the implications of new technology adoption and crop specialization for farm incomes and the environment, and through the focus of farm households on the short-term income maximization and the market. At the same time formerly strategies pursued by farmers to overcome soil degradation and economic insecurity have been discouraged by the new institutional and policy environment implying less

adaptive capacity to directly act on adverse climate events; and, making agriculture livelihoods more insecure for many family farmers now and in the future.

The new technologies which allowed and induced production specialization through more capital-intensive practices (Murmis, 1998), also enabled the expansion of cultivation onto poor soils and into more marginal land, increasing the exposure of production to the impacts of climate variability, especially drought. Despite increased yields for most of crops, the loss of agriculture income purchasing power has reduced the capacity of small-scale producers to managed effectively climate or market shocks. Moreover, diversified agricultural strategies have been now replaced by economic diversification strategies through non-farm alternatives. In general, the result has been an increased marginalization of those family farmers that remain in business, less capacity of this sub-sector to manage losses, and thus greater possibility of not being able to sustain the household economy in face of repeated shocks.

As a consequence of their fragile economic condition following the macro economic reforms of the 1990s, the decisions of small-scale family farmers now prioritize the short-term and the volatility of market signals in order to maximizing current incomes. This has translated into an increase in strategies such as mono-cropping and land rental. Interviews with experts in the region suggest that mono-cropping is contributing to wind and water erosion (characteristic of this region), and together with the high rates of nutrient extraction from increasing yields, are accelerating soil degradation and prevalence of crop diseases. This process increases the demand for agrochemicals, while increasing production costs and pollution levels. Land rental is allowing farmers to overcome the lack of working capital in exchange for high and secure rents. However, the type of contracting common in the region (very short-term) increases the likelihood of depredating practices affecting soil conditions.

2) Mexico

The changes in national and sector policy that have occurred in Mexico from the mid-1980s to the present are in many ways epitomized by the coffee subsector. In the early 1980s coffee was one of Mexico's principle agricultural exports, representing as much as 35% of the total agricultural export value (Fox Quesada 2004). In 1985, the crop was also one of the sector's most important employers, involving a labor force of over 300,000 (Nolasco 1985). Smallholders (farmers with landholdings between 2 and 3 has) have traditionally represented over 80% of coffee farmers, although rarely contributing more than 30% of the country's coffee harvest. Recent research has illustrated that temperatures are, in general, rising in central Veracruz where the case study research was conducted (Gay, Estrada et al. 2004). Over the last two decades, farmers have reported frequent losses to drought and heat stress, and economic models suggest that coffee yields are likely to be increasingly sensitive to heat stress in the future (Gay, Estrada et al. 2004). The most vulnerable farmers to such climate change are likely to be undiversified smallholders who, because of poor coffee prices, have not

kept up with the maintenance on their coffee trees and yet have few economic alternatives (Eakin, Tucker et al. *in review*).

History

The agroecology of small-scale coffee in Mexico has been the subject of considerable research, and coffee farming is often presented as an example of the potential for sustainable agriculture in Mexico. However, the sector is quite diverse in terms of the production systems it supports (Nolasco 1985). Beginning in the early part of the 20th century, coffee production, processing and commercialization were also heavily regulated by the public sector through financial and marketing parastatals (Aguirre Saharrea 2003). Internationally beginning in the 1960s, coffee production and prices were controlled through a system of quotas managed by the International Coffee Agreement, to which both coffee producing countries and coffee consuming countries were party (Santoyo Cortés, Díaz Cárdenas et al. 1996).

The Mexican government's regulation of the sector was consolidated in 1958 with the creation of INMECAFE, the National Coffee Institute. The production philosophy associated with the Green Revolution in Mexico's grain crops was extended through INMECAFE to the coffee sector and, during the 1970s and early 1980s, the resources of the institute were dedicated to standardizing and increasing coffee production through the diffusion of new coffee varieties produced in INMECAFE nurseries, non-native shade species and the promotion of frequent use of commercial fertilizers (Santoyo Cortés, Díaz Cárdenas et al. 1996). This industrial policy was particularly influential in central Veracruz, where INMECAFE's headquarters were located, where those farmers with landholdings within the altitude range considered ideal for coffee (900 m.a.s.l. to 1200 m.a.s.l.) were encouraged to replace traditional shade trees such as banana with *Inga leptoloba* and to plant coffee as a monocrop (Nestel 1995). Many coffee communities, including one of the case studies in this project, abandoned their subsistence crops and alternative cash crops during this period as recommended by INMECAFE in order to secure credit (Hoffman, Blanc-Pamard et al. 1987). Between 1975 and 1985, coffee production expanded by 50% in Mexico and 29% in the state of Veracruz. INMECAFE as the principle commercialization channel for Mexico's smallholder coffee farmers, as well as the primary source of credit, technology and extension, a large proportion of Mexico's coffee farmers became heavily dependent on the state apparatus in their production decisions.

The reforms of the 1990s

The context of production radically changed in the end of the 1990s. In 1989, following the United States' withdraw, the International Coffee Agreement collapsed (Ponte 2002). Almost immediately following the dissolution of the agreement, excessive quantities of coffee entered international markets, prices increased in volatility, and, with new uncontrolled volumes of coffee entering the market, world coffee prices began a

precipitous decline which has continued to the present (Ponte 2002). Climate conditions also had an impact on the stability of the sector at the end of the 1980s. National production declined by 10% as a result of one of the most devastating frosts that have ever affected coffee farmers in Mexico, driving many farmers in the affected regions to seek income from alternative sources and denying thousands of coffee harvesters employment (Martínez Morales 1997).

In the same year, as part of a broad program of national market liberalization, the Mexican government decided to privatize INMECAFE, and began several years of negotiations with coffee farmer organizations concerning the conditions under which the services and infrastructure managed by the institute would be transferred to either producer groups or the private sector (Krippner 1997; Synder 1999). In 1992, INMECAFE was formally dissolved, and along with it, the hundreds of farm credit unions INMECAFE had organized to transfer finances, technology and production. In the early 1990s, the ownership and management of the state-owned coffee processing plants were transferred to farmers' cooperatives and the private sector. A huge number of smallholder producers entered the 1990s with large debts that inhibited them from managing the coffee processing plants successfully (Hernández Navarro and Célis Callejas 1994). In addition to INMECAFE, BANRURAL, the public agricultural finance institution began to cut back substantially its loans to smallholder farmers in this period. Between 1985 and 1995, credit offered through BANRURAL contracted by almost 70% in real terms (Appendini 2001).

In 1994, after the credit programs of INMECAFE were abolished, farmers were also provided with very small annual loans at no interest through the government's community finance program, PRONASOL (Aguirre Saharrea 2003). Although the credit repayment in this program was generally quite good, the amount of capital offered to farmers was relatively small, preventing any substantial investment in the plantations (Hernández Navarro and Célis Callejas 1994).

Lack of credit and technical support, combined with declining coffee prices, has substantially affected the use of inputs in the sector. Prior to 1990, fertilizer prices were heavily subsidized, and the domestic market was protected through high tariffs and import quotas (Ávila 2001). In 1990, Mexico's fertilizer parastatal was privatized, and fertilizer prices liberated. Domestic fertilizer producers proved to be uncompetitive, and quickly farmers in Mexico faced a market controlled by a transnational fertilizer oligopoly (Ávila 2001). As a consequence, fertilizer prices did not decline after liberalization, and, in combination with plummeting coffee prices, smallholder coffee farmers began to cut back substantially on their input use.

As illustration, a national survey of coffee farmers conducted in the early 1980s found that 80% of farmers in Central Veracruz used chemical fertilizers. Fifteen years later, a survey of Veracruz farmers undertaken by the Universidad Veracruzana in 2000 found that only 44% used chemical fertilizers. Our own

data from 2003 of two coffee communities in central Veracruz found that while 78% of the 60 farmers surveyed used purchased inputs (including fertilizer, but also seeds, herbicides and pesticides), 62% reported that their use of purchased inputs had declined substantially in the later half of the 1990s. Not surprisingly, as a result of these changes in the coffee sector, overall productivity fell by over a third between 1989 and 1993 with a corresponding loss in farm income of 70% (Krippner 1997). In Veracruz, coffee yields plummeted from a peak of 4 tons/ha in 1992 to just over 2.5 tons/ha in 1999 (Figure 1).

The lack of investment in coffee has also translated into an increase in pest problems for coffee farmers. In the late 1970s, *la broca* (*Hypothenemus hampei*), a pest that reproduces in the unprocessed coffee berry, was introduced into southeastern Mexico from Central America (Santoyo Cortés, Díaz Cárdenas et al. 1996). By 1994 just over 5,000 has were infected with the pest in Veracruz (Santoyo Cortés, Díaz Cárdenas et al. 1996). According to the coffee census of 2001 36,442 has were infected (ASERCA 2003). Interviews with technical experts on coffee in the Veracruz region conducted by the authors suggested that the rapid proliferation of *la broca* is likely a result of the fact that because of poor coffee prices and a lack of labor, many farmers are not harvesting their coffee trees completely and are not investing in traditional maintenance practices, and thus have created ideal conditions for the reproduction of the pest. Some specialists also hypothesized that warmer conditions in the region may also be contributing to the extension of the pest to higher altitudes. Confirming this hypothesis is made complicated by the fact that much of the research results and database of INMECAFE have been distributed among various public and non-governmental institutions, such that locating historical data on pest distribution is now complicated.

Adaptation to environmental and economic change

The crisis in coffee prices and lack of maintenance of coffee plants has prevented smallholder farmers from perceiving important environmental changes in the sector. A recent analysis of climate data in the region found that winter temperatures have risen over the last 30 years, a trend that is expected to have negative implications for coffee production in the future given that coffee in Veracruz is already being produced at the upper limits of its temperature range (Gay, Estrada et al. 2004). Precipitation has also become more variable in recent decades. Improved management of shade species, new coffee varieties and investment in technologies such as integrated pest management are just a few possible means by which Veracruz farmers might adjust to warm conditions and possible increases in rainfall variability. Yet poor prices, lack of credit and inaccessible technical support are likely to inhibit many farmers from both perceiving the signal of climate change and from responding in the near term.

Since 1992 the federal government has continued to support the coffee sector, although it has tried to limit its interventions to those programs and policies that do not distort the coffee market. Rather than directly

intervene in coffee commercialization, the Mexican government today has developed a variety of programs encouraging crop diversification in coffee regions, supporting the costs of production for smallholder producers through a direct per-hectare payment and, most recently, compensating farmers for abysmally low prices with a per-kilo payment for coffee commercialized below what the government is considered a viable price.

Unlike past public sector programs, however, these new programs are restricted to economic supports and generally not accompanied by technical assistance or extension services. Agricultural extension support in Mexico was reduced dramatically over the 1990s (de Janvry, Chiriboga et al. 1995). Public support for agricultural research and science declined in real terms throughout the 1990s, and only recently (in 2002/2003) has return to 1990 levels (Fox Quesada 2004: Annex Estadística, pg 65). According to a recent analysis, in 2000 there were 752 extension workers specializing in coffee in the country (up from 0 in 1994), serving 282,000 coffee farmers (ASERCA, 2001). In the Xalapa area, the technical staff with specialization in coffee of the National Institute for Research Forestry, Agriculture and Livestock (INIFAP) field station was cut in half in the 1990s, constraining their capacity to both conduct primary research and provide free extension service to smallholder producers.

In this context, the increasing participation of non-governmental organizations – including international environmental and conservation groups – in the organization of the smallholder coffee sector could be viewed as a positive development. Groups such as Conservation International are working with farmers' cooperatives in some states to facilitate their participation in niche coffee markets (e.g., gourmet or organic coffee) while encouraging sustainable agroforestry practices. For farmers to capture sufficient rent in the coffee markets, they must be able to profit more directly from the stages of coffee processing and commercialization (Martínez Morales 1997). Organization is a critical element in this process. Independently, smallholders who are dependent on intermediaries are unlikely to receive the breadth of information now needed to adapt both to global markets and environmental change. In the absence of public extension support, farmer organizations can facilitate access to information on the availability of public support programs, pest proliferation and pest control, the management of shade, soils, and inter-cropped species and on the impacts of climate variability on coffee quality and yields. For example, of the 48% of coffee farmers who reported receiving government support in the coffee sector survey implemented by the Universidad Veracruzana, over half received the support through a farmer organization (INVERDER and Universidad Veracruzana 2001). In the two communities surveyed by the authors, only a third of the households were members of farm organizations (Eakin, Tucker et al. *in review*). Those that were not members perceived the organizations in the region to be too political, exclusive, and fraudulent, reflecting in part the long history of political manipulation of Mexico's rural sector through farm organizations associated with political parties (Eakin 2004).

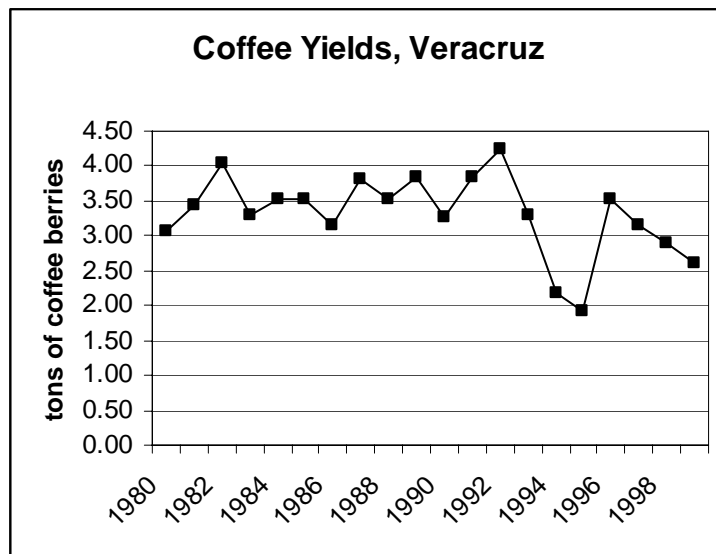


Figure 1.
Source: SIACON database, SAGARPA.

IV. Conclusions

The economic impacts of both sector and macroeconomic reforms in both countries have undeniably produced mixed economic, environmental and social results. Both countries have benefited from aggregate growth in their respective agricultural sectors in the period since the reforms were implemented. However, in both countries particular sub-sectors, geographic regions and rural populations have not unequivocally benefited from the policy changes. Reforms that boost national productivity and economic growth may not necessarily have positive implications for social vulnerability to economic and environmental change.

There is little evidence, for example, that the privatization of input suppliers and of the coffee commercialization process in Mexico increased the flexibility of coffee farmers' production strategies or reduced their production costs. To the contrary, as coffee markets were liberalized, smallholder farmers have faced a reduced economic margin with which to deal with market and climatic shocks.

In the Pampas, market liberalization has increased the availability of new production technologies and has contributed to the intensification of the production process. The fact that these technologies are now generally sourced outside the region and commit farmers to capital-intensive strategies has, however, had negative impacts on local economies. Also, the resulting concentration of capital in large-scale farm operations and the spread of mono-cropping practices have reduced the economic viability of the family farm, and thus also have affected the capacity of these farm to respond rapidly to change.

In both case studies, new actors are now present in the production process. In the Pampas region, multinational agribusinesses have now largely supplanted INTA and the public sector in the provision of agricultural technologies and services. The indirect result on adaptive capacity appears to be negative. Small-scale farmers have found their access to technology reduced, and the yield-enhancing technologies offered by the multinationals are not necessarily tailored to the agroecological requirements of the Pampas region.

In the coffee sector, the closure of INMECAFE has allowed for an increased participation of non-governmental environmental organizations and producer associations in the production process, with potentially positive implications for the economic and environmental sustainability of coffee production in the regions where these organizations are operating. This participation may enhance the capacity of farmers to address new challenges, whether from market or climate change.

Yet the policy reforms have also indirectly produced environmental changes in both case study regions. In the Pampas, soil erosion and degradation may be contributing to the sensitivity of farmers to drought. In Veracruz, the local economic crisis precipitated by declining coffee prices, rising costs and problems in commercialization has led farmers to reduce investment in their coffee trees resulting in an increased exposure to pests. In these conditions, the coffee orchards may be more sensitive to increased climatic variability and rising temperatures, and the coffee farmers less prepared to address these changes through their production practices.

In spite of the generally positive assessments of the aggregate economic benefits that have resulted and are resulting from the current trends in economic policy in Latin America (e.g., Spoor 2000), the evidence from the two case studies presented above indicates that any evaluation of the present social vulnerability of farmers in face of climatic variability and change requires a consideration of the social and environmental impacts of national and sector policy reform. In fact, although the positive implications of neoliberal reforms for national economic growth should imply an increased flexibility at the farm level, the case studies illustrate that the social and environmental impacts of these reforms at the regional level not only can increase the sensitivity of farm units to climate impacts but also reduce the capacity of farmers to reduce their vulnerability.

Although the two case studies differ significantly in terms of the type of farm system, scale of production, commodity orientation etc., a comparison of these cases illustrates that the reforms are affecting both individual and community security in rural areas. The resulting insecurity will likely affect the capacity of rural populations to face climate change, given the ways in which policy reforms are altering their ability to

manage present risks presented by climatic variability. Monitoring the relationships between macro-level policy, sector programs, environmental change and the differential capacities of particular populations to manage climate risk is a critical task for future research. The case studies presented here represent an initial effort to outline these interactions. We argue that such evaluations should be central to any effort to improve the sustainability and reduce the social vulnerability of rural populations—whether in environmental, social and economic terms.

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